KANSAS CERTIFIED MEDICATION AIDE CURRICULUM

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Under the authority of the
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Health Occupations Credentialing

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FOREWORD

Much effort has been made to ensure that this curriculum is accurate and current at the time of its writing. However, knowledge about drugs is constantly growing and drug uses may change. Therefore it is the responsibility of the licensed nurse instructor who uses this curriculum to modify medication-related information as necessary to maintain its accuracy.

Although the curriculum is intended as a guide for the instructor, it is also adaptable for students, and the revision committee encourages student access to the curriculum. There are several appendices and supplements for optional use. Instructors may add supplemental materials as needed for individual teaching methods and style. It is incumbent upon the instructor as a licensed professional to use current nursing practice standards when teaching. As a technical agent, certified medication aides are to be taught basic medication administration techniques and safety. The course is intended to prepare the individual to safely perform duties which are of a standard nature within Kansas licensed adult care homes. Once certified, the individual then gains competency as these basic skills are practiced under the supervision of a Kansas-licensed nurse. There is not a "scope of practice" for unlicensed, assistive personnel. The credential that is conferred upon them is an acknowledgment of having successfully completed a body of training including didactic and clinical experience. The practice of the medication aide is the responsibility of the supervising licensed nurse. The ultimate goal is to provide competent, quality care to the frail and elderly residents of the state's adult care homes.

Sound educational practice suggests that students should be tested over small units of information, so that the student and instructor have feedback about the student's progress throughout the course. This practice is more helpful than administering a comprehensive final exam at the conclusion of the course.

Every effort has been made to compile accurate medical and nursing data within this curriculum. In addition to the work of the revision committee in gathering and revising materials, appreciation is expressed to Tom Frazier, RPh, who represented the Kansas Board of Pharmacy in reviewing the curriculum, as well as to Diane Glynn, JD, RN, Kansas Board of Nursing, and Jeanne Miles, Hutchinson Community College.

Many individuals contributed to the revised curriculum and State test, including associations, schools, facilities, and certified medication aides. The following organizations contributed members to the revision committee:

Health Occupations Credentialing Advisory Group
Kansas Health Care Association, Cindy Luxem, President; Linda Mowbry, Dir. of Education
Kansas Adult Care Executives, Phyllis Kelly, Executive Director
Kansas Department on Aging
Kansas Association of Homes and Services for the Aging, Debra Zehr, President; Joe Ewert, Government Affairs Coordinator

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Unit 1. Legal, Ethical and Current Practice

Objectives

1. **Role and responsibility**
2. **Statutes and regulations**
3. **Ethical Standards of Conduct**

See Federal State Operations Manual

See Kansas Administrative Regulations at:
http://www.aging.state.ks.us/PolicyInfo_and_Regs/ACH_Current_Regs/ACH_Reg_Index.html

For authorizing statute for certified medication aides in the Kansas Nurse Practice Act, see: K.S.A. 65-1124(i) at www.ksbn.org. Follow the link regarding the Nurse Practice Act.

Content

1. **Attitude –** know yourself and your attitude toward medications/drugs.
   - The medication aide's attitude towards medications may differ from those of the residents he or she serves.
   - Medications have a great potential for altering body function, so medication aides must be aware of their responsibility.
   - Recognize all residents as individuals.
   - Be able to identify the resident in any setting.
   - Know the activity and behavior of each resident. The most common adverse drug reaction the elderly experience is confusion, so a change in behavior or appearance may be the first clue to an adverse drug reaction.

2. **Performance expectations –** know what is expected of you on the job.
   - Be familiar with your job description.
   - Be familiar with accepted policies and procedures at your place of employment.

3. **Legal responsibilities–**the medication aide is legally responsible for his/her own actions.
   - It is legal in Kansas for a medication aide:
     - To work under the supervision of a Kansas-licensed nurse, either LPN or RN.
     - To administer oral, topical (skin), eye, ear, vaginal, rectal medications in an adult care home in Kansas.
     - To perform certain other procedures if they are taught to do so and deemed competent by a supervising licensed nurse.
     - To refuse to perform a task the medication aide has not been trained to do or does not feel competent to perform.
   - It is **not** legal for a medication aide:
     - To give medication by any route that involves puncturing the skin, such as intramuscular or subcutaneous injections or through intravenous lines.
     - To take phone orders from a physician, physician's assistant, advanced registered nurse practitioner (ARNP), dentist, or pharmacist.

4. **Ethical responsibilities –** ethical standards differ from legal issues in that ethics refers to moral principles, values or conduct not necessarily included in the law.
   - Ethical treatment of residents by medication aides includes but is not limited to:
     - Respecting residents' rights.
     - Respecting residents' privacy.
     - Respecting residents' individuality and autonomy.
     - Maintaining confidentiality.
     - Respecting residents' wishes whenever possible.
     - Maintaining respectful communication.

Unit 2. Communication

Objectives

1. **Describe the importance of verbal and nonverbal communication in health care.**
2. **Describe the communication process.**
3. **Demonstrate sensitivity to residents' verbal and nonverbal communications, changes in thought process, mood and behavior and identify important elements of an effective helping relationship.**
4. **Identify barriers to effective communication.**
5. **Participate in the nursing process.**
6. **Report significant changes in resident's condition and in a timely manner.**
7. **Share information objectively and subjectively in a professional manner.**
8. **Recognize when, where and how to refer resident to other professionals.**
9. **Use techniques which support the care plan including: behavior modification, therapeutic communication, reality orientation, and validation.**
10. **Relate effectively with other team members.**

Content:

1 Health team members must communicate with each other for coordinated and effective resident care.

- Information must be shared about what has been done and what needs to be done.

2. Communication process

- Communication is a continuous reciprocal process of exchanging information.
  - Communication requires a sender, a message and a receiver.
  - A message sent is received and interpreted by the intended person(s).

- Messages may be verbal or nonverbal.

- Validating is necessary to determine accuracy and meaning of message.

- Sender must have knowledge to send a message and receiver must have knowledge to understand what is sent.
  - For communication to be effective, words must have the same meaning for the sender and the receiver of the message. The words "small," "medium," and "large" can mean different things to different people. Is small the size of a dime or a half dollar? In health care, differences in meaning could have serious consequences.
  - Avoid using words that might have more than one meaning or the words "I understand."
  - Use words that are familiar to people with whom you communicate.
  - Be brief and concise when communicating.
  - Information should be communicated in a logical and orderly manner.
  - Be aware of language differences.

3. Communicating with the resident

- **Properly identify the resident according to facility policy**, having them state their name or using additional identification such as pictures on the medical records.
- If the resident is cognitively impaired, get assistance from other staff member(s) for proper identification. Identify yourself: name, title, reason for being there.
- Address them by their proper name; determine their chosen name. Do not call them "grandpa," or use pet names.
- The medication aide must be empathetic, understanding and respectful of the resident as a person.
- The resident must be thought of as more than a disease or illness; the resident is a physical, psychological, social and spiritual human.

- **Listen** carefully to expressed thoughts and feelings and tone of voice.
  - Face the person; make eye contact; do not turn or walk away while talking; block distractions. Communicate at eye level.
  - Allow the resident to express thoughts and feelings.

- Don't talk about personal problems; don't criticize staff or facility.
- Accept and respect the resident's culture and religion.
- Honesty, trust, self-control, being nonjudgmental, self-disclosure, confirmation, and professionalism are some of the elements of an effective relationship.

- **Communicating with the dying** involves listening and touch (when accepted as comforting). The following topics may be of concern to the resident:
  - Fears, worries, anxieties.
  - Privacy, being left alone.
  - Having family and friends available and present.
  - Having the health care team present and being able to talk about what is happening.
  - The time of day may influence mood and concerns. Some prefer to talk at night when it is quieter and there are fewer distractions.
  - Provide reassurance and explanation of care.
  - Do not give "false" hope or offer platitudes: "It's going to be okay." "You're doing fine."
  - Respect their spiritual needs and values. Some may or may not have religious beliefs. Do not force yours on them.
  - Keep favorite memorabilia close, such as medals, pictures, knickknacks and books of choice (bible, other religious writings).
  - Hearing is one of the last senses lost. Provide positive and comforting words. Avoid negative words or topics that would upset them. Often, just a calm voice, describing the day, the view out of doors, the colors and textures in the room will soothe and comfort. Low volume music may be helpful. Be careful to abide by resident's preferences. Commercial radio station may be inappropriate, especially those with lots of DJ commentary, advertisements, etc.

- **Verbal Communication:** Words are used in verbal communication spoken or written.
  - Verbal communication is used to talk to residents, to find out how residents are physically and emotionally, and to share information with them.
  - Control the loudness and tone of voice, and rate of speech. Speak clearly and distinctly. Shouting, mumbling and whispering cause poor communication.
  - Written words are used when residents cannot speak or hear.
    - Treat with dignity and respect - not pity.
    - For hearing impaired people, provide ways to communicate, such as the Magic Slate (copyrighted).
    - Eliminate background noise.
    - Write messages for those who cannot hear, or those with severe hearing problems.
    - When speaking, face the resident and allow the resident to follow your lips and expression.

- For the visually impaired:
  - Announce your presence; do not startle. Communicate at eye level, face to face, when possible.
  - Books are available in Braille, talking books, and audiotape books.
- Techniques for using the phone or intercom:
  - Identify the location (on phone, state name of facility).
  - Identify your name and your job title.
  - Speak slowly and clearly.
  - When taking a message, write it down, ask for spelling, and repeat message back to verify name of caller, information, phone number.

- **Nonverbal communication** does not involve words.
  - Seventy percent or more of our communication is nonverbal.
    - Facial expressions are the most important source of information about a person's emotions; they telegraph what really matters to a person.
    - Vocal clues include pitch and rate of speech, and are the best ways to interpret an individual message.
  - Body movements such as postures, gestures, and actions convey a person's feelings, self-image and energy level.
  - Odor tells something about a person's hygiene. Clothing and grooming also convey a message about a person's self-image and self-esteem. This applies to residents as well as employees.
  - Object placement and environmental organization reveal how organized or disorganized a person is - qualities that have value to many of us.
  - Use of touch is very important in health care.
    - Research has demonstrated the healing powers of touch. It expresses very personal behavior and means different things to different people.
    - Touch is one of the most effective nonverbal ways to express such feelings as comfort, love, affection, security, anger, etc. Unfortunately, some people misinterpret touch at times.
    - Never touch in a harmful way, or as an expression of frustration, to gain control, or to convey anger.

4. Barriers to effective listening and communication

- Diminished alertness and confusion reduce communication.
  - Resident may become tired, disoriented and agitated, especially toward end of day.
  - Visual and hearing impairment distract and distort communication

- Selective hearing may result in limited information sharing.

- Neglecting to determine that the listener understood what was said promotes misunderstanding.

- External distractions may be barriers to communication.

- Unshared meanings and not seeing eye to eye on issues may limit understanding.

- Inappropriate jargon such as, "ya know," "know what I mean," or, "uh-h-h," may reduce effective communication.

- Watch for different interpretations of the same words.

- Avoid cliches, stereotypes, and pat answers such as, "everything will be OK."

- Do not prejudge the resident: rushing communication, finishing sentence for him or her, etc.

- Cultural, ethnic, or religious diversity may become barriers because of lack of familiarity, differences, lack of acceptance, prejudices.

- Disruption of the family occurs when a resident is admitted to any health care facility. Life within the family unit is changed. This often leads to feelings of anger, depression and loss on the part of the resident and other family members. Any major change will cause the message to be heard in part or, sometimes, blocked. Present one idea at a time, making sure it is understood.

5. The Nursing Process

- The primary purpose of the nursing process is to help the nursing team manage care scientifically, holistically and creatively.
  - It is an interpersonal process that is always resident-centered rather than task-centered.
  - It is goal-oriented to assist residents, nurses and staff to work together.
  - Assessment, problem solving, goal-setting and evaluation help determine the resident's condition and progress, or lack of progress toward recovery and/or goal achievement.

- Health care professionals must have effective communication to coordinate and provide continuity of care.
  - Communicating effectively helps all staff to supplement and complement each others' services and to avoid duplications and omissions in care.
  - The medication aide understands directives and works within his or her scope of training under supervision of licensed nurse.
  - Discussing, reporting and recording are the primary means of communication in health care.
  - Professional qualities must be demonstrated in each situation.

- The nursing team promotes wellness, prevents disease, restores and maintains health, facilitates coping and acts as an advocate for the resident.

- Be familiar with federal and state regulations, policy and procedures of the facility, job description, advance directives, accident/incident reports and disaster plan.

- The comprehensive interdisciplinary care plan is reviewed and updated as per regulations and policy of facility.

6. **"Report"** - means to give an account of something that has been seen, heard, or considered to be done. The medication aide reports to his/her supervising licensed nurse. Medication aides are often asked by family members about a resident's status. You will need to know what your facility's policy is for giving this information. Usually the medication aide will report the information of concern to the licensed nurse and he or she will talk to the family member(s).

- **Reporting and recording**
  - Reporting is the verbal account of resident care and observations.
  - Always give the name of the resident, time your observations were made or care that was given.
  - The report needs to be factual, objective, and timely. Be thorough and accurate.
  - Report any change in behavior or physical condition, positive or negative. A change in the normal behavior could be the first clue of an adverse drug reaction. Report current status of resident, any change in medical condition, or response to medical treatment.
  - Anything that endangers the safety of the resident should be reported immediately, such as difficulty in breathing, chest pain, change in level of alertness, etc.
  - If resident conveys suicidal thoughts or thoughts of harming self or staff, report to supervisor immediately and other team members according to facility policy.
  - All complaints from resident, family and visitor should be reported factually in a timely manner (chronological order). Each facility must have a policy about accident and abuse/neglect/exploitation reporting.
  - Medication aides are responsible for their own actions. Document each situation in a factual, logical manner, listing observations, procedures and treatments in the order done. Use appropriate terminology and approved abbreviations.
  - Reports may be given orally in a meeting, or may be audio-taped.

- **Objective and subjective data collection**; observation and conclusion.
  - Objective data (signs), are those things you can see, hear, feel or smell.
  - Subjective data (symptoms) is what the resident tells you but is not noticed through the senses, such as touch, etc. Opinions are considered subjective data.
  - When a resident or family member voices concerns, listen and offer support and encouragement. Refer the problem to supervisor or another team member.

- Listen attentively. Repeat what you believe that you heard.
- Ask about the main problem using terminology the resident understands.
- Use open-ended questions, reflecting back what the resident said and asking questions to clarify information.
- Avoid comments and questions that impede communication, such as yes-no questions, cliches, giving advice, changing the subject or giving false information.
- Use silence and touch when appropriate.
- Family members and friends are especially helpful sources of data when the resident has limited capacity for sharing information. (Care must be given that the resident agreed to the sharing of information.)

7. **Share information gathered in a professional manner** to appropriate health care team members, respecting the rights and confidentiality of the residents and family members.

8. **Resident referrals:** The process of sending or guiding someone to another service for assistance is called referral.

- This is the duty of the licensed nursing staff or physician. However, nurse aides and medication aides provide the "eyes" and "ears" for the nursing staff.
  - Referrals may be for physical, social, psychological or spiritual reasons.
  - Resident or family members' verbal or nonverbal expressions of concerns in the following areas may be noted when considering a referral: guilt, concern over money matters, anger, loss of a family member, lack of understanding of health care treatments or medications, change in behavior or mental condition.

- Most health facilities have policies for referrals.
  - A facility may have special forms that personnel are to use when making or recommending referrals.
  - The policies usually indicate who may initiate a referral and how it is to be done.

- Common methods of communication, other than the resident's record, which are used by nurses include reporting, conferring and referring.
  - Other members of health care team may respond to needs expressed through the resident's record or referrals:
    - dietary services
    - therapy services
    - social services and activities
    - other services available in the community for referrals
    - community support groups
    - community activities
    - clergy

- Interdisciplinary care plans are a review of each resident, completed by team leaders/associate team leaders.

- Medication aides may be designated by team leaders to present information about a resident assigned to him/her.
- Address the problem according to policy of facility. Be specific, descriptive and tactful. Describe your feelings and views objectively.

9. Techniques in a "helping" relationship for behavior issues.

- Know the disease, treatment, and appropriate goal-setting.
  - Note problems as they occur; report and record.
  - Promote verbal communication among staff and residents.
  - Tell the resident your name with each interaction.
  - Use short, simple statements.

- Cue resident: "It's time to go to dinner..."

- Use resident's proper or chosen name.

- Use reality orientation (to person, place and time) if resident has memory retention and recall.

- Use validation techniques for residents with long and short term memory loss. Do not argue or correct the resident.
  - Reminisce.
  - Ask questions using "who, what, when, where and how."
  - Do not ask "why."

- Concentrate on resident's needs, not on staff's needs.

- Use distraction or activity.

- Approach in a slow, non-hurried manner from the front.

- Share techniques developed by staff while working with a confused resident.

- Treat the resident with courtesy and respect.
  - The sensitivity of staff members should include empathy for the resident, placing one's self in his/her situation, touch, being gentle and reassuring.
  - Move slowly.
  - Don't rush the residents. This is especially true in transporting residents. Do not whisk residents away in geri-chairs, wheelchairs, etc. at a pace that is too brisk.
  - Walk at a normal pace for the resident.

- Residents may exhibit combative behavior, inappropriate, violent or hostile behavior such as hitting, biting, pushing, or verbal attacks. These behaviors are usually reactions to the residents' inability to cope with their environment.

- Block any physical blows, remove yourself from harm's way with safety of resident in mind.
- Get help when needed.
- Report the event.
- When a resident or family member behaves inappropriately, including sexual advances or anything that makes you feel uncomfortable, report the behavior to your supervisor.

➢ The resident and family need much encouragement and emotional support.
- Physical safety, love and belonging, esteem and self-actualization needs are all affected.
- Be aware of and report behaviors such as mood swings, hallucinations, delusions, sundowners syndrome (changes in personality and activity that seem to occur at nighttime), aggression or agitation, confusion or decline in mental alertness, tearfulness, and combativeness.
- Family and friends typically are there to provide love and support. Be respectful to them.
- If a family member or friend has a negative effect on the resident, report your observations to supervisor.

➢ Always report to licensed nurse and document. It is important for health care team members to be aware of behavior from shift-to-shift.

10. Team members - work together in accomplishing goals, maintaining a successful relationship.

➢ Team members (medication aides) should:
- Encourage a positive attitude with other team members.
- Encourage an atmosphere of support for the caregiver.
- Maintain flexibility and adaptability while working with different priorities.
- Reinforce the communication among staff.
- Be effective in increasing communication between shifts.
- Assure continuity of resident care to deliver quality resident care.
- Report to person(s) responsible for promoting communication among team members.
- Be competent, courteous, empathetic and have a positive attitude.
- Continuously improve your interpersonal skills by expressing feelings and views objectively, showing support, giving and receiving compliments, saying "no" when appropriate, and resolving problems effectively.
- Positive feedback - Be sensitive, specific, descriptive and logical, not emotional. Be tactful if or when you disagree.
- Negative feedback - Make sure the feedback is problem-focused and not person(s)-focused.
- Caregiver stress refers to the fact that this work puts us in daily contact with residents who are struggling with crisis, emotional problems, or physical illness. This is a situation that can lead to interpersonal tension,

burnout, insufficient understanding and struggles. The goal should be to achieve cohesiveness as a team:

- Identify caregivers as a group: use "we, us, our."
- Create tradition. Identify activity that, as a group, helps to maintain spirit.
- Think teamwork. Do not be concerned with who gets "credit," but that the entire group benefits and succeeds.
- Learn to recognize the achievements and positive contributions of others of the team. Take notice, give verbal praise and compliments.
- Set and strive for clear goals for the team.
- Live by the Golden Rule.

- Team work is the essential key to success in delivering quality resident care.

Unit 3. Infection Control

Objectives

1. **Review the principles of standard precautions.**
2. **Know that facilities will have specific policies relating to infection control.**
3. **Identify proper hand hygiene techniques.**
4. **Identify additional methods of infection control.**

Content

1 **Principles of Standard Precautions:** Review principles of standard precautions, chain of infection, barriers to infection and ways to handle infectious waste. See also www.cdc.gov.

2. **Facility's "Employee Exposure Plan"** - policies/procedures that relate to infection control.
   - Review these policies. Ask questions to clarify and assure understanding.

3. **Hand washing:** Hand washing is the single, most important action to protect yourself and your residents from the spread of infection.
   - **Hands should be washed:**
     - After touching blood, body fluids, secretions and excretions and contaminated items, regardless of whether gloves are worn.
     - Immediately after gloves are removed.
     - Before and after providing direct care such as bathing, perineal care, or oral care.
     - After caring for resident with known infection.
     - Before and after caring for or touching wounds.
     - Between tasks on the same resident to prevent cross contamination of different areas of the body (working with different wounds).
     - Before caring for a resident susceptible to infection, such as a resident with an impaired immune system.
     - Before and after your work shift.
     - Before and after using the restroom.

   - **Hand washing technique**
     - **Use warm, running water**, keeping hands lower than elbows allowing water to flow toward fingertips.
     - Use firm rubbing motion to clean all surfaces of wrists, hands, fingers and nails. Liquid soap is usually provided from a dispenser.
     - Wash for an adequate length of time (15-30 seconds).
     - Dry hands with paper towels, using dry towel to turn off faucet.
     - Avoid touching sink with clothing or body.
     - Always use soap and water if hands are visibly dirty.
     - Follow facility policy when using waterless hand cleaner. Rub all surfaces of wrists, hands and fingers until the cleaner dries, or as described in facility policy.
     - Hand washing techniques and updates can be found at the website for Centers for Disease Control and Prevention: www.cdc.gov.

4. **Additional methods of infection control:**
   - **When applying medications** to contaminated areas, it is mandatory to use effective barriers per facility's policies/procedures. (Example: if applying a cream to a perineal area, gloves are worn.)

- Maintain clean work area and replace items used on your shift.
- Clean equipment according to manufacturer's recommendations.
- Store supplies, equipment, and medications according to facility policies.
- See also units 21 and 23.

Unit 4. Safety and Medication Administration - Pharmacodynamics

Objectives

1. **Define pharmacokinetics.**
2. **Define medication action.**
3. **Explain the relationship between medications and drugs.**
4. **Know the four basic body processes that affect medication action.**
5. **Know factors which affect medication action and be able to identify the effects of each factor.**
6. **Know medication effects. Demonstrate ability to differentiate between therapeutic effects and side effects; and local effects and systemic effects, and to recognize descriptions of major adverse reactions, including the meanings for the terms which describe unwanted medication reactions.**
7. **Define medication interactions and differentiate between synergism and antagonism.**
8. **Know other medication-related disorders.**
9. **Explain the difference between psychological and physical medication dependence.**
10. **Define drug abuse and name classifications of drugs that are commonly abused.**

Content

1. Pharmacokinetics and body cells

- Pharmacokinetics - the study of a medication during absorption, distribution, metabolism and excretion.
  - Pharmacokinetics refers to the chemical changes that medications cause in the body cells and how these chemical changes alter body functions.

- Medications are ordered for a specific resident, to modify or change a specific condition.

2. Medication Action

- Each medication interacts with normal processes of the body's cells. Action may:
  - Slow down the ordinary processes that the cells carry out.
  - Speed up the ordinary processes that the cells carry out.
  - Destroy or alter certain cells or interfere with reproduction or functions of cells.
  - Replace or supplement natural substances.

3. Medications and drugs

- Medication is defined as "treatment with remedies." It is the term that is used inclusively for drugs, vitamins, and herbal substances. Medications may be "drugs" or other substances.
- "Drug" is the term generally used for substances that are manufactured and classified under the Food and Drug Administration. Drugs include those chemical substances that are available through prescription or over the counter.
- All drugs are medications.
- Not all medications are drugs.

Note: In listing drugs throughout the curriculum, the generic or chemical name is listed first (brand name in parenthesis).

4. Four basic body processes that affect medication action.

- **Absorption**
  - Passage of a medication from the site of administration into the bloodstream.
  - Process by which this takes place for each medication will affect how quickly and how completely the medication is absorbed.

- **Distribution**
  - Movement of the medication from the bloodstream into the body cells and into the spaces between the cells, to the site of action.
  - Some medications tend to collect in certain organs or tissues, called medication reservoirs.

- **Biotransformation**
  - Chemical alterations which a substance undergoes in the body.

- Metabolism is controlled by enzymes - proteins that cause chemical changes in medications (and in cell processes).
- Most biotransformation - the chemical breakdown, metabolism and detoxification of medications - is done in the liver, with some in the kidneys, lungs, blood and intestines.
- Biotransformation affects the medication's action:
  - Some medications cannot work on body cells in the form in which they are given. Biotransformation changes them into active medications.
  - Other medications become inactive and lose their power to work on body cells when they are bio-transformed.

➢ **Excretion**

- The body's way of removing the waste products of ordinary cell processes.
- Medications are excreted in the same way as other wastes, through the urine or feces, or lungs, sweat, hair or milk.
- Excretion affects a medication's action:
  - If excreted quickly, the medication's effects are short-acting.
  - If excreted slowly, the effects last longer.

5. Factors affecting drug/medication action

➢ **Age** (See Appendix - Medications and the Elderly)

- Growing old in itself does not change medication response, but change in effective function of body systems and cells does. This cannot be predicted by age in years.
- Elderly people may be more sensitive to some medications and, therefore, there may be a greater potential for adverse reactions.
- Be alert for unusual responses to medications (excessive, delayed, less than expected, no response).

➢ **Size**

- Obese persons or those large in stature require a higher dose to achieve the desired effect because of the high percent of body fat and overall body mass.

➢ **Diet and Time of Day**

- Taking food with medications can alter the medication's effects. Check medication resource for examples.
- Food delays emptying of the stomach and may retard absorption of medication. This may aid the effect of some medications, such as antacids.
- The presence of food increases the acidity of the stomach. This may prevent or speed up absorption.
- Check medication resource for which medications should be given with food, and which should not.
- See also "medication interactions" below.

- **Gender**
  - Primarily due to differences in size, metabolic rates, proportion of body fat.

- **Genetic factors**

- **Pathological (disease) conditions**
  - Body's ability to respond to the medication may be changed due to underlying disease and may result in more unwanted affects.
  - Diseases of the liver and the kidneys, which change the processing and elimination of medications, can increase side effects or toxicity.
  - The body's homeostatic mechanism is compromised.

- **Psychological (emotional) condition or attitude**
  - Positive attitude and belief in effectiveness can impact the acceptance of the medication.
  - Distrust-confusion can be a result of the medication, interactions of disease and medication, or drugs interacting together. Or, it may be an indication that no one has taken the time to explain the need for the medication and how it is helpful to the resident.

- **Route of administration**
  - Some medications are absorbed better by different routes of administration.
  - The method of giving a medication can impact its absorption and effectiveness.
  - If a long-acting drug is crushed, its potency may be diminished or released too rapidly.
  - Assure that the medication has been swallowed, absorbed, or retained as is indicated. This will impact its effectiveness and is a direct responsibility of the medication aide.

- **Medication history**
  - Know whether or not the resident has taken the medication or other medications previously. This may result in the need for smaller or larger doses.
  - Noting allergies in the resident's record is critically important.

- **Environmental condition**
  - How medication is stored may affect its potency and/or effectiveness.
  - Temperature and humidity may degrade the medication.
  - When exposed to air (lids not tightly closed, bubble pack burst but medication not administered), some medications begin to degrade or chemically change.
  - Sunlight can chemically alter medications; thus, some medications must be stored out of direct sunlight.

- **Dosage: The greater the amount of the medication, the greater the expected effect.**
  - Not all dosage increases improve effectiveness.
  - Increased, or more frequent doses can be dangerous and increase side effects or medication interactions.
  - Reducing frequency or dose can have similar, harmful effects.
  - Accuracy in administration of the correct dose is critical.

6. Medication effects: The desired effect is to benefit the resident, but medications may cause unwanted reactions, too.

- **Action:** how the medication produces chemical changes in cells and tissues.

- **Effect**: the combination of biological, physical and psychological changes that happen as a result of the medication action.

- **Medication effects can be local or systemic.**
  - Local: affect mainly the area where they enter or are applied to the body.
  - Systemic: travel through the blood stream to affect cells or tissues in various parts of the body.

- **Therapeutic effect:** Medications are usually (but not always) prescribed on the basis of their primary effect - also called the desired therapeutic effect.

- **Adverse Consequence:** an unpleasant symptom or event that is due to or associated with a medication, such as impairment or decline in an individual's mental or physical condition or functional or psychosocial status. It may include various types of adverse drug reactions and interactions (e.g., medication-medication, medication-food, and medication-disease).
  - **Adverse drug reaction (ADR):** a form of adverse consequences. It may be either a secondary effect of a medication that is usually undesirable and different from the therapeutic effect of the medication or any response to a medication that is noxious and unintended and occurs in doses for prophylaxis, diagnosis or treatment.
  - The term "side effect" is often used interchangeably with ADR; however, side effects are but one of the ADR categories. A side effect is an expected, well-known reaction that occurs with a predictable frequency and may or may not constitute an adverse consequence. Occasionally, a side effect may be the reason a medication is prescribed, a unique application of the medication or for its interaction with other medications.

- **Medication aides are expected to be aware of these possible reactions** and notify their supervisor as soon as they notice any signs or symptoms of adverse reactions.
  - **Allergic reaction:** various responses due to the body's immunity mechanism reacting to the presence of a medication - a foreign substance. These are usually described in drug reference materials.

        - An abnormal response when a person has developed antibodies against a medication.
        - The cells react by releasing histamine.
        - Mild allergic reactions can cause itching eyes or skin, skin rash, swelling or miscellaneous GI effects.
        - Severe reactions can cause anaphylactic shock - severe breathing problems, cyanosis, severe low blood pressure (shock) and cardiac arrest.
    - **Idiosyncrasy:** unusual effect - strong or unique responses to certain medications, probably due to genetics.
    - **Tolerance:** resistance to the effect of a medication, need to take increasingly larger doses to produce the same physical or psychological effect.
        - A decreased response to repeated doses of the same drug.
        - Drugs that often produce tolerance are opiates, tobacco, alcohol.
        - Even though there is a "tolerance" to the effectiveness of the drug, it may cause toxic reactions.
    - **Cumulation:** Addictive or synergistic effect.
        - The body cannot biotransform and excrete one medication completely before the next dose is given.
        - Medication starts to collect in the blood and body tissues.
        - There are stronger and stronger effects on the body with each additional dose given.
        - An increased effectiveness may also be the result of combining medications with similar actions.
    - **Overdose and toxicity:** a dose that is too large for a person's age, size or physical condition.
        - Any medication can act like a poison if taken in too large a dose.
        - Toxicity refers to the medication's ability to poison the body, the effect of an excessive amount of medication (greater than the body can tolerate).
        - May be the effect of an excessive amount of medication, greater than the body can tolerate.
        - May be a result of impaired function of the body, such as kidney or liver disease.

7. **Medication interactions:** when one medication modifies the action of another medication. **Synergistic** (potentiation) and **antagonistic** (diminished) effect.

- **Interaction** with other medications may enhance or impede medication actions.
    - **Additive or synergistic effect:** increased effectiveness of the medication, usually the result of combining medications with similar actions.
    - **Antagonist:** medications work against or cancel the effects of each other.

- **Many interactions are possible.** (See medication reference materials such as are found in The Merck Manual).

- **Changes in response to existing medications** may occur when a new medication is added. There may be physiological changes that occur as a result of added medication.

- **Food** can interact with some medications. (See section on diet.)

- **Herbs** can interact with pharmaceuticals and over the counter medications. It is important to know what the resident is taking, whether over-the-counter, herbs, vitamins or prescription medications. Family members may advocate for and/or provide herbal medications. The managing physician must be kept informed of any other substances the resident may be taking.

- **Synergistic effects** are caused when medications given together "help" each other to produce the desired effect. Sometimes combination medications are used in one tablet or capsule.

8. Other medication-related disorders

- **Bone marrow suppression:** Some bioactivity has the result of interfering with normal production of blood cells.

- **Kidney or liver disease:** Cumulation, toxicity, or other related effects of a medication can result in organ damage. This may be a relatively known or rare outcome of the use of the medication.

- **Sleep pattern disruption:** Many medications that have an effect on the central nervous system or particular portions of brain activity may also disrupt normal sleep.

- **Sexual side effects:** Medications for high blood pressure and certain psychoactive medications may alter either desire for sexual activity or ability to perform intercourse. Some medications may cause vaginal dryness and discomfort.

9. Drug dependence: either the psychological or physical need to take a certain drug.

- **Psychological dependence** is also called **habituation:** a strong desire or craving for the drug, with no physical symptoms if the drug is taken away.

- **Physical dependence is also called addiction:** When the drug is taken away, the person develops physical symptoms of withdrawal, extreme discomfort, nausea, vomiting, tremors, sweating, etc.

10. Drug abuse refers to taking drugs, not for medical reasons, but for the psychological or emotional effects it produces; or, taking drugs for effects other than as they are intended or prescribed.

- Abuse usually involves self-administration of drugs in chronic excess.

- Feelings of euphoria are produced: feeling "high."

- Commonly abused drugs include narcotics, sedatives, alcohol, tranquilizers, stimulants, marijuana.

- The medication aide is responsible for consulting with the nurse in charge if you suspect drug abuse or dependence.

- Everyone is responsible for keeping medicines locked up, giving only prescribed medications, and watching for signs of drug dependence and improper use of drugs.

- Diverting a resident's drugs for personal use is against the law and state and federal regulations. It can result in prosecution.

Unit 5. Safety and Drug Administration - Forms of Medications

Objectives

1. **Identify forms in which medications are available and implications for effective use.**
2. **List and describe the routes for administering medications.**
3. **Explain who is qualified to give medications by the parenteral route.**

See Appendices: (Included in alphabetical order in Appendices)

- Administration of Dressings, Topical Medication and Soaks
- Administration of Ear Drops and Ointment
- Administration of Eye Drops and Ointment
- Administration of Inhaler Therapy
- Administration of Medication Patches
- Administration of Nasal Inhaler Therapy
- Administration of Nebulizer Therapy
- Administration of Suppository – Rectal
- Administration of Suppository – Vaginal
- Administration of Skin Ointment and Lotion

Content

1. Forms of medication which are available.

- **Drugs are mixed with other ingredients**, so that they can be swallowed, injected, rubbed on, instilled, inserted, inhaled.

- **Use the correct form and route**–failure to do so is a drug administration error.

- **Liquids and semi-liquids**
  - May be given by mouth, rubbed onto skin, instilled into or onto body opening.
  - Allows for rapid absorption.
  - Helpful for those who have trouble swallowing pills, when given orally.
  - Active ingredients are mixed with:
    - Water
    - Alcohol
    - Both water and alcohol
    - Solutions–drug is dissolved in the water or other liquid

- **Suspensions**– contain large portions of the active ingredient, so they are given in small amounts. Do not dissolve.
  - Tiny particles or droplets of the drug are held in an even distribution throughout the liquid.
  - If left standing, suspensions will separate, with particles settling to the bottom and the water or alcohol, and any oils rising to the top. Bottle must be well shaken before administering the drug.
    - **Emulsions**–suspensions of oils and fats in water.
    - **Magmas**–heavy particles mixed with water–forms a milky liquid.
    - **Gel**–like magmas, but with smaller particles.
    - **Liniments**–liquid suspensions–for rubbing into the skin to promote absorption.
    - **Lotions**–suspensions of drugs in water base for external use. They are patted onto the skin, not rubbed.

- **Solutions**
  - Very concentrated, so can be dangerous.
  - Measure carefully–use a dropper that comes with the medication or the barrel part of a syringe with the needle removed.
  - Specific solutions and suspensions:
    - **Tincture**–solution made with alcohol or alcohol and water. Active ingredients are 10 to 20 percent of the mixture.
    - **Fluid extracts**–very concentrated alcohol solutions that contain drugs from plant sources.
    - **Elixirs**–solutions of alcohol and water which is sweetened and favored. Contains 10 to 20 percent of the drug.
    - **Spirits**–alcohol solutions of volatile oils. Contain 5 to 20 percent of active ingredient.

- **Syrups**–heavy solutions of water and sugar, usually with flavoring added, like cough syrups.

- Solutions that contain alcohol will evaporate, leaving the drug very concentrated. Keep tightly closed, open only to pour the amount needed, then close again.
  - Solutions containing alcohol should not be given to an alcoholic.
  - Store alcohol solutions in a dark place, and if it separates, do not use.

- **Solids and semi-solids–oral**
  - **Ointments**–semi-solid preparation of medication in an oily base. Some ointments can be placed into the eyes if they are marked "sterile–for ophthalmic use."
  - **Creams**–semi-solid preparation of medication in a water soluble base. Can be rubbed in.
  - **Pastes**–(like zinc oxide) thick, stiff ointment that does not melt at body temperature.
  - **Powders**
  - **Tablets**–powdered or granulated drugs compressed into various small shapes, called a "pill." May have a scored or indented line so they can be easily broken.
  - **Capsule**–hard or soft gelatin covering for powdered or liquid medication. Content may have an objectionable taste.
  - **Caplets**–similar shape as capsule, may be smaller. May be solid–cross between capsule/tablet.
  - **Time-released**–may also be called spansules, timespans, sustained-release, delayed-release, prolonged action tablets and capsules. May be identified with "S-R," "LA," "ER," or "XR" after the Trade name.
    - Contain several different doses of a drug.
    - Have special coatings that allow dissolving of medication at a slow rate to produce a sustained drug action and reduce the number of doses per day that the resident needs. Granules dissolve at different rates, to allow gradual release.
    - Some doses released immediately, followed by more of the dose released later, up to 12 hours later.
    - Allow drug effects to continue at a constant rate over a long period of time.
    - Never crush, open, or empty a delayed-release or timed-release tablet or capsules or mix with food or liquid. The resident could receive an overdose.
    - Used to reduce the number of doses a resident must take in one day.
  - **Enteric-coated tablets**
    - Have a special coating that is resistant to stomach acid, but dissolves easily in the alkaline pH of the small intestine.
    - Used for drugs that may cause nausea or stomach irritation.
    - They dissolve in the small intestine.

- Must not be crushed or mixed with food or liquid.
- Do not give with antacid or the alkaline pH might dissolve the drug in the stomach.

- **Troches and lozenges**–meant to dissolve in the mouth rather than the stomach or intestine.
- **Suppositories**–drugs mixed with some substance (such as soap, glycerinated gel, cocoa butter) that melts at body temperature, to make a solid dosage form, for insertion into the rectum, urethra, or vagina.

2. Routes of Administration

- **Oral**–by mouth swallowed. Absorbed into the bloodstream from the lining of the stomach or intestine.

- **Sublingual**–placed under the tongue, where it dissolves in the saliva, and is quickly absorbed into the circulation through the mucous lining of the mouth. Dissolves readily.
  - Do not allow the resident to eat or drink anything until the medication is dissolved.
  - Give as last medication if resident takes more than one medication at this time.

- **Buccal**–dissolves next to the cheek.

- **Topical**–on the skin or mucous membrane.
  - Topical also includes the instillation of drops into the eyes, ears, and nose, suppositories and irrigations with liquids.

- **Rectal**–inserted into the rectum and pushed to the side wall of the rectal mucosa where it will dissolve and/or absorb the best.
  - Good for giving drugs to a vomiting or an unconscious patient.

- **Vaginal**–medication can be in the form of a liquid solution, cream, douche, or a suppository.

- **Inhalation, nebulized, or aerosol**–solutions and powdered solids which are broken up into fine particles and inhaled into the respiratory tract. A nebulizer is used to break up and suspend the particles of medication in air or gas (liquid vapor–spray, mist, steam).
  - Drugs are in the form of gases or fine droplets–sprays, mists.
  - Commonly used to treat asthma or other respiratory disease.
  - Drug companies are exploring more use of inhalation or aerosol delivery systems for other types of medications.

3. Parenteral–injecting a drug with a needle and syringe. **Medication aides may not deliver medications by injection.**

- Only people specially educated or licensed may give drugs by injection or IV.

- State laws on nursing practice limit who can perform injection of medication.

Unit 6. Safety and Drug Administration - Common Medical Abbreviations

Objectives

1. **Give the meanings of, and use common medical abbreviations for medication forms, route, administration times and general medical abbreviations.**

Content

Abbreviation related to time	Abbreviation	Meaning
✓	ac (ante cibum)	before meals
	ASA	aspirin
✓	ad lib	as desired
	amp	ampule
✓	AM	morning
	ax	axillary
✓	bid or BID	twice daily
	BP	blood pressure
	$\overline{c}$	with
	cap	capsule
	c/o	complains of
	dc	discontinue
	elix.	elixer
	et	and

	F	Farenheit temperature
	C	Celsus temperature
	GI	gastrointestinal
✓	h (or) hr	hour
	H_2O	water
	H_2O_2	hydrogen peroxide
	I and O (or) I & O	intake and output
	K^+	potassium
	L	left
	MOM	milk of magnesia
	noc	night
	NPO	nothing by mouth
	NS	normal saline
	PO	orally
	O_2	oxygen
	OD (oculus dexter)	right eye

	OS (oculus sinister)	left eye
	OU (oculi unitas)	both eyes
	oz	ounce
✓	pc (post cibum)	after meals
	per	through or by
	po (per os)	by mouth (see orally)
✓	PM	afternoon
✓	PRN	as necessary
✓	$\overline{q}$	every
✓	qh	every hour
✓	QID	four times daily
✓	q2h	every two hours
✓	q4h	every four hour
	℞ (take thou)	prescription
	$\overline{s}$	without
	sob (or) SOB	short of breath

	$\overline{ss}$	semi or half
✓	stat or STAT	immediately
	SL	under the tongue
	tab	tablet
✓	tid (or) TID	three times a day
	tr.	tincture
	TPR	temperature, pulse, respiration
	VO	verbal order
	wt	weight
	x	times
	mg	milligram
	GM	gram
	ml (or) cc	millileter

Unit 7. Safety and Drug Administration - Mathematics, Weights and Measures

Objectives

1. **Identify what professionals are responsible for calculating drug dosages.**
2. **Be aware that there are different systems of measurement and identify the importance of correct dose measurement.**
3. **Correctly read and write lower case Roman numerals ½ through 30.**
4. **Define the prefixes used in the Metric system and be able to add and subtract decimals.**
5. **Describe the disadvantages of the Household system of measurement in medication use.**
6. **List two drugs that are measured in units.**
7. **Convert grams to milligrams and vice versa, and list some of the most common equivalents among the different systems of measurement.**
8. **Add fractions and decimals.**
9. **Table of measurements**

Content

1. Calculating drug dosages

- Medication aides do not convert drug dosages in preparing drugs for administration.

- ***Dosage calculations are done only by pharmacists and licensed nurses.***

2. Systems of measurement

- Dosage range–the amount that produces a therapeutic effect; below this there is no therapeutic effect, and above this, it can be toxic.

- Historically, there were three systems of measurement used for measuring drug dosages.

- See Appendix B, Units of Measurement.

3. The Apothecaries' System–the oldest

- Be able to recognize this system and understand its measurements.

- Basic unit of weight is the grain.

- Basic unit of volume is the minim.

- Dosage quantities are written in lower case Roman Numerals.
  - Some medications are ordered in drams, grains, etc.
  - The Roman numerals are used to indicate how many drams, grains, etc.

Roman = Arabic numbers (from ½ to 30):

ss = ½	xi = 11	xxi = 21
i = 1	xii = 12	xxii = 22
ii = 2	xiii = 13	xxiii = 23
iii = 3	xiv = 14	xxiv = 24
iv = 4	xv = 15	xxv = 25
v = 5	xvi = 16	xxvi = 26
vi = 6	xvii = 17	xxvii = 27
vii = 7	xviii = 18	xxviii = 28
viii = 8	xix = 19	xxix = 29
ix = 9	xx = 20	xxx = 30
x = 10		

- Numbers are written after the symbol for the measurement unit, for example, gr.xx.

- Ask licensed nurse for directions or equivalents, when there is a question. For quantities less than one, Arabic fractions are likely to be used.
  - Exception: For the quantity ½, use ss.

- If a drug is very powerful, it may be measured in minims. You must use a minim dropper, not any dropper. Minims are very precise.

- In this system, you must be able to read, add and subtract Roman Numerals and fractions. For example, two gr. 1/4 tablets would equal gr. ½. Or two gr. v tablets = gr. x.

4. Metric System

- Simple, logical, based on units of 10.

- Length–meter.

- Volume–liter.

- Weight–grams.

- Prefixes are used to indicate multiples or divisions by ten.
  - Kilo--multiply by 1000.
  - Centi–divide by 100.
  - Deci–divide by 10.
  - Deca–multiply by 10.
  - Milli–divide by 1000.
  - Micro–divide by one million.

- ml.–milliliter is the most common volume measurement used, and is very small. A milliliter is equal to a cubic centimeter, so one ml. = one cc.

- 5 ml. = 1 teaspoon.

- Doses use Arabic numerals, in front of the unit of measure. Doses of less or more than a whole number are always written using decimals.

- In the metric system, you must be able to add and subtract decimals, for example, two 0.5 gram tablets = 1.0 gram.
  - Decimals are used to express the part of a number that is less than one.
  - The first place to the right of the decimal is tenths:
    .1 = 1/10
    .2 = 2/10
  - The second place to the right of the decimal is hundredths:
    .25 = 25/100
    .75 = 75/100
  - The third place to the right of the decimal is thousandths:
    .375 = 375/1000
  - When a whole number precedes the decimal, the decimal is read as "and."
    2.5 is read "two and five-tenths"
    2.5 is also sometimes read as "two point five" but the numerical value is "two and five-tenths."

- Decimals can be converted to fractions. For example:
  .5 = 5/10 = ½ (The 5/10 is reduced to ½ by dividing both numerator which is the top number, and the denominator which is the bottom number, by the same number. In this example, both numerator and denominator are divided by 5.

5. Household system

- Units of measure include teaspoon, tablespoon, ounce, cup, pint, quart, gallon. There is "dry" and "liquid" measurement. Equivalents and successive amounts are more complicated and confusing. For example:
  3 teaspoons = tablespoon
  2 tablespoons = ounce
  8 ounces = cup
  2 cups = pint
  2 pints = quart
  4 quarts = gallon

- Not as accurate.

- Must teach patients in terms they can understand.

6. Drugs measured in units

- Are measured in terms of their action, not weight or volume.

- Examples: heparin, insulin.

7. Converting between systems

- **Important: any conversion must be performed by a licensed nurse or pharmacist–NOT a medication aide.**

- Drug doses are usually converted at the pharmacy before they are filled and dispensed to administer/take.

- Even if the doctor writes the order in the Apothecary system, the pharmacy will likely dispense it in the metric system.

- **For familiarity:** 1 gram is equal to 1000 milligrams.
  - Grams are equal to milligrams by multiplying the number of grams by 1000. For example: 5 grams = 5 x (1000) milligrams = 5000 milligrams.
  - For fractional portions of grams, the multiplier is similar.
    For example: .75 grams to milligrams multiply .75 x 1000 = 750 milligrams.

  - Milligrams are equivalent to grams by dividing the number of milligrams by 1000. For example: 2 milligrams = 2/1000 grams = .002 grams.

- Some system examples of equivalents:
  - 1 ounce = 30 ml (or cc)
  - 5 ml = 1 teaspoon
  - 1 liter = 1 quart
  - 1 kilogram = 2.2 lbs
  - 15 ml = 3 teaspoons = 1 tablespoon = ½ ounce
  - 15 minims = 1 ml = 1 cc
  - 1 dram (or fluidram) = 1 teaspoon

- One cubic centimeter = 1 milliliter. Similarly, 30 cubic centimeters = 30 milliliters.

- Convert fluid ounces to cubic centimeters.
  - One fluid ounce = 30 cubic centimeters = 30 milliliter. One cubic centimeter = .034 ounces.

- You should have a basic understanding and concept of the relative size of units of measurement. For example, grams are larger than milligrams, or an ounce is larger than a dram.

8. Add fractions and decimals

- To add fractions, the fractions must have the same denominators.

- The numerators (top numbers) are added and the denominator remains the same. For example, ½ + ½ = 2/2 =1.

- If the denominators do not match, the numbers must be written in a form in which the denominators are the same.

- If ½ and ¼ are to be added, both numbers must have the denominator of 4. To convert ½ to 4ths, multiply ½ by 1 in the form 2/2. ½ times 2/2 = 2/4. Then ¼ and 2/4 may be added for a sum of 3/4.

  ½ x 2/2 = 2/4
  + 1/4
  3/4

- To add decimals, keep the decimal point in line and add. For example:

  2.5 1.0
  + 2.5 + .5
  5.0 1.5

- Student should be able to determine, for example, that two gr. 1/4 tablets equal gr. ½ or that two 0.5 gram tablets equal 1.0 gram. (Two gr. 1/4 tablets = 2/4 or ½ gr. tablet)

9. Table of Measurements

Units of Measurement and their Abbreviations
(arranged in order of increasing size)

Apothecaries

Weight (dry)	Volume (liquid)
grain (gr)	minim (m, mx)
dram (dr, ʒ)	fluidram (fl. dr.)
ounce (oz, ℥)	fluidounce (fl. oz.)
pound (lb.)	pint (pt.)
	quart (qt.)

Household

Weight (dry)	Volume (liquid)
ounce (oz.)	drop (gt) drops (gtt)
pound (lb.)	teaspoon (t or tsp.)
	tablespoon (T or Tbsp.)
	cup (c.)
	pint (pt.)
	quart (qt.)
	gallon (gal.)

Metric

Weight (dry)	Volume (liquid)
microgram (g, mcg.)	milliliter (ml.)
milligram (mg.)	cubic centimeter (cc.)
gram (g, Gm)	liter (l.)
kilogram (kg.)	

Unit 8. Safety and Drug Administration - Drug Standards and Names

Objectives

Note concerning the terms, "medication" and "drug": Since the connotation of the term "drug" is often associated with illegal substances, it is used when it seems technically correct to do so, but the word "medication" is used when in context of medication administration.

1. **Explain what is meant by drug standards and tell how they are determined.**
2. **List and differentiate between two types of names by which drugs are known.**

See Performance Evaluation - Drug Card – Sample

See Appendices:

- Medication Classification
- Common Medications

Content

1 Drug Standards:

- Medications differ in strength, purity and quality.

- The Food and Drug Administration (FDA) is responsible for ensuring the safety of medications.

- Federal law requires that drug manufacturers follow standards to ensure uniformity and purity. These standards are published in the United States Pharmacopeia/National Formulary (USP/NF).
  - Law states that all preparations called by the same name must have a **u**niform **s**trength and **p**urity (U.S.P.) throughout the United States.
  - A drug which follows the standards in the USP/NF may use U.S.P. after its name.

2. Drug Names

- Many drugs have four names; two are most important:
  - The *generic* name - the official name for a drug, begins with a lower case letter, the name given by the company that owns the drug with input from regulatory agencies - the U.S. Adopted Names Council (USAN).
    - The *generic* name also means any drug not sold under a particular product name.
  - The *brand name, or trademark name*, is the drug name that is owned by the manufacturer, and is always capitalized.
    - The brand name is also known as the trade name, product name, or proprietary name.
    - The brand name will have the trademark symbol next to it.
    - A drug may have one generic name but several brand names.
    - Become familiar with both names of the medications given most often at your work.

- Product name drug versus generic
  - Most people in the public know medications by their brand names.
  - Physicians may prescribe medications by either their brand name or their generic name.

- Physicians may specify that only a specific brand be dispensed. (More often they allow substitution of generic brands.)

Unit 9. Safety and Medication Administration - Drug Resources Information

Objectives

1. **State the importance of knowing how to find current information on medications.**
2. **Demonstrate the ability to find and use drug references and other resources to obtain drug information.**
3. **Be aware of how quickly information on medications changes.**

See Appendices - Medication Classification

See Performance Evaluation - Drug Card - Sample

Content

1. **Medications should not be given until medication aide knows the expected effects and the adverse effects.**
   - Many sources of information are available to obtain such information about a medication.

   - Not all resources will be available in the work setting for the medication aide, but some can be viewed on the internet.

2. **Drug references** help the medication aide understand why a particular medication is being given.
   - Drug references are used by everyone, including doctors, nurses, consumers, etc.

   - References usually include the following information:
     - Names of medication: generic and trade names.
     - Description of what the medication is made of - its chemical formula.
     - Action - how the medication works.
     - Indications - what medical conditions are treated by the medication.
     - Contraindication - conditions under which the medication should not be used.
     - Monitoring - from CFR 483.25(I), "Monitoring" is the ongoing collection and analysis of information (such as observations and diagnostic test results) and comparison to baseline data in order to:
       - Ascertain the individual's response to treatment and care, including progress or lack of progress toward a therapeutic goal;
       - Detect any complications or adverse consequences of the condition or of the treatments; and
       - Support decisions about modifying, discontinuing, or continuing any interventions.
     - Precautions - special conditions that might alter the effects of the medication.
     - Adverse reactions - unpleasant or dangerous effects of the medication, other than the desired effects.
     - Dosage – amount of medication given.
     - How supplied - how the medication is packaged and storage instructions.
     - Route – how the medication is given.

   - Generally available drug references:
     - **Package insert (brochure)** - prepared by the manufacturer to accompany every packaged unit. Available only with prepackaged medications.
     - **Physician's Desk Reference (PDR)**
       - Contains information from the drug manufacturer.
       - Convenient, usually up-to-date.
       - Usually also contains much technical information.
       - Does not give information on ALL medications.
       - Available online.

- **Pharmacist -** the consulting pharmacist, or the pharmacist that filled the resident's prescription, can be a valuable source of information.

- **Other resources**
  - USP Drug Information for the Health Care Professional (USP DI)
    - Three volumes, IA, IB, II and III.
    - Written in everyday language.
    - Volume II - Advice for the Patient - is very helpful.
    - Some sections available online.
  - Handbooks - some available online or in CD
  - Pharmacology textbooks
  - Articles in nursing journals - some available online
  - Nursing-oriented drug reference books
    - Written with nursing staff in mind.
    - Indexed in the back, usually by both generic and trade name.
    - Information includes "Nursing Implications" - what the medication aide must do to give the medication safely and correctly.

3. Changes in medication information

- Medication information changes rapidly as new drugs are discovered. Drug reference books become outdated quickly.

- Medication aides are always responsible to know what they are giving to residents.

Unit 10. Drugs and Body Systems - Cardiovascular System

Objectives

1. **Identify basic structures and functions of the cardiovascular system.**
2. **Identify the names of instruments used to measure blood pressure and to record the heart rate, and be familiar with current practice regarding the definitions of pre-hypertension, hypertension and hypotension.**
3. **Identify the main components of blood.**
4. **State the functions of the lymphatic system.**
5. **State possible effects of aging on the cardiovascular system.**
6. **Explain the major cardiovascular disorders and related medications.**
7. **Identify disease of blood and lymph.**
8. **Be able to give a review of medications which may be used for cardiovascular and blood disorders, including methods of administration, nursing care and side effects.**
9. **Be able to summarize cardiovascular medications.**

See Appendices:

- Medication Classification
- Common Medications
- Medications and the Elderly
- Medication Patches

See Performance Evaluations - Drug Card – Sample

Content

1. Anatomy and physiology of the cardiovascular system

- Blood Vessels
  - Arteries - muscular tubes
    - Decrease in size to arterioles and finally to capillaries.
    - Carry blood away from the heart, exiting from the left ventricle and atrium to all parts of the body.
    - Usually, but not always, carry oxygen and other nutrients to body tissues.
  - Veins - thinner, muscular tubes
    - Decrease in size to venules and to capillaries.
    - Have valves to assist carrying blood to the heart from lower extremities.
    - Carry blood, containing carbon dioxide and other wastes from tissues, to the heart from all parts of the body - entering the heart on the right side into the right atrium and ventricle.
    - The pulmonary circulation through the lungs is one area where the arteries carry blood that is low in oxygen, and veins return blood to the heart that is high in oxygen.
    - The kidney circulation filters blood to remove wastes, then recycles the blood back into the circulation.
  - Capillaries - the connecting vessels between arteries and veins
    - Walls are only one cell thick, so they allow substances to flow out of and into them.
    - Nutrients, oxygen, and drugs pass through the walls of the capillaries and into the interstitial fluid - the fluid surrounding each cell. They are then absorbed by the cells through the cell wall.
    - Wastes, carbon dioxide, etc., are released from the cells into the interstitial fluid, and are absorbed into the capillaries, where they are returned to the heart and then to the organs that excrete them.
    - The lungs re-oxygenate the blood.
    - The liver breaks down wastes into smaller components; the kidneys filter out the wastes.

- Heart - a muscular organ that rhythmically pumps blood
  - The heart has 4 chambers: right upper atrium, left upper atrium, right lower ventricle, left lower ventricle.
  - The heartbeat should be regular in rate and force.
  - Cardiac medications affect the specific parts of the heart.
    - Endocardium - inner layer of the heart.
    - Myocardium - middle, muscle layer; divided into the 4 chambers.
    - Pericardium - pericardial sac, outer layer of the heart, encloses the heart.
    - Coronary arteries - wrap around the heart and supply the heart structure with blood containing oxygen and nutrients.
  - The heart does not absorb anything from the blood that flows through it.

- If coronary arteries are narrowed or blocked, chest pain results, and eventually the part of the myocardium that is affected dies.
- Electrical conduction system
  - The heart contracts and relaxes normally between 60-80 times per minute at rest.
  - The heartbeat is controlled by pacemaker cells that are located throughout the myocardium, especially in the septum, the wall that divides the two sides of the heart.
  - Each heart beat results from the firing of the pacemaker cells which transfer the electrical signal to the next electrical cell and so on out into the myocardial muscle cells, causing them to contract.
  - The sound of the heartbeat - "lub-dup" is the sound of the four heart valves closing.
  - The electrical activity of the heart can be recorded on an electrocardiograph, and an "EKG."
  - An EKG can be used to diagnose heart disorders.

2. **Blood pressure (BP) and pulse**

- Blood pressure is a combination of 2 factors: 1) the force of the heart beat; 2) the condition of the blood vessels.
  - Vessels are elastic, and if they become hardened, called arteriosclerosis, they will not expand with each heartbeat, causing pressure to go up. This is a common outcome of aging.
  - If the vessels are partially blocked with fat deposits, called atherosclerosis, and are narrowed, the pressure will go up.
  - With high blood pressure, the heart has to pump harder.

- A sphygmomanometer is used to measure the blood pressure.
  - Systolic - the pressure when the heart contracts; rises with aging.
  - Diastolic - the pressure when the heart is at rest.
  - Pre-hypertension is: 120-140 systolic and 80-90 diastolic.
  - Hypertension is systolic above 140 and diastolic above 90.
  - Hypotension is systolic below 90 and diastolic below 60.
  - Symptoms of hypotension:
    - pale
    - light headed or dizzy
    - fainting
    - irregular heartbeat
    - decreased urinary output

- Pulse rate can be taken at a variety of sites - the most common are radial and apical.
  - Pulse rate - number of beats per minute.
    - Pulse range is 60-100 with 80 being average.
    - BP and pulse are often required before each dose of cardiac and other drugs. These are recorded on the medication documentation with your initials.

3. **Blood - component parts are:**
   - Plasma - the liquid part of the blood
     - 90% water
     - Nutrients, carbohydrates, fats and protein
     - Other substances, like immune factors
   - Corpuscles - the solid elements floating in the plasma
   - Red blood cells (RBCs), also called erythrocytes, give blood its red appearance and carry oxygen. They contain a substance called hemoglobin, made partly of iron, which binds to the oxygen molecule in the lungs to carry it until it is released at the capillaries.
   - White blood cells (WBCs), also called leukocytes, help protect the body from infection.
   - Platelets, also called thrombocytes, supply the bloods clotting factors.
   - Arterial blood is bright red, highly oxygenated, travels from the heart to the body. When a vessel is cut it spurts from the cut.
   - Venous blood is dark red, has a high content of carbon dioxide and other waste gasses, and low oxygen content. When a vessel is cut it slowly oozes from the cut.

4. **Lymphatic System - carries waste products the blood cannot carry such as dead cells and debris.**
   - Some of the fluid from the blood is lost from the capillaries into the interstitial fluid with each pass of the blood through it.
   - The lymphatic system drains away extra fluid and filters it through lymph vessels back to the heart, where it is added back into the blood.
   - The lymph system also helps produce some of the WBCs and antibodies.
   - Part of the lymph system is the spleen, a soft, round, purplish organ in the upper left abdomen, made of lymph tissue. The spleen filters and has an immune function. It stores 30% of all of the body's platelets.
   - Lymph is not pumped - it is pushed through the system with body movement.

5. **Effects of Aging on the Cardiovascular System**
   - Heart becomes larger as it loses its elasticity
   - Endocardium becomes thicker and sclerotic
   - Valves thicken and are more rigid

- Changes lead to problems in filling and emptying the heart
  - Results in decrease in oxygen intake and output
  - Leads to the following:
    - Cardiovascular disease
    - High blood pressure
    - Coronary artery disease
    - Heart attacks
    - Congestive heart failure

6. Cardiovascular disorders

- **General Signs and symptoms**
  - **Dyspnea** - breathlessness, labored or difficult breathing at rest or with exertion.
  - Angina pectoris - chest pain.
  - **Edema** - Body tissues contain excessive amount of tissue fluid. This may be built up in the legs and feet, or also the lungs and abdomen.
  - **Dysrhythmias/Arrhythmias** - absence of rhythm, irregular heartbeat.
  - **Tachycardia** - rapid heartbeat greater than 100.
  - **Bradycardia** - slow heartbeat less than 60.
  - **Hemoptysis** - coughing up blood.
  - **Hemorrhage** - bleeding - ruptured vessels or inadequate clotting.
  - **Fainting or fatigue**
  - **Cyanosis** - a bluish tint to the skin due to poor oxygen delivery.
  - **Cardiac arrest** - "code blue" - sudden stopping of the heartbeat. Causes:
    - Myocardial infarction - "heart attack"
    - Electric shock
    - Severe allergic reaction - anaphylaxis
    - Drug overdose
    - Electrolyte imbalance

- **Congestive Heart Failure (CHF)** - many conditions can cause CHF.
  - Heart cannot pump strongly enough due to aging, disease, high BP, etc. The heart is not working effectively as a pump.
  - Heart pumps so weakly that the blood backs up in the veins and body organs.
  - Important organs cannot do their work and become damaged.
  - Blood pressure is high, fluid leaks into tissues of back, lower body, abdomen and causes edema. Fluid can also leak into the lungs.
  - Blood "backed up" can affect how it circulates in the lungs to become oxygenated. Hemoptysis and dyspnea will likely occur.
  - CHF can be either Right or Left sided.
    - In Right Sided, blood backs up in body organs and interstitial tissue - particularly dependent parts such as lower extremities.
    - In Left Sided, blood backs in the lungs, interfering with respiration.

Related Medications:

- Heart stimulants
- Diuretics
- ACE inhibitors (vasodilators) to lower blood pressure

- **Dysrhythmias** - cardiac arrhythmias
  - The heart does not beat rhymically. It is out of sync. Parts may beat at different rates.
  - Fibrillate - quivering, spontaneous contraction of muscle fibers, skip beats, double or triple beats.
  - A disturbance of the electrical system.

  Related Medications:
    - Antiarrhythmics, also referred to as antidysrhymics

- **Coronary Artery Disease (CAD)** - blood vessel disease in the arteries that provide the blood supply to the heart muscle.
  - **Atherosclerosis** - a build-up of fat, or cholesterol in the walls of the arteries, causing a thickening of the wall of the blood vessel and a narrowing of the open space. When it happens to the coronary arteries, it can cause angina, myocardial infarction (MI), and sudden death.

  Related medications:
    - Vasodilators
    - Beta blockers
    - Antilipemics
    - Calcium channel blockers
    - ACE inhibitors
    - Aspirin
    - Antiplatelet drugs

- **Angina Pectoris** - pain in the chest caused by oxygen starvation due to narrowed or blocked coronary arteries. Can be transitory, coming/going related to physical exertion or excitability, emotional stress.

  Related medications:
    - Antianginals

- **Peripheral Vascular Disease**
  - **Causative factors:**
    - Atherosclerosis as under CAD
    - Arteriosclerosis - loss of elasticity due to build up of deposits in vessel walls
    - Occurs in lower extremities
    - Symptoms include thrombophlebitis and pain
    - Person also often has CAD

  Related medications:
    - Vasodilators
    - Beta blockers
    - Analgesics

- **Other Blood Vessel Diseases**
  - **Thrombosis** - clot in a vessel.
    - A blocked, or partially blocked vein from a clot may also develop inflammation of the vein, called thrombophlebitis.
    - Part of a thromus that breaks off, begins to travel through the circulation, and is called an "embolus."
  - **Embolus** - may be solid, liquid or gaseous.
    - May be bits of tissue, tumor cells, globules of fat, air bubbles, clumps of bacteria, foreign objects which travel through lymph or blood vessels.
    - Emboli may cut off circulation to any part of the body, including the heart, brain, kidney, lungs.

  Related medications:
    - Anticoagulants
    - Anti-inflammatories
    - Antibiotics

- **Hypertension**
  - Generally caused by increased peripheral resistance in blood vessels through constriction or narrowing. Difficult to detect the specific underlying cause in each person.
    - Usually involves another disease process, such as renal disease, tumors of the adrenals, CHD, CHF.
    - Known as the "silent killer" as person goes without symptoms for a long time, until blood pressure gets very high and causes damage to major organs.
    - Leading cause of strokes.
    - Weakens heart, kidneys, and eyes - where smaller blood vessels are.
    - Various types include: benign, essential, malignant, renal. All vary in cause and severity.

  Related medications:
    - Antihypertensives

7. Diseases of the blood and lymph

- **Anemia** - not enough red blood cells or not enough hemoglobin so not enough oxygen is carried to tissues. Signs may include fatigue, shortness of breath on exertion, paleness. This can be from a lack of iron or vitamin B-12 in the diet, excessive bleeding, bleeding disease (Hemolytic disease) or failure of the bone marrow to produce red blood cells.

  Related medications and treatment:
    - Supplemental iron, iron-rich foods, vitamin B-12, folic acid, transfusions.

- **Leukemia** - a group of malignant disorders that result in unrestrained growth of leukocytes and their precursors.

- Proliferation occurs because of disruption of normal cell growth and life cycle. Affected are the blood-forming tissues in the bone marrow, spleen and lymph system.
- Types are classified according to cells affected and cellular maturity. For example, acute leukemia is now characterized as the rapidly progressive replacement of normal bone marrow by blast cells from a malignant transformation of an underlying control mechanism.
  - Symptoms are different for children and adults affected by different types of the disease.
  - Persons with leukemias are typically susceptible to viral and bacterial and fungal infections because of the disease as well as some treatments.
  - Therapies are changing rapidly and are complex.

Related medications and treatment:

- Antineoplastics, chemotherapeutic

- **Hodgkin's Disease** - cancer of the lymph system, involving the lymph node tissue and bone marrow.
  - Symptoms include enlargement of the lymph node, particularly the cervical, may include fever, night sweats, weight loss. Diagnosis confirmed by tissue biopsy.

Related medication and treatment:

- Radiation therapy
- Antineoplastics, chemotherapeutics

- **Non-Hodgkin's Lymphoma** - malignancy of the immune system. Proliferation of the lymphoid cells in sites such as lymph nodes, bone marrow, spleen, liver, and GI tract. Symptoms and signs include peripheral lymphadenopathy, enlarged, rubbery or matted lymph nodes.
  - May involve multiple sites in lymph system throughout the body. May suggest involvement of an organ that the enlarged node is pressing upon rather than just limited to the node.
  - Other cancerous conditions may be stimulated including GI tract.
  - Malabsorption syndrome may result from intestinal lymphomas.
  - Anemia may be present initially or develop.
  - Requires tissue biopsy to diagnose.

Related medications and treatment:

- Radiation therapy
- Antineoplastics, chemotherapeutics

8. General review of medications used for cardiovascular and blood disorders

- Vasodilators - Nitrates - cardiac medications used for angina
  - Relax or dilate the walls of the arteries, so less force is used to pump the blood through.
  - Used especially to treat angina pectoris.
  - Dilate the coronary arteries, so the heart muscle gets more oxygen.
  - Side effects are usually due to the systemic effects of vasodilation:

- Throbbing headache
- Postural hypotension, dizziness, weakness
- Fainting

Related medications:

- nitroglycerin or "NTG." Several different forms:
  a. Sublingual tabs - take effect in 1-3 minutes (Nitrostat) - rapid action, the most common vasodilator.
  b. Ointment (Nitro-Bid), for prevention of angina attacks, usually used at night.
  c. Patches also used primarily for prevention.
  isosorbide dinitrate (Isordil, Sorbitrate) - oral medication possibly effective for prevention of angina. (Nitrobid, Imdur)

➢ Adrenergics - vasoconstrictors - raise blood pressure by causing vessels to contract.

Related medications:

- norepinephrine (Levophed) - IV
- phenylephrine (Neo-Synephrine)
- dopamine (Intropin)
- dobutamine (Dobutrex)
- psuedoephedrine

○ **Precaution:** Monitor blood pressure closely

Nursing care and side effects:

○ **Tablets** - Physician may order that tablets are to be at bedside for resident to use when angina begins.
- Sublingual tabs are to be placed under the tongue to be dissolved into the mouth's blood vessels for quick action. Advise resident to lie down after taking the medication so he will not feel faint or fall.
- Should not be kept in pocket. Heat (above 85 degrees) destroys potency.
- Keep tabs in manufacturer's container (dark glass, light proof) and tightly capped to prevent deterioration.
- Report what resident uses and chart.
- Notify charge nurse or follow facility policy if no relief. For example, if orders say give 1 tablet under tongue every 5 minutes for total of 3 doses, and no relief is seen after 3 doses, nurse will call doctor or 911.

○ **Ointment or patches** - Wash resident's skin at the site you want to use first.
- When applying patches, ointments, etc., that are vasodilators, the CMA should always wear clean gloves, and avoid getting the medication on his/her skin, because the CMA could experience the side effects of these drugs, such as vasodilation, dizziness and a severe headache.
- Apply ointment to clean skin that is free of heavy hair growth, usually on the upper chest, upper back or upper arms.

- Usually should be removed at night; wash skin where ointment or patch had been applied; medication is reapplied the next morning.
- Write on the dressing or patch: date, time and the CMA's initials.

- **Timed-release tablets** - also available.

➢ **Diuretics**

- Increase urinary excretion to rid the body of excess fluid.
- Used to treat CHF.

Related Medications:

- thiazides (Diuril, Hydrodiuril, Esidrix)
- Potassium-sparing-spironolactone (Aldactone)
- Loop - furosemide (Lasix, Bumex)
- Potassium replacements (K-Dur, K-lyte, Slow-K)
- Combination potassium loss and sparing diuretics (Maxide, Dyazide, Morduretic, Aldactazide)

Nursing care and side effects:

- Can cause dehydration in elderly due to inadequate fluid intake.
- Can cause severe loss of potassium (K) resulting in muscle cramping, cardiac arrhythmias, nausea, vomiting, confusion.
- Give K-replacement either through medications as ordered, or, foods rich in K (oranges, orange juice, bananas).
- Should be given early in the day, or at least before afternoon to avoid sleep disturbance, with food; full glass of liquid.

➢ **Antihypertensives** - lower blood pressure. With hypertension, the BP remains too high. If not reduced, the blood vessels in the brain, kidney, and heart, and the small blood vessels of the eye, will become damaged.

- Used to treat hypertension.
- Actions - lower BP, many do this by dilating blood vessels: blood vessel walls relax by action on the nerves that control dilation and constriction.
- Will not improve hypertension caused by arteriosclerosis.
- Often used in conjunction with diuretics.

Related medications: Four types of medications

- **ACE Inhibitors** – angiotensin converting enzyme inhibitors
  - Dilate blood vessels resulting in decreased blood pressure
  - capotopril (Capoten)
  - enalapril (Vasotec)
  - lisinopril (Zestril)
- **Beta-Blockers** – beta 1 and beta 2 adrenergic blocking activities
  - Decrease nerve impulses to heart and vessels
  - Heart beats slower and with less force
  - Decreases blood pressure
  - atenolol (Tenormin)
  - metoprolol tartarate (Lopressor)
  - propranolol (Inderal)

- metoprolol succinate (Toprol XL)

- **Alpha Blockers** – inhibits alpha-adrenergic receptors
  - Decreases nerve impulses to blood vessels
  - Decreases blood pressure
  - methyldopa (Aldomet)
- **Vasodilators** – relaxes smooth muscles acting directly on arteries and veins
  - Decreases blood pressure
  - hydralazine (Apresoline)

Nursing care and side effects:

- Postural hypotension, also known as orthostatic hypotension–may mean dose is too high.
- Drowsiness, may mean not enough blood circulation (perfusion) is going through the brain.
- Check BP routinely and often, at least once per week. Occasionally check BP in lying, sitting and standing positions.
- Resident may faint easily because of the side effects (orthostatic hypotension) so resident should rise slowly from a lying position to a sitting, then pause before standing upright.
- Hot baths or showers may further dilate blood vessels placing resident at greater risk for falling.
- Standing still may cause fainting because blood will collect in the leg veins, so there is less blood to return to the heart. Encourage movement, which causes the muscles in the legs to promote blood flow toward the heart. May need help walking for safety. If the medication is omitted or suddenly discontinued, the BP may rise suddenly, and higher than before.
- Coughing is a common side effect of ACE inhibitors.
- Because of these and other side effects, residents may not take the medicine. Monitor and encourage compliance.

➢ **Calcium channel blockers**

- Newer group of cardiac drugs.
- Decrease the contractibility of the heart muscle.
- Also dilate coronary arteries.
- Used to treat hypertension and angina.

Related medications:

- amlodipine besylate (Norvasc)
- diltiazem hydrochloride (Cardizem)
- verapamil (Calan)
- nifedipine (Procardia)–has the greatest effect on lowering BP, and in an emergency situation, where the BP is rising to critical levels, the capsule (which is filled with gel) can be pierced with a sterile needle and the medication squeezed into the patient's mouth under the tongue where it will be rapidly absorbed for an immediate effect.
- bepridil (Vascor)

- felodipine (Plendil)
- isradipine (DynaCirc)
- nicardipine (Cardene)

Nursing care and side effects:

- Headaches, dizziness, fatigue.
- Shortness of breath, edema of the extremities.
- Before administering each dose, take the resident's BP and pulse, and document these findings with the medication on the medication documentation form. The physician may give parameters whereby the med will not be given for one dose.
- Orthostatic hypotension means that the resident must move slowly when changing positions from lying to standing.

➢ **Antilipemics**

- These lower the lipid levels in the bloodstream.
- Used to treat hyperlipidemia–high cholesterol levels.
- Combined with diet and exercise.

Related medications:

- gemfibrozil (Lopid)
- pravastatin (Pravachol)
- simvastatin (Zocor)
- cholestyramine Resin (Questran)
- lovastatin (Mevacor)
- atorvastatin (Lipitor)
- niacin
- rosuvast (Crestor)

Nursing care and side effects:

- Common side effects are constipation, flatulence, nausea, vomiting, diarrhea, abdominal cramps and most severe would be liver damage.
- Most of these drugs should be taken before meals.
- Some of these medications come in the form of a powder and have to be mixed with juice, soup, cereal, etc.
- Work closely with the dietitian to encourage adherence to special diet.

➢ **Heart stimulants--Cardiac Glycoside/Digitalis**

- Stimulate the myocardium. Slows and strengthens the heart beat, so more blood is pumped with each beat.
- Reduces edema, increases oxygen delivery to the tissue, and restores kidney function.
- Used to treat CHF.
- Digitalization: Starting out with high doses until the therapeutic dose range is reached, then decreasing dosage to a daily maintenance dose.
- Blood test to monitor blood level of digitalis called "dig. level."

Related medications:

- digoxin (Lanoxin)–most common by far.
- digitoxin (Crystodigin)–more toxic.

Nursing care and side effects:

- Side effects–are those of toxic levels of the drug in the blood.
- The difference between the therapeutic level in the blood and the toxic level is very small.
- Excessive slowing of the heart <60 beats per minute.
- Irregular heart beat.
- Gastrointestinal symptoms, anorexia, nausea, vomiting.
- Confusion, weakness.
- Vision problems–blurred or double vision, yellow-green halos around objects.
- Bigeminal heartbeats (double beats) or trigeminal beats.

Implications for nursing care–relate to correct dose, measuring effects of drug

- Read label carefully to see that you are giving the right medication. These medications are **NOT** interchangeable in spite of the similarity of their names.
- Check the pulse before giving.
- Check the pulse apically for one full minute, especially during digitalization.
    a. In the adult care home setting it is acceptable to take the pulse radially if resident has been stabilized for some time on the medication and has no symptoms of toxic effects.
    b. Hold the medication and report to licensed nurse if the rate is less than 60 beats per minute or if you hear double or triple beats, or there are any other signs of toxicity; or if any change has occurred in the patient's pulse from the usual.

- **Anti-dysrhythmics/Antiarrhythmics**
- Act on the heart's pacemaker cells to restore normal rhythm.
- The heart beats irregularly because of damage to the heart's pacemaker cells perhaps after a heart attack, or other disease.
- The antiarrhythmics calm down the heart muscle so it does not flutter or beat too rapidly–promote a normal heart rhythm.
- They do this by depressing the ability of the heart muscle to respond to irregular or weak signals to beat.
- Used to treat arrhythmias.

Related medications:

- propranolol (Inderal)
- amiodarone (Cordarone)
- diltiazem (Cardizem)
- procainamide (Pronestyl)
- disopyramide (Norpace)

Nursing care and side effects:

- Slow pulse–even normal impulses do not cause the heart to beat.
- Postural hypotension, dizziness–slowed heart action may lower blood pressure.

- Give medication at evenly spaced intervals to maintain an even level in the blood.
- Report postural hypotension, slowed pulse, or low blood pressure to supervisor.
- Check pulse and BP before giving, and hold if changes from normal or usual.

➢ **Anticoagulants, antithrombotics**

- Prevent blood from clotting to reduce the formation a thrombus or embolus in an inflamed or narrowed vessel, or to prevent further formation of a clot already formed.
- Used to treat clotting that is not helpful (helpful clotting stops bleeding) such as clotting in the heart, brain, or lungs (stroke, myocardial infarction, pulmonary embolism).
- Abnormal clotting may cause damage to the brain, heart, lungs (stroke, myocardial infarction, pulmonary embolism).
- Action–inhibit the clotting of blood, or make clots form more slowly.

Related medications:

- warfarin (Coumadin) is the oral anticoagulant.
- heparin is the injectable and IV drug.
- enoxaparin (Lovenox) is the newer, safer type of heparin that patients often inject themselves at home.
- vitamin K (Aqua-Mephyton) is antidote to Warfarin's excessive "thinning" of the blood leading to bleeding.
- Thrombolytics
  - streptokinase (Streptase): IV drug

Nursing care and side effects:

- Observe for signs of bleeding: bleeding gums, nose bleeds, bruising, blood in the urine or stools.
- Protect from injury especially falls, special care when transporting or moving to protect from bumps, pinching; protect feet with footwear; shave with electric razors. Head injury from falls may cause brain bleeds.
- Must have blood clotting tests at regular intervals–prothrombin time or INR (PT).
- Dosage of the medication will be prescribed in response to the results of the clotting test.
- Do not give with aspirin, oral contraceptives and antacids. Many other interactions and contraindications–check drug book.

- **Coagulants**
  - Help formation of blood clots.
  - Used to treat bleeding or overdose of anticoagulant.

Related Medications:

- vitamin K (Aqua-Mephyton)–given by injection or 5 mg. tablet.

➢ **Hematinics, antianemics**

- Provide the ingredients for the formation of red blood cells (RBCs), such as iron (Fe), Vitamin B-12.
- Used to treat anemia.

Related medications:

- ferrous sulfate (Feosol)
- vitamin B-12 or Cyanocobalamin

Nursing care and side effects:

- Can irritate mucous membranes, so give with lots of water.
- Stools will be dark and tarry looking.
- Diarrhea or constipation.
- Give with lots of water.
- Give liquid iron through a straw, to avoid staining the teeth.
- Provide resident with information about diet and the side effects.

9. Summary – Cardiovascular medications

- Have annoying or distressing side effects.

- Residents may have to restrict life style–change eating habits to no or low salt diet, low fat diet, lose weight, no smoking, less emotional pressure, etc. May be angry or have negative feelings about having to "give up everything."

- Treatment may be a combination including changes in diet and exercise as well as medications. Some may resent that a "pill" cannot be affective alone.

- Read package inserts, drug references; be familiar with common cardiovascular medications.

- Resident may start with a large initial, "loading" dose, then reduced later to maintenance dose.
  - "Maintenance" dose is the amount that maintains a therapeutic blood level of the medication without being toxic, or overdosing the patient.
  - Usually maintenance cardiovascular drugs are given for the rest of the resident's life or until the doctor orders another dose or a different medication.
  - Reassure the resident and focus on the benefits of compliance with the medical advice.

Unit 11. Drugs and Body Systems – Urinary System

Objectives

1. **Identify basic structures and functions of the urinary system.**
2. **State the three functions of the urinary system.**
3. **Describe disorders of the kidneys and urinary tract. Be able to define key terms, define symptoms and describe related medications and treatments, and nursing care and side effects.**
4. **Identify medications used to treat urinary tract disorders and nursing measures to promote effectiveness, including the following drug groups or treatments:**
   antispasmodics
   antibiotics
   urinary antiseptics
   urinary analgesics
   diuretics
   replacement electrolytes

See Unit 22 – Macrominerals

See Appendices:
- Medication Classification

See Performance Evaluation – Drug Card – Sample

Content

1. Urinary anatomy and physiology: major structures

- **Kidneys** are situated at the back (retroperitoneal) area of the abdominal cavity.
  - One on each side of the spinal column.
  - Function - excrete urine which contains the end products of metabolism (urea), help regulate the water, electrolyte and acid base content of the blood.
  - Kidneys have 2 layers – outer cortex and inner medulla
  - Functional unit is the nephron which filters water, nutrients, and minerals from the blood. There are one million nephrons in each kidney.
  - Kidney restores some water, nutrients, and minerals to the body – the rest is excreted as urine.

- **Ureters** are the muscular tubes through which urine travels from the renal pelvis to the bladder.
  - There is one ureter descending from each kidney.
  - Ureters are about 10 inches in length.

- **Bladder** is a muscular storage structure for the urine.
  - Expandable, stretchable because of the musculature.
  - Capacity is about 2 cups or about 500 ml.
  - Nerve endings stimulate the brain of need to empty when the bladder is stretched to about 1 cup or about 250 ml.
  - Capacity may extend to more than 500 ml.

- **Urethra** is the tube through which urine travels from the bladder to external opening (meatus).
  - Female urethra a few inches long, extending from the bladder with the meatus located between the clitoris and the vagina opening.
  - Male urethra extends from the bladder the length of the penis to the tip.
  - Male urethra transports urine and seminal fluids.
  - Female urethra transports urine only.

2. Urinary anatomy and physiology: major functions

The main functions of the urinary system are to remove waste products from the blood, regulate the amount of water in the body, and maintain acid-base balance in the blood. These functions are done by the kidneys filtering the blood.

- **Excretion of waste** products–filter waste out of the blood:
  - urea–a product of the metabolism of protein
  - minerals
  - water

- **Maintaining homeostasis–**maintaining water balance in the body tissues by eliminating excess water.

- **Regulation of pH** balance.

- pH is the acid-alkaline balance
- normal pH of the body is neutral or very slightly alkaline (7.35 to 7.45 on the pH scale)

3. Disorders of the kidneys and the urinary tract

- **Normal urine** is clear and pale yellow and has a slight ammonia odor.
  - 1500 to 2000 ml are produced every 24 hours.
  - A single voiding expels about 300 ml.
  - Urine is predominantly water, with 5% waste products.
  - Medical conditions or disorders may be detected through urine testing.
  - Frequency, amount voided, color are initial indicators of health.
  - Using testing equipment, the pH and sugar content can be tested relatively easily.
  - If there is low percent of water, the urine may be concentrated or dark and will have an increased "specific gravity." Specific gravity is a method of "weighing" urine byproducts.
  - A high percent of water will appear as clear, colorless urine.

- **Catheterization** is a means of placing a tube through the urethra into the bladder.
  - Usually a catheter is placed in order to drain the bladder or to obtain a urine sample for testing.
  - An "indwelling" catheter remains in place and is attached to an external collection bag.
  - Antiseptic or antibiotic solution may be instilled through catheter to irrigate the bladder of a patient who has a severe bladder infection.
  - Irrigation solution may also be instilled through a catheter to irrigate the bladder of a patient who has had bladder or prostate surgery.

- **Tests**
  - X-rays
  - Cystoscope – a telescope-like device is passed through the urethra and into the bladder to look at the structures directly; the view may be displayed on a monitor screen.
  - Catheter may be inserted to obtain urine directly from the bladder.
  - Urine sample–can be examined for:
    - Hematuria–blood in the urine
    - Pyuria–pus in the urine
    - Chemical analysis–looks for cells, microscopic blood, protein, pH, salts, sugar, etc.

- **Symptoms**–change in act of urination. All these symptoms may be signs of urinary disorders, but may also be side effects of drugs given for other disorders.
  - **Retention**–inability to urinate–urine is made and bladder is full, but cannot be released.
  - **Incontinence**–inability to control urination.
  - **Frequency**–having to urinate very often.

- **Urgency**–feeling a great urge to urinate unrelated to the amount of urine in the bladder.
- **Dysuria**–painful or difficult urination–may be a burning sensation during urination.
- **Oliguria**–little urine is produced.
- **Anuria**–no urine is produced.

- **Major disorders**
  - Obstructions
    - Malformed organs
    - Tumors
    - Injuries
    - Kidney stones–formed of salt crystals that collect together and form rock-like particles that usually pass down the ureters, causing intense pain, lodging in the bladder. Sometimes they are large enough to block the ureters. Sometimes they are crushed with an instrument during a cystoscopy, and flushed out of the bladder through the urethra. Kidney stones are often pulverized using lithotripsy and are excreted from the body in urine. Urine is caught in "hat or beaker" at each voiding and then filtered to remove stone particles which are sent to lab for analysis
    - Prostate (NOT prostRate)–in males this organ surrounds the urethra at the based of the bladder. Enlargement may produce urinary obstruction. It is shaped like a donut and the urethra passes through the prostate as it exits the bladder. An enlarged prostate regularly occurs in older age, constricts the urethra, and interferes with urination.

  - **Infections**–urinary structures are prone to infection because they are lined with mucous membranes, carry waste products and metabolites to the outside of the body. Urinary tract infections are generically referred to as "UTI." Prevent urinary tract infections by instructing resident and providing good perianal hygiene. Females should wipe/wash the area in one direction, from front (pubic) to back (anus), not back and forth.
    - Treat with antibiotics and analgesics for pain.
    - Elderly are especially susceptible to urinary infection, especially "nosocomial" infections. Nosocomial means that the infection was acquired at the facility.
    - Cystitis–bladder infection–that may cause bladder spasms, frequent urination, and burning upon urination. Can be acute or chronic and resistant to treatment.
    - Pyelonephritis–inflammation of kidney pelvis.
    - Nephritis–inflammation of the kidney, glomeruli, tubules, interstitial tissue. Can be acute or chronic and resistant to treatment.
    - Ureteritis–inflammation of the ureter(s).

- Urethritis–inflammation of the urethra (may affect different portions).

- **Kidney failure** - also known as renal failure. Kidneys no longer perform essential functions, cannot filter urine and waste from the blood.
  - Uremia is "blood poisoning" or "toxic renal insufficiency"–waste products are not filtered out by the kidneys and build up in the blood stream; can reach toxic levels. Person may undergo dialysis to remove wastes, or IV antibiotics in hospital setting.
  - Drugs are not excreted as fast from the body, so a cumulative effect occurs as the drug level builds up.
  - Damage to the kidneys can occur from the use of drugs, particularly antibiotics. Infections are also damaging to the kidneys.
  - Diseases may affect or slow down processing by the kidneys because blood flow is blocked or flow through the kidneys is slow. Urine production is reduced or does not occur. Water and wastes remain in the body, requiring dialysis.

- **Imbalance** of fluids, electrolytes, and pH. Water is the medium for all of the body's chemical reactions.
  - Average adult body is 60% water.
  - Elderly bodies are only about 50% water.
  - Most of the water in the body is inside cells.
  - About 1/4 of the water is interstitial fluid or blood plasma.
  - Body must maintain a balance between water taken in and water lost.
  - In some diseases the body cannot maintain this balance, so monitoring intake/output may be important as well as giving or restricting fluids.
  - Water is obtained from fluids, food and as the results of metabolic activity.
  - Intravenous fluids may be administered to correct fluid imbalances.
  - Water is lost from the body through urine, sweat, feces, respiration, vomiting, and wounds.
  - Intake can be accurately measured, but output can only be measured in part. Measuring sweat or water lost through respiration is not easily accomplished.
  - Fluid balance is influenced by activity, body temperature and size.
  - Intake which is significantly greater than output will result in fluid overload over time.
  - Output which is significantly greater than input will result in dehydration over time.
  - Accurate intake and output or I&O records help medical staff decide on treatment or therapies. Examples include IV fluids for dehydration and diuretics for edema.

- **Bladder function/tone**
  - Infections, irritation, repeat (chronic) infections or other damage or diseases can reduce the bladder's muscular tone and holding and contracting ability.

Related medications and treatments:

- Antispasmodic–reduces bladder contractions and delays the initial urge to void in persons with neurogenic bladder. The bladder is not functioning properly due to damage to the nervous system usually caused by a spinal cord injury, diabetes, or Multiple Sclerosis.
  - oxybutynin (Ditropan)
- Cholinergic–helps stimulate bladder emptying.
  - bethanechol (Urecholine)–increases bladder tone, promotes voiding.
- Estrogen replacement/supplement therapy used in treatment of post-menopausal women, may restore urethral mucosal lining. This may increase the elasticity of the bladder as well.

Nursing care and side effects:

- Behavioral interventions include bladder retraining, habit training for urge incontinence, and prompted toileting for cognitively impaired persons. Pelvic muscle exercise for stress incontinence may help maintain urinary continence.
- Diagnostic testing may be used to discover the cause of urinary tract problems, which is important in determining appropriate therapies.

4. Other drugs used for urinary disorders

- **Antibiotics:** Some antibiotics are excreted through the kidneys. This means that the kidneys will absorb a very high concentration of the drug which will help with an infection of the urinary tract.
  - penicillins – ampicillin and amoxicillin
  - cephalosporins – cefaclor (Ceclor), cefadroxil monohydrate (Duricef)
  - broad spectrum antibiotics – ciprofloxacin (Cipro), ofloxacin (Floxin)

- **Urinary anti-infectives/antiseptics**
  - Drugs which are only partly effective for the treatment of cystitis.

Related medications:

- nalidixic acid (NegGram).
- nitrofurantoin (Macrodantin, Macrobid)–give with food for absorption and reduction of G.I. upset; may turn urine rust-brown.
- methenamine, methylene blue, phenyl salicylate, benoic acid, atropine sulfate, and hyoscyamine (Urised) is a combination anticholinergic, anti-infective drug. Encourage fluids to relieve discomfort and improve effect. Urine and feces may discolor, turning bluish or bluish-green.
- sulfamethoxazole (Azo Gantanol, Bactrim, Septra, Gantanol) and phenazopyridine (Pyridium); sulfisoxazole and phenazopyridine (Gantrisin). Encourage fluids. Do NOT administer if sulfonamide or sulfa allergy exists. Watch for rashes, respiratory reaction.

- trimethoprim, sulfamethoxazole (Bactrim, Cotrim, Septra)–combination antibacterial including sulfonamide. Encourage fluids. May cause nausea, rashes.
- methenamine (Hiprex, Urex, Mandelamine)–acidic urine is important for effectiveness. Avoid milk, dairy products. Encourage consumption of protein and cranberry-based foods. Add vitamin C if directed by physician. May need to check urine pH.

➢ **Urinary analgesics–**relieves pain or urinary tract infections by soothing action directly on the mucosal lining of the urinary tract. May discolor urine (dark orangish, brown).

Related medications:

- phenazopyridine (Pyridium)–especially causes changes in urine color–anaesthetizes mucous membranes of the urinary tract.
- ethoxazine (Serenium)

Nursing care and side effects:

- Side effects are minimal, but many medications used to treat urinary infections color the urine a rust or red color–WARN THE RESIDENT.
- Encourage lots of fluids and regular emptying of the bladder.

➢ **Diuretics–**decrease the reabsorption of salts and water from the kidney tubules. Increases urine production. More urine is produced, so more fluid is removed from the body. There are several types of diuretics with different modes of action.

Related medications and treatments:

- Thiazide type diuretics–keep the kidneys from reabsorbing sodium, potassium and chloride, so more of these salts remain in the tubules and attract water, which is then excreted. Causes a loss of potassium, which is needed for the body's chemical processes. No storage in the body for potassium, so it must be replaced every day in the diet. Low potassium levels–hypokalemia also makes the effect of any digitalis drug more potent, possibly causing digitalis toxicity.
  - chlorothiazide (Diuril)
  - hydrochlorothiazide (Hydrodiuril, Esidrix)
- Potassium-sparing diuretics–prevent the loss of potassium, while increasing urinary output. These can lead to an excess of potassium–hyperkalemia. Hyperkalemia symptoms may include diarrhea, intestinal colic, irritability, nausea, cardiac arrhythmias. Patients are told to avoid food rich in potassium.
  - spironolactone (Aldactone)
  - triamterene (Dyrenium)
- "Loop" diuretics–strong diuretics that prevent the reabsorption of sodium and potassium. Hypokalemia symptoms include anorexia, silent intestinal ileus, weakness, soft flabby muscles and confusion. Potassium supplements may be ordered with these.

        - furosemide (Lasix)
        - bumetanide (Bumex)
    - Carbonic anhydrase inhibitors
        - acetazolamide (Diamox)
    - Combination type–combine a Thiazide-type diuretic with a potassium-sparing diuretic
        - triamterene and hydrochlorothiazide (Dyazide)
        - spironolactone with hydrochlorothiazide (Aldactazide)

Nursing care and side effects:

- Some diuretics cause excessive potassium loss and should be given with potassium replacements or conscientious dietary replacement. Foods rich in potassium are bananas, oranges.
- Give these drugs early in the day.
- Make it easy and comfortable for the patient to urinate frequently.
- Make sure the call light is within reach at all times so the resident will be able to call for help if needed.
- Monitor the effectiveness of the diuretic by weighing the resident regularly. Weigh at the same time of day and with the same type of clothes on, if possible.
- A daily weight change of more than plus or minus two lbs. is significant. Report to licensed nurse immediately.
- Watch for signs of potassium depletion–hypokalemia–confusion, gas, muscle weakness, muscle cramping, and/or an irregular heartbeat.
- Encourage the resident to eat a variety of foods.
- Be alert for symptoms of electrolyte imbalances–nausea, thirst, fatigue, dry mouth, and others mentioned above.
- Be alert for hypotension, especially orthostatic hypotension. Diuretics often lower blood pressure, so watch for dizziness, fatigue, muscle weakness and orthostatic hypotension.

➢ **Electrolytes–dissolved mineral salts or "macrominerals"**

Electrolytes must be in proper balance for the body's chemistry to function.

- Electrolytes are solutions which conduct electricity, containing electrically charged particles called ions.
- Chemicals cling to these ions and are transported through the body's fluids, into and out of the cells and the bloodstream.
- Electrolytes are:
    - Potassium – K
    - Calcium – Ca
    - Sodium – Na
    - Magnesium – Mg
    - Chloride – Cl
    - Bicarbonate
    - Sulfate
- Electrolytes and water must be in balance with each other.

- Electrolyte imbalances (bold, capitalization to help remember, distinguish):
  - Hypo**K**alemia–too little potassium
  - Hyper**K**alemia–too much potassium
  - Hypo**N**atremia–too little sodium
  - Hyper**N**atremia - too much sodium
  - Hypo**C**alcemia–too little calcium
  - Hyper**C**alcemia–too much calcium

- **Bases-acid relationship**–pH is the ratio of bases to acids.
  - Body fluids are very slightly alkaline, and cannot tolerate very much deviation from this pH without death resulting.
  - The kidneys regulate the amounts of acids and bases that are excreted in the urine, so they help control the pH of the blood and body fluids.
  - Acidosis is too much acidity for the body cells to function.
  - Alkalosis–too much alkalinity for the body cells to function.

Related medications and treatment:

- Potassium replacement drugs–replace potassium (K) lost when certain diuretics are used. Can cause stomach irritation.
  - KCL–abbreviation for "potassium chloride."
  - Slow-K--has a wax matrix form for slow release.
  - K-Lyte

Nursing care and side effects:

- Give with food to help prevent gastric irritation.
- Do not give the wax matrix form with hot food or liquid to prevent melting.
- Follow directions carefully when diluting liquid forms of drug.

Unit 12. Drugs and Body Systems – Respiratory System

Objectives

1. **Identify the major structures and functions of the respiratory system.**
2. **Describe the mechanisms of breathing and how gases are exchanged in the lungs.**
3. **Describe the major respiratory disorders, listing common signs and symptoms.**
4. **Be familiar with the correct medical terms associated with respiratory disorders.**
5. **Describe the actions, give examples, nursing care and side effects for these drug groups:**
   antihistamines,
   decongestants, and
   bronchodilators.
6. **Explain and demonstrate how to administer medication through a meter dose inhaler and using a nasal inhaler.**

See Appendices:

- Administration of Inhaler Therapy
- Administration of Medication Classification
- Administration of Nasal Inhaler Therapy
- Administration of Nebulizer Therapy

See Performance Evaluation – Drug Card – Sample

Content

1. **Respiratory system**
   - **Major structures**
     - **Nose**–warms, moistens and filters inhaled air.
     - **Pharynx** (throat)–passageway for air. Shared with the digestive system. Both food and air go through it.
     - **Epiglottis**–thin, leaf-shaped structure located in the throat, at the base of the tongue. It covers the larynx during swallowing to prevent food, fluids from entering the airway.
     - **Larynx** (voice box)–Contains the vocal cords and makes vocal sounds.
     - **Trachea** (wind pipe)–A tube that extends from the larynx to the bronchi. It conveys air to the lungs.
     - **Lungs**–main component of the respiratory system. Oxygen and carbon dioxide exchange occur here. There are two lungs, right and left; each is further defined into lobes. The right lung is composed of three lobes. The left lung is composed of two lobes with an indentation for the heart.
     - **Bronchi**–two airway branches that carry air to the lungs.
     - **Bronchioles**–smaller bronchial tubes that carry air deeper into the lungs into the alveoli.
     - **Alveoli**–air sacs of the lungs where gas exchange takes place. Oxygen and carbon dioxide are exchanged from the blood circulation through the walls of the alveoli.

   - **Major functions**–the exchange of oxygen from the air with carbon dioxide and water, byproducts of metabolism from the body carried by the blood.
     - Cells of the body use oxygen for energy and produce carbon dioxide as waste.
     - Carbon dioxide alerts the brain to trigger inspiration (breathing in of air).

2. **Mechanisms of breathing**
   - **Intercostal muscles**–muscles around and between the ribs.

   - **Diaphragm**– membranous wall separating the abdomen from the chest cavity. Shaped like an upside down bowl.
     - With each inspiration, it flattens and allows the lungs to fill with air.
     - It also assists with defecation and parturition (giving birth) because of its ability to cause an increase in intra-abdominal pressure with exhalation.
     - The diaphragm contracts spasmodically with hiccoughs and sneezes.

   - **Brain**–control center for respiration.
     - As carbon dioxide builds in the blood it triggers the lower mid-brain to stimulate inspiration.

   - **Mucus**–sticky fluid secreted by membranes and glands.
     - Consists of mucin, leukocytes, inorganic salts, water, and epithelial cells.

- Its continual production within the lungs helps flush the lungs of various cellular debris upward to the pharynx where it can be coughed up or swallowed.

- **Rate**–of normal respiration is 12 to 25 breaths per minute.

3. Disorders of the respiratory system

- **Asthma**–airway inflammation resulting in airflow obstruction. Symptoms may include wheezing, noisy respirations, breathlessness, shortness of breath and coughing.
  - May be a part of allergic response.
  - Molds or pollen may trigger allergic response, which may then lead to an acute "attack."
  - Respiratory infection may also trigger an acute episode.
  - Emotional upset may trigger asthma attack.
  - Attacks may occur only occasionally or may last several days.
    - Treatment: inhaled corticosteroid for acute attacks, medications to prevent attacks

- **Allergies**–inflammatory response to an allergen (may include release of histamine) which may result in a series of responses by the body, including the lining of the lungs.
  - Swelling of tissues in the lungs may occur. Fluid may build up in the lung tissues causing obstructed air flow.
  - Some allergens include foods, drugs, animals, insects, pollen, mold or dust, perfumes or fragrances.

- **Emphysema**–abnormal permanent enlargement of the airspaces at the end of the bronchioles with destruction of the walls of the bronchioles. Interference of the exchange of gases occurs. There is no cure.
  - These physical changes are one way the lung reacts to damage.
  - Symptoms include shortness of breath, cough and unequal or enlarged chest expansion.
  - Workplace exposure to toxins can also contribute to lung damage, leading to emphysema.
  - Major cause of emphysema is chronic tobacco/cigarette smoking.
    - Treatment: breathing exercises, antibiotics for infections, expectorants to thin and moisten sputum, bronchodilators to promote coughing up sputum and clear air passages

- **Bronchitis**–inflammatory response of the bronchi, a specific structural part of the anatomy of the lungs.
  - Usually an acute bronchitis is the result of infection producing increased mucus in the bronchi leading to difficulty breathing, wheezing, coughing.
  - Chronic bronchitis may be an ongoing response to allergens, toxins, or infections.
    - Treatment: antibiotics: ampicillin, tetracycline, erythromycin

        - Increase fluids
        - Expectorants to thin and moisten sputum

- **COPD (chronic obstructive pulmonary disease)–**a progressive and irreversible condition characterized by impaired function of the respiratory tract due to damage to the lungs. Often emphysema and COPD are used interchangeably.
    - May result from chronic bronchitis, asthma, and emphysema.
    - Chronic exposure to lung toxins or smoking.

- **Pleurisy** – inflammation of linings of lungs
    - Causes: pneumonia, TB, chest trauma, pulmonary infarctions, tumors
    - Symptoms: knife sharp pain in chest – worse on inhalation
    - Treatment: Treat causative factor, bedrest, pain medication, splint side when coughing

- **Pneumonia–** acute infection of the lower respiratory tract: bronchi, bronchioles, alveoli
    - Fluid may accumulate leading to inadequate air exchange.
    - All five lobes of the lung may be involved or infection may locate in a particular lobe.

- **Pulmonary embolism** – begins in deep vein of leg, especially in immobilized persons, migrates and becomes lodged in lung
    - Symptom: Sudden, unexplained dyspnea, tachypnea, tachycardia
    - Treatment: oxygen, anticoagulant therapy

- **Rhinitis, Sinusitis, Strep throat** – inflammations of the upper respiratory tract
    - Many types: bacterial, fungal, viral
    - Causes and predisposing factors: bacteria, allergies, irritating substances, air pollution, malnutrition, bedrest, immobility, other diseases
    - Treatment: Control symptoms with decongestants and antihistamines
        - Antibiotics for infections
        - Encourange fluids

- **Tuberculosis or TB**
    - Short for tubercles bacillus
    - Bacterial infections of the lung

- **Tumors** – of head, neck, and lungs
    - Symptoms: persistent hoarseness, cough, dyspnea, wheezing
    - Treatment: Surgical removal, radiation, chemotherapy

4. Additional Terminology

- **Apnea** - cessation of breathing, may occur during sleep.

- **Auscultation – process of listening to lung sounds, using stethoscope, to evaluate lung function**

- Normal sound is an unobstructed swish of air.
- Variations are characteristic of certain lung diseases and disorders

- **Coughing –** forceful expiratory effort, sometimes violently forceful. Protective reflex to clear trachea, bronchi, lungs of secretions or irritants - may become persistant or uncontrolled fits - may be productive (producing sputum of mucus or pus) or dry (not producing sputum.)

- **Dyspnea –** shortness of breath or difficulty breathing.

- **Hemoptysis –** blood in sputum.

- **Hoarseness –** a roughness of the voice usually due to irritation or abnormal growth of vocal chords.

- **Hypernea** - hyperventilation - breathing too rapidly or deeply.

- **Orthopnea –** difficulty breathing deeply unless sitting or standing. Seen in disorders such as asthma, emphysema, and pneumonia.

- **Pulse Oximetry** – measuring concentration of oxygen in blood. Probe is attached to ear, finger, toe, or bridge of nose.

- **Sputum–**substance expelled by coughing which contains cellular debris, mucus, blood, pus and microorganisms.

- **Tachypnea -** rapid breathing.

- **Wheezing** – high pitched, musical sound due to narrowed airway – cause may be asthma, bronchitis, or allergies.

5. Related medications and treatments:

- **Antihistamines–**relieve allergy symptoms such as runny nose, itchy watery eyes and sneezing. Drugs work against the effects of histamine. Dry the respiratory mucosa. Not always helpful if secretions are present, especially if they are thick and difficult to expectorate. Classification–anticholinergic.

  Examples:
  - azatadine (Optimine, Trinalin Repetabs)
  - loratadine (Claritin)
  - diphenhydramine (Benadryl)
  - Dimetane
  - cetirizine (Zyrtec)
  - Xyzal

  Nursing care and side effects:
    - Balance intake and output, assure adequate fluids.

- Watch for urinary retention, frequency, dysuria. Immediately report to supervising licensed nurse if any of these symptoms occur.
- May cause heart irregularity, palpitations, increased pulse, hypotension.
- Some medications may be given with food or milk to decrease GI upset. Others must be given on empty stomach.
- Photosensitivity may occur. Protect from sunburn.

➢ **Decongestants**–reduce nasal obstruction, swelling and drainage by shrinking blood vessels in the mucous membranes. Classification–adrenergic.

Example:

- pseudoephedrine (Afrin, Drixoral, Sudafed – OTC), phenylephrine (Dristan Cold Nasal Decongestant, Neo-Synephrine Hydrochloride Ophthalmic, Rynatuss)

Nursing care and side effects:

- Short-term use.
- Can cause rebound congestion with prolonged use.
- Pseudoephedrine effect can be decreased with methyldopa, rauwolfia alkaloids.
- Pseudoephedrine effect can be increased with urinary alkalizers.
- May not relieve bronchial congestion.
- May cause tremors, anxiety, insomnia, or seizures in the elderly.

➢ **Antitussives**–inhibit cough reflex by depressing the regulating "cough center" in the brain. Given to suppress but not entirely eliminate cough. Coughing is protective mechanism to clear airway.

Examples:

- dextromethorphan (Benylin DM, Pertussin, Robitussin DM)
- codeine (Controlled substance)
- hydrocodone (Controlled substance)
- Dimetapp DM

Nursing care and side effects:

- Most helpful with dry, hacking, non-productive coughs.
- May contain a narcotic.
- If narcotic ingredient, side effects may include drowsiness, sedation, dizziness.
- Gastric upset may occur.
- Respiratory depression can occur with narcotic antitussives.
- Urinary retention (watch intake/output ratio).
- Rash may occur as early indicator of allergic reaction.
- Safety measures to guard against falls, injury.
- Increase fluids.

➢ **Expectorants**–liquefy and loosen mucus making it easier to cough and expel sputum. Also referred to as Mucolytics.

Example:

- guaifenesin (Benylin E, Duratuss-G, Humibid, Naldecon Senior EX, Unitussin, Mucinex)
- acetylcysteine (Mucomyst)

Nursing care and side effects:

- Adequate hydration is critical for helping thin secretions for expulsion.
- Increase fluid intake for resident taking expectorant.
- May cause nausea, decreased appetite.

- **Bronchodilators–**increase the opening of the bronchi allowing more airflow to occur. The bronchioles relax and expand. Helpful in preventing and treating broncho-constriction associated with asthma, bronchitis and emphysema.

Example:

- albuterol (Proventil, Ventolin, Ventodisk)
- metaproterenol (Alupent)
- epinephrine (Primatine Mist)
- terbutaline (Brethine)
- ipratroprium (Atrovent)
- theophylline, aminophylline, ephedrine

Nursing care and side effects:

- If given orally, may cause gastric upset. Give with meals or food.
- Limit other stimulants such as caffeine, nicotine which can add to feeling of "jitteriness."

- **Inhalation therapies–**medication is delivered directly into the lungs. Resident inhales medication through mouth or nose (nasal inhaler only). Delivered by mechanical device, or pressured container that uses propellant. **See Appendices.**

Nursing care and side effects:

- Medications used in inhalation therapies (primarily bronchodilators) may cause increased pulse rate, a feeling of "bounding" or "pounding" heart beats.
- Monitor heart rate carefully.
- Use may be contraindicated in residents with cardiac arrhythmias.
- Residents may be uncomfortable with and unfamiliar with how an inhaler, nebulizer works. If resident is alert and oriented, demonstrate the equipment, let him/her hold or handle the inhaler first to become familiar and comfortable. Prepare the resident for any bitter taste, burst of aerosol, mist, or other sensation that may be expected.
- Spacers may be helpful for resident. Supervising licensed nurse should check with pharmacist.

- Popular remedies for allergies and colds are a combination of antihistamine with decongestants, expectorants, and antitussives

Example:

- Actifed
- Benylin

- Dimetapp
- Drixoral
- Phenergan Expectorant with Codeine

- Corticosteroids are potent anti-inflammatory drugs used to control some respiratory conditions. They may be administered via inhalation.
  Examples:
  - belcomethasone (Beclovent, Vanceril)
  - triamcinolone (Azmacort)

Unit 13. Drugs and Body Systems–Digestive System

Objectives

1. **Identify the basic structures and functions of the digestive (gastrointestinal) system, including the five main functions. Be able to name the major parts of the GI system and tell what they do.**
2. **Define the symptoms of gastrointestinal disorders.**
3. **Describe the major gastrointestinal disorders for which medications are prescribed.**
4. **Describe the actions, give examples, nursing care and side effects for these drug groups:**
    - **antacids**
    - **antisecretory drugs**
    - **digestants**
    - **antiflatulents**
    - **emetics**
    - **antiemetics**
    - **anticholinergics**
    - **antispasmodics**
    - **diarrhea medications (Discuss non-drug means of controlling diarrhea and for preventing constipation)**
    - **cathartics (laxatives and purgatives)**
    - **antiparasitics**
5. **Identify principles to remember in administering medications for the digestive system safely.**

See Appendices
- Medication Classification

See Performance Evaluation – Drug Card – Sample

Content

1. **Gastrointestinal (G.I.) system–alimentary or digestive system anatomy and physiology.**
   - **Structures**
     - **Mouth–** Digestion begins in the mouth. Food is broken into smaller pieces, mashed and mixed with saliva.
     - **Esophagus–**muscular tube extending from the pharynx to the stomach. About nine inches in length. Food passes through the GI system with the assistance of a wavelike process called peristalsis.
     - **Stomach–**muscular, pouch-like distensible portion of the alimentary canal below the esophagus and below the diaphragm. The opening from the esophagus is the fundus and the opening into the small intestine is the pylorus. Made up of four layers of tissue, primarily muscular and mucous lining.
       - Secretes gastric juice and converts proteins.
       - Acts as a reservoir, moderating the movement of contents into the next portion of the alimentary canal. Acid kills microorganisms. In the acid environment of the stomach, very little absorption of nutrients or medications occurs.
       - Expands to hold up to 2000 ml./2 quarts of food.
       - Food may stay in the stomach for about 3 hours.
     - **Small intestine–**extends from the stomach, into the duodenum (about 10 inches long) connecting to the jejunum (about 8 feet long) which then joins the ileum (about 12 feet long).
       - Duodenum receives food through the pyloric valve of the stomach.
       - Receives secretions from the liver and pancreas which aid digestion in the first third of the small intestine.
       - Wall has glands, blood and lymph vessels, nodules, folded surface and tiny finger-like projections called villi that absorb products of digestion.
       - Absorption of nutrients and medications occurs in the alkaline environment of the last 2/3 of the small intestine and are transported to the liver via the bloodstream.
     - **Large intestine–**also called the colon (about 5 feet long). Consists of the cecum, ascending, transverse, descending, and sigmoid colon, the rectum, and the anus.
       - Primary function is to absorb water from digestive byproducts.
       - Produces feces.
     - **Rectum–**end of the large intestine; holds feces. Centers for defecation reflex are in the medulla and 2nd, 3rd, and 4th sacral segments.
     - **Anus–**opening at the far end of the intestine for expelling feces.
     - **Liver–**secretes digestive substances (bile–aids in digesting fats), removes certain waste products from the blood.
       - Produces clotting factors and some immune factors.
       - Breaks down and inactivates many drugs and toxins.

- Nutrients are stored in the liver and are released into the blood stream as needed by the body.

- **Gallbladder**–a pear-shaped storage pouch on the undersurface of the right lobe of the liver.
  - Holds bile until it is discharged for digestion.
- **Pancreas**–secretes digestive substances into the digestive tract and insulin into the bloodstream. It is a gland with its head attached to the duodenum and its tail portion reaches toward the spleen. Pancreatic juice plays an important role in digestion (breaking fats, proteins, and carbohydrates into particles that can be absorbed.
  - Produces internal and external secretions.
  - Hormones are produced including insulin and glucagon. These work with hormones from other endocrine glands to regulate carbohydrate metabolism. Diminished secretion of insulin by the Islets of Langerhans results in diabetes mellitus.

➢ **Major functions**
- Breaking up food into smaller pieces
- Transporting food through the GI tract–peristalsis
- Secreting digestive enzymes, regulating metabolism
- Absorbing nutrients into the blood
- Excreting solid waste products

➢ **Mechanisms of digestion and elimination**–Peristalsis and the secretion of digestive enzymes are under the control of the autonomic nervous system, so digestion is affected by stress. Normal bowel elimination is from 3 times per day to every 3 days.

2. **Disorders of the GI/digestive system: Symptoms**

➢ **Symptoms –** changes in normal process of digestion.
- **Emesis or vomiting –** reverse peristalsis. Expelling stomach contents through the esophagus and mouth and/or nose.
- **Nausea –** feeling or need to vomit. May or may not precede vomiting.
- **Constipation –** failure to have regular bowel movements due to hardened feces, slow peristalsis movement of the intestine, lack of bulk in the diet, psychological factors, or lack of physical activity.
- **Heartburn –** acid liquid reflux from the stomach into the esophagus causing a "burning" feeling in the chest. Has no relation to heart other than location of the pain in upper chest area.
- **Abdominal cramps –** tightening, "cramping" feeling in the alimentary canal. May be in the upper or lower colon.
- **Eructation –** belching; expelling gas or air from stomach through esophagus.
- **Flatus –** gas in the GI tract, expelled through the anus.
- **Diarrhea –** loose watery stools or too frequent stools. Can be caused by greasy food or too spicy food, coffee or other intestinal irritants.

- **Increased intestinal motility –** moving food through the intestine with too much speed. Affected by nervous tension, infections, drugs, etc.
- **Tarry stools –** dark, black, sticky consistency. Can be a sign of GI bleeding or may be side effect of iron supplements.
- **Anorexia–**lack of appetite.
- **Tooth and gum disorders –** residents may avoid foods that are hard to chew, such as fruits and vegetables or foods high in bulk and fiber, leading to other GI problems.
- **Gastritis –** inflammation of stomach, characterized by pain, tenderness, nausea, vomiting.
- **Dysphagia** - difficulty swallowing.

3. Diseases and disorders

- **Ulcers –** an erosion of the lining of the stomach or duodenum. Underlying tissue is exposed. Hypersecretion of stomach acids has been thought to be the main cause. Current evidence shows that there are other underlying causes: disruption in the normal mucosal defense and repair, increasing susceptibility to breakdown by stomach acid. Acids destroy tissue. Infections and medications may destroy stomach lining.

  Related medication and treatment:
  - Antibiotics
  - Antacids
  - Antisecretory drugs
  - Dietary changes–eliminate foods that cause resident distress. Diet changes overall do little to promote healing.

- **Liver disorders–**Liver is the largest and most metabolically complex organ. Symptoms are result of changes in cell function or impaired bile secretion. Clinical features of liver disease include:
  - **Jaundice–**yellowing of the skin and sclerae, dark urine. Bilirubin builds up in tissues rather than metabolized. Many causes for bilirubin to increase in bloodstream and eventually tissues, including secretory or metabolic malfunctions. May turn feces white color as disorder progresses.
  - **Hepatitis–**general inflammation or infection of the liver. Viral types are classified as Hepatitis "A," "B," "C" etc.
  - **Cirrhosis–**liver damage that results in the liver becoming fibrous, scarred and forming nodules. Many things may cause cirrhosis–chronic hepatitis, infections, toxins, changes in immune response, biliary obstruction, diabetes mellitus, poor nutrition. It is the "end-stage" of many forms of liver injury, including chronic alcoholism.

- **Gallbladder disorders–**
  - **Cholecystitis–**inflammation of the gallbladder and bile ducts.
  - **Cholelithiasis–**formation of stones or calculi. May not create symptoms until or unless gallbladder or duct becomes blocked and inflamed.

    Related medication and treatment:

- Surgical intervention generally required.
- May attempt to reduce inflamation with antibiotics first.
- Another treatment may be oral bile acids or extracorporeal shock-wave lithotripsy.

- **Pancreatitis**–Acute or chronic inflamation of the pancreas. Biliary tract disease and alcoholism along with drugs, estrogen use, infection, hypertriglyceridemia, structural abnormalities are main causes. Pain is severe. Persistent vomiting occurs. May quickly become very ill and unstable. Can lead to shock, systems failure and death.

  Related medication and treatment:
  - Treatment of acute vs. chronic may vary according to symptoms.
  - Supportive therapy including hyperalimentation and intravenous therapy. Relief of symptoms including nausea, vomiting, abdominal tenderness and acute pain.
  - Monitor for hypotension, urine output, hypoxemia.
  - Oxygen
  - Antibiotics (for specific infections–biliary sepsis, pulmonary infections, UTI)
  - Dietary restrictions
  - H2 blocker or antacids
  - Pancreatic enzymes (inhibit release of cholecystokinin)
  - Proton Pump Inhibitor

- **Enteritis**–inflammation of the intestine. Many forms of gastrointestinal enteritis exist, depending on the location and source of inflammation–medications, bacteria, viruses, fungi, food allergies, parasites.

  Related medication and treatment:
  - Supportive treatment is most important.
  - Easy access to toilet.
  - Antiemetics
  - Oral fluid replacement or IV fluids
  - Suppositories may be used as route of medication administration if diarrhea is not present or profuse.

- **Crohn's disease**–also known as regional enteritis, granulomatous ileitis or ileocolitis (nonspecific inflammation of the distal ileum and colon). May have a genetic propensity.

  Related medication and treatment:
  - Supportive care may include oral anticholinergics, bulking agents (psyllium preparations), sulfasalazine, antibiotics, corticosteroids (prednisone, hydrocortisone).
  - Corticosteroid–budesonide can be given orally or as an enema.
  - Other drugs such as methotrexate may be given.
  - Surgery may be necessary for recurrent intestinal obstruction or abscesses.

- Ulcerative colitis–chronic inflammatory and ulcerative disease in the mucosa of the colon, characterized by bloody diarrhea. Unknown cause; bleeding is the most common complication along with toxic colitis progressing to dilation of the colon, loss of muscle tone.
- Related medication and treatment:
- Diet can be important–avoiding raw fruits and vegetables limits the mechanical trauma to the inflamed colon.
- Anticholinergic drugs or loperamide (Imodium) may be used.
- Medication for treatment of diarrhea must be used with caution to avoid toxic megacolon (relaxation, dilation of the colon).
- Hydrocortisone enemas may be given.
- Mesalamine may be given by enema or suppositories. Other treatment may be similar to treating Crohn's's disease.

➢ **Peritonitis**–inflammation of the membranous coat lining the abdominal cavity. Infectious agent gains access through a rupture or perforation of the bowel or organ or carried by blood stream or lymphatic vessels.

Related medication and treatment:

- Treatment for mild infection is **antibiotics**.
- Surgery may be necessary for perforated bowel, stomach, appendix.

➢ **Irritable bowel**–A non-inflammatory disorder of the intestine characterized by abdominal pain, constipation, diarrhea, abdominal bloating, and passage of mucus. Cause is unknown. Emotional factors, diet, drugs, or hormones may aggravate GI motility. Organic disease may be present, or in addition fibromyalgia, headaches, temporomandibular joint (TMJ) syndrome, hypothyroidism.

Related medication and treatment:

- Supportive treatment includes psychological support, empathic care, reduction in external stressors, regular physical activity.
- Anticholinergics (antispasmodics) may be used in addition to fiber. Loperamide (Imodium) may be used when resident has diarrhea.
- Antidepressants may relieve constipation and bloating (by down-regulating the activity of spinal cord and cortical afferent pathways from the intestine).
- Aromatic oils (carminatives) can relax smooth muscle and relieve pain (peppermint oil).
- Normal diet usually followed, but individuals may benefit from reduction or elimination of beans, cabbage, other foods containing fermentable carbohydrates; reduced intake of apple, grape juice, bananas, oranges, orange juice.
- Artificial sweeteners such as sorbitol, mannitol, fructose may be avoided.

- Increase in dietary fiber, bland bulk-producing agents may be administered (bran, psyllium). Avoid excessive use of fiber which can lead to bloating and diarrhea.

➢ **Diverticulosis–**disease caused by sac-like mucosal projections in the GI tract which cause symptoms by trapping feces, becoming infected, bleeding, or rupturing. Related to segmental spasm of the muscular coat of the bowel, increased pressure causing extrusion at the weakest points of the muscle layer.

Related medication and treatment

- Treatment involves reducing spasm.
- Diet high in roughage may help along with psyllium and bran.
- Antispasmodics don't always help. Chronic use in elderly can cause more problems.
- Surgery is sometimes indicated.

➢ **Diverticulitis–**inflammation of the mucosa with complications such as abscess, peritonitis, obstruction, fistulas, bleeding. Usually there is pain, local tenderness in left lower quadrant of the abdomen and fever. Complications may occur, obstruction, fistulas.

Related medication and treatment

- Treatment in mild cases includes rest, liquid diet, **oral** antibiotics (cephalexin).
- With improvement, diet may advance to soft low-roughage and daily psyllium.
- Once resolved, high-roughage diet resumed.
- Severe symptoms or with other complications, may require IV antibiotics and surgery.

➢ **Hemorrhoids–**Dilated veins in the anal-rectal area.

- May be external or internal to the anus, may protrude.
- May regress spontaneously or be reduced manually.
- Hemorrhoidal bleeding typically follows defecation.
- Thrombosed or ulcerated hemorrhoids are painful.
- Pain can be severe.
- Internal hemorrhoids may cause a feeling of incomplete defecation. Examining the rectum after straining at defecation will usually determine if there are hemorrhoids.
- Itching of the anal area is not usually related to hemorrhoids.

Related medication and treatment:

- Treat with **stool softeners**, **bulking agents** (**psyllium**), warm sitz baths, anesthetic ointments, or witch hazel compresses.
- Large or protruding hemorrhoids may require surgery.

➢ **Parasites–**Parasites are organisms that grow, feed and are sheltered on or in a different organism. Protozoans may live outside or inside the intestines. **Entamoeba histolytica** ("Montezuma's revenge"), **Giardia lamblia**, **Cryptosporidium**, and **Cyclospora** are some of the more common intestinal

parasites. Intestinal protozoa are passed by the fecal-oral route. Common in developing countries with poor sanitation, locations where there is fecal incontinence and poor hygiene (persons who are incapable of performing hygiene correctly–very young, elderly, or mentally incompetent). Some may be spread through sexual contact. Person may be asymptomatic but spread disease to others. Prevention involves good hand-washing, preventing contamination by fecal matter. Symptoms may include watery malodorous diarrhea, abdominal cramps and distention, flatulence, intermittent nausea, chills, head ache. Stool cultures may be necessary to diagnose and correctly treat.

Related medication and treatment:

- Antiparasitics–given to kill worms (parasites also known as "helminths").
- Oral metronidazole (Flagyl) is effective for Giardia.
- No specific treatment is effective in Cryptosporidium–prevention of contamination is key.
- Double strength oral trimethoprim-sulfamethoxazole (Bactrim, Septra) for isosporiasis and cyclosporiasis.
- mebendazole

4. Additional GI-related medications and treatments:

- **Antacids**–relieve gastric and ulcer pain; neutralize stomach acid. Treat hyperacidity, peptic ulcer, gastritis, and indigestion.
  - sodium bicarbonate (baking soda).
  - calcium salts–seldom used (TUMS).
  - aluminum salts (Amphogel, Rolaids).
  - magnesium salts (Milk of Magnesia)–MOM dose determines its use: 30 cc is a laxative; 5 cc is an antacid.
  - Combination of Mg and aluminum (Maalox, Mylanta, Gelusil, Aludrox, Riopan)

  Nursing care and side effects:

  - These drugs interfere with the absorption of all other drugs, so should not be given at the same time as other medications. Administration at 30 minutes before or after other drugs.
  - Effect is prolonged when taken with food.
  - Persons with heart and kidney problems on sodium restricted diets should not take sodium bicarbonate. It is not safe for long-term use, can change the blood to a more alkaline level, and cause heart rhythm problems.
  - calcium salts–constipating.
  - aluminum salts–constipating.
  - magnesium salts–cause diarrhea.
  - Combination products, magnesium and aluminum are used to balance out the constipating and laxative effects of each other.

- **Antisecretory**–help inhibit gastric acid secretion by reducing the amount of histamine (H_2), a chemical which stimulates the formation of stomach acid. May

be used in treating ulcers, hyperacidity, and avoiding irritation of the stomach when gastrostomy tube is placed. Peptic ulcer disease is no longer believed to be primarily due to hyperacidity. More knowledge is being gained about *H. pylori*, a pathogen believed to be a causative factor in acid-peptic disease. NSAIDs and the breakdown in the mucosa of the stomach are also contributors.

- cimetidine (Tagamet)
- omeprazole (Prilosec)
- nizatidine (Axid)
- ranitidine (Zantac)
- famotidine (Pepcid)
- iansoprazole (Prevacid)
- esomeprazole (Nexium)

Nursing care and side effects:

- May cause headache, abdominal pain, nausea, vomiting, diarrhea.
- Should be taken before meals.

- **Digestants**–help promote digestion, replace or supplement naturally produced digestive juices. Stimulate production of digestive fluids, treatment for digestion for chronic pancreatitis, milk-intolerance (lactose sugar).
  - pancreatin (Creon, Donnazyme)
  - pancrelipase (Cotazym, Ku-Zyme, Pancrease, Zymase)
  - lactase enzyme (Lactaid)
  - trizyme and Lipase (Arco-Lase)

  Nursing care and side effects:

  - GI upset–do not give with antacids without doctor's permission.
  - Monitor resident's response to these supplements.

- **Antiflatulents**–reduce gas production by mildly stimulating motility or gathering bubbles of gas together so they can pass more easily. Reduces the feeling of gassiness and bloating, particularly in indigestion. Taken as a preventative or given following abdominal surgery to prevent postoperative bloating from immotility.
  - simethicone (Mylicon, Max Strength Phazyme, Maalox Anti-Gas, Mylanta Gas Relief)

  Nursing care and side effects:

  - Dietary modifications may be necessary once foods which produce gas are identified for the resident.
  - Encourage resident to chew food thoroughly.
  - Medication should be given after meals and at bedtime for best results.
  - Chewable tablets should be chewed thoroughly before swallowing.

- **Antiemetics**–suppress nausea and vomiting by acting on the control center in the brain. Used for motion sickness, nausea associated with chemotherapy, and nausea caused by drugs. Most are antihistamines and phenothiazines (tranquilizers).
  - dimenhydrinate (Dramamine)

- trimethobenzamide (Tigan)
- meclizine (Antivert)
- phenothiazines (Compazine, Thorazine, Phenergan)
- Marinol–derived from marijuana.

Nursing care and side effects:

- Most cause drowsiness, dizziness and postural hypotension (risk for falling).

➢ **Anticholinergics–**slow down peristalsis and intestinal motility by blocking the action of acetylcholine (the chemical that transmits nerve impulses at the synapse). Less acid is produced in the stomach; alkaloids. Used for ulcers, irritable bowel syndrome, spastic colon, and diarrhea.

- atropine sulfate and diphenoxylate HCL (Lomotil)
- atropine, scopolamine, phenobarbital (Donnatal)
- kaolin, pectin, atropine, belladonna (Donnagel)
- loperamide (Imodium)
- Banthine

Nursing care and side effects:

- Side effects vary according to the type of medication. Many are due to stimulation of the parasympathetic nervous system causing blurred vision, dilated pupils, dry mouth, heart palpitations, constipation, and urine retention.
- Observe for side effects.
- Replace fluids.
- Rest the intestines (limit solid foods).

➢ **Antispasmodics–**act on the smooth muscle in the intestines and stomach. May be combined with anticholinergics. As with most anticholinergics, use in the elderly may be contraindicated because of other disease processes (glaucoma, heart disease, bladder dysfunction, obstructive diseases).

- dicyclomine hydrochloride (Bentyl)
- atropine, scopolamine, phenobarbital (Donnatal)
- hyoscyamine (Levsin)

Nursing care and side effects:

- Side effects vary for each medication. Many are similar or the same as those for anticholinergics (dryness of mouth, heart palpitations, urine retention).
- Most are contraindicated and should not be given to residents who have glaucoma.

➢ **Diarrhea medications–**drugs used to relieve diarrhea; absorb fluids, decrease intestinal motility, shrink swollen tissue, or coat and soothe tissues.

- kaolin
- bismuth (Pepto-Bismol, Kaopectate)
- pectin
- kaolin and pectate combination (Kaopectate)
- camphorated opium tincture–paregoric

- loperamide (Imodium)

  Nursing care and side effects:
  - Some medications cause drowsiness. Many anti-diarrhea medications are also anticholinergics.
  - Risks associated with misuse.
  - Replace fluids and rest intestines. Non-drug means of treating diarrhea include limiting solid food intake. Fluids may be limited for short periods of time.
  - Eliminate foods that may stimulate diarrhea.
  - Observe for symptoms of dehydration and report to licensed nurse.

- **Emetics** - used to produce vomiting in cases of poisoning.
  - Syrup of ipecac

- **Cathartics** (laxatives and purgatives)–promote defecation through various actions. "Laxatives" are more slow-acting and gentle and may be used as a preparation for bowel and rectal exam, constipation, and stool softener. Purgatives are used to thoroughly clean intestinal tract in preparation for surgery or diagnostic testing. May also be used in treating constipation.
  - **Stimulant**–castor oil (Neoloid), senna (Senokot), bisacodyl (Dulcolax), phenolphthalein (Dialose Plus, Ex-lax). May cause cramping.
  - Saline cathartic–magnesium hydroxide (Milk of Magnesia "MOM") in large dose, Epsom salts.
  - Bulk former–draw fluids into feces. Increased volume stimulates peristalsis. Fortify with additional fluids during the day. Few side effects. Psyllium (Metamucil), psyllium without sugar (Konsyl).
  - Lubricant–lubricate the feces. May interfere with absorption of some vitamins. Not given with food or meals. Mineral oil.
  - Emollient–moisten and soften feces; non-irritating but take longer for action. Dioctyl calcium sulfosuccinate (Surfak), dioctyl sodium sulfosuccinate (Colace), docusate sodium (Colace), combination with mild laxative (Peri-colace).

    Nursing care and side effects:
    - Preventing constipation includes providing a diet that is high in fiber and fluids and regular exercise.
    - Dependency on laxatives or purgatives may alter the resident's bowel habits.
    - Changes in bowel habits can be an indication of more serious problems such as a bowel obstruction.
    - Residents should always be assured ready and safe access to toileting when cathartics are given. It is not reasonable to expect a resident to "wait" or "hold it." Some residents may have urgent need for emptying. Losing control of bowels is both dangerous for the resident and humiliating.
    - All nursing staff should be alerted if resident is given a cathartic medication. The resident's usual bowel habits should be identified.

- Observe for cramping, rectal bleeding, nausea, or vomiting; report to licensed nurse.

Unit 14. Drugs and Body Systems–Nervous System

Objectives

1. **Identify the two major divisions of the nervous system, and describe the major structures and functions of the nervous system.**
2. **Describe disorders of the nervous system including related medications and treatments, nursing care and side effects.**
3. **Describe the actions and give examples of CNS stimulants and depressants. Note the reasons that these drugs are often abused.**
4. **Be familiar with analgesic pain medications for mild and moderate pain, as well as common side effects.**
5. **Be thoroughly familiar with considerations regarding pain management in the elderly. Include the certified medication aide's response to reports of pain by residents, and how to achieve effective pain control.**
6. **Describe the actions and give examples of psychotropic drugs, nursing care and side effects. Understand the two types of depression. Understand issues surrounding the use of placebos in adult care facilities.**
7. **List medications which may result in transient or permanent drug-induced movement disorders.**

See Appendices
- Medication Classification
- Medications and the Elderly

See Performance Evaluation – Drug Card – Sample

Content

1. **Nervous system –** composed of the **Central Nervous System (CNS)–**brain and spinal cord; and the **Peripheral Nervous System–**connects the CNS to all parts of the body.
   - **Major structures**
     - **Neurons–**individual nerve cells–the primary functional unit. Initiate, receive, process messages and impulses.
     - **Synapse–**the junction between two neurons–a space between them, filled with transmission chemicals.
     - **Nerves–**bundles of neurons bound together by connective tissue.

   - **Major functions–**control bodily functions, conscious thought, sensory perceptions, motor functions, regulation of organs, blood vessels, other physical responses.
     - **Brain** is the control center for most of the vital bodily functions.
       - **Cerebrum** is the largest part of the brain. It is the center for conscious thought, speech, hearing, and sight. It is divided into two hemispheres – right and left. The right hemisphere controls activities on the left side of the body. The left hemisphere controls activities on the right side of the body.
       - **Cerebellum and Brain Stem** control unconscious brain activity, balance, muscle coordination, and gland stimulation.
     - **Spinal cord** contains the motor and sensory pathways. Provides a pathway for impulses to and from the brain.

   - **5 Senses**
     - Sight – eye
     - Hearing – ear
     - Taste – tongue
     - Smell – nose
     - Touch – nerve endings in skin and mucous membranes

   - **Autonomic nervous system (ANS)–**means "self-controlling." Controls involuntary bodily functions such as glands, smooth muscle tissues of the blood vessels and GI tract, and heart. Includes sympathetic and parasympathetic systems.
     - **Sympathetic–** stimulating these nerve fibers usually produces vasoconstriction, rise in blood pressure, goose-flesh, dilated pupils, reduced saliva, slowing of GI activities, and acceleration of the heart rate.
       - Under conditions of stress, it prepares the body to meet an emergency.
       - Called the "flight or fight" system.
     - **Parasympathetic –** stimulating these nerve fibers usually produces vasodilation, fall in blood pressure, contraction of the pupil, increased saliva and GI activities, and slowing of the heart rate.
       - Restores and conserves body energy and brings the body back to normal conditions.

2. **Disorders of the nervous system, especially associated with aging.** Almost any disease or injury may affect the nervous system in some manner.

- **Nervous system problems–**Use appropriate terms when describing general signs of nervous system problems.
  - **Pain–**person senses discomfort, distress or suffering due to sensory nerve stimulation.
  - **Tremor–**trembling, quivering or involuntary movement.
  - **Spasticity–**an involuntary, abnormal increase in muscle tone or contraction.
  - **Vertigo–**dizziness, person has a sensation of moving around in space or objects moving around the person.
  - **Dry mouth–**lack of saliva or reduced saliva. May be due to stimulation or over stimulation of the autonomic nervous system.
  - **Loss of muscle control**
  - **Paralysis–**inability to move.
  - **Convulsions–**involuntary muscular contraction and relaxation in an unsynchronized, irregular, contorted manner.
  - **Coma–**unconsciousness, deep stupor. Person cannot be aroused by external stimuli.
  - **Stupor–**being "in a daze."
  - **Insomnia–**inability to sleep.

- **Aging–**brings structural and functional changes.
  - Decrease in responses and reflexes.
  - Reduced muscle coordination.
  - Asthenia–weakness.
  - Decreased sensory reception.

- **Parkinson's Disease–**Cause is unknown. Degeneration of dopamine-producing neurons; some treatment is aimed at replacing dopamine.
  - Slow progressive destruction of the nerve center in the brain responsible for body movement.
  - Results in slow and decreased movement, muscular rigidity, resting tremor, and postural instability. Infrequent blinking, "mask-like" lack of facial expression.
  - Fourth most common neurodegenerative disease of the elderly.
  - No cure – patient fluctuates between good and poor functioning.

  Related medications and treatment:
  - **Anticholinergics (antihistamines, antidepressants)–**help in treating tremor, depression associated with disease.
    - benztropine (Cogentin)
    - trihexyphenidyl (Artane)
    - orphenadrine (Norflex, Norgesic Forte)
    - amitriptyline (Elavil, Etrafon Forte, Limbitrol, Triavil)
    - amantadine (Symmetrel)
    - Surgical procedures have been reported with varying success.

Nursing care and side effects:

- Dry mouth.
- Urinary retention.
- Blurred vision.
- Constipation.
- Confusion.
- Decreased sweating–impaired body temperature control.

○ **Dopaminergic–**crosses blood-brain barrier and replaces missing neurotransmitter, dopamine.

- carbidopa and/or levodopa (Larodopa, Dopar, Atamet, Sinemet)
- pramipexole (Mirapex)
- bromocriptine (Parlodel), pergolide (Permax)
- ropinirole (Requip)

Nursing care and side effects:

- Involuntary movements, dystonia.
- Postural/orthostatic hypotension.
- Hallucinations.
- Nausea.
- Confusion, psychosis.
- Side effects can be severe and require careful monitoring and documentation of behaviors, fluid intake, temperature.
- Safety is primary since either disease or medication can cause changes in motor responses. Resident may be mentally confused, unknowingly unsafe in ambulation.
- Maintain adequate hydration.
- Meals high in protein may interfere with drug absorption.
- Physicians will often specify specific dosage times to ensure that plasma drug levels are constant during the daytime. If a specific time is ordered, the drug must be administered within 30 minutes before or after the designated time. For example, drug is ordered for 10 AM. Drug must be administered between 9:30 AM and 10:30 AM.
- May administer with a low protein snack if necessary.

➢ **Myasthenia Gravis–**chemical deficiency at the synapse, causing episodic muscle fatigue, prolonged recovery in muscle activity. Lack of acetylcholine or excess of cholinesterase. May be caused by a significant immunological response.

Related medications and treatment:

○ **Antimyasthenics/anticholinesterase–**block or reduce available cholinesterase.

- neostigmine (Prostigmin)
- pyridostigmine (Mestinon, Regonol)

Nursing care and side effects:

- Diarrhea and abdominal cramps.
- Increased sweating and salivation.

- Nausea and vomiting.
- Difficult defecation and urination.
- Other medications may be combined to relieve side effects.
- Careful monitoring of drug therapies and observation of effects.

- **Corticosteroids–**Reduce the body's immune response, reducing inflamation.
  - prednisone (Deltasone)

  Nursing care and side effects:
  - Stomach upset, diarrhea.
  - Increased appetite.
  - Fluid retention.
  - Agitation.
  - May need to restrict sodium to control fluid retention.
  - Give with food to reduce gastrointestinal (GI) upset.
  - Very potent medication with numerous side effects and drug interactions; monitor resident's response.
- **Immunosuppressants–**reduces the natural immune response.
  - azathioprine (Imuran)

  Nursing care and side effects:
  - Increased risk for cancer.
  - Nausea and vomiting.
  - Changes in blood count especially white blood count (WBCs)
  - Increased risk for infections, infectious diseases (communicable diseases).
  - Skin rash.
  - Bleeding or bruising.
  - Giving the medication after meals or at bedtime may lessen GI upset.

- **Multiple Sclerosis (MS)–**the outer covering of the nerves (myelin sheath) is destroyed, disrupting impulse conduction.
  - Cause and cure are unknown.
  - May be intermittent with lengthy remissions.
  - Symptoms depend on which nerves are damaged; may include blurred vision, paralysis, speech problems, numbness, unsteady gait; progressive.
  - Treatment is aimed at relieving symptoms.

  Related medications and treatment:
  - **Beta-interferon** (Beta-Scron) – used to control patients treated at home.
  - **Immunosuppressive** drugs are used with relapsing MS.
    - azathioprine (Imuran)
    - cydophosphamide (Cytoxan)
  - **Adrenocorticotropic Hormone (ACTH)**
    - corticotropin (Acthar)
    - cosyntropin (Cortrosyn)
  - **Corticosteroids**

- glucocorticoid (Deltasone, Decadron, Dexasone, Medrol, Orasone, Solu-Medrol, Solu-Cortef)

- **Seizure disorders–**Seizures may range from staring spells to prolonged convulsive movements. Residents may exhibit one or more of the following:
  - Impaired consciousness
  - Excess or loss of muscle tone or movement
  - Disturbed behavior and/or mood
  - Involuntary urination and defecation

  Related medications and treatment:
  - **Anticonvulsants–**block nerve impulses that cause seizures.
    - phenytoin sodium (Dilantin)
    - primidone (Mysoline)
    - divalproex sodium(Depakote)
    - carbamazepine (Tegretol)
    - barbiturates, Phenobarbital (Nembutal)
    - benzodiazepines (Klonopin, Valium)

    Nursing care and side effects:
    - Minimize alcohol use.
    - Normal activities should be encouraged.
    - During a seizure, protect resident from injury. Do not attempt to 'protect' tongue as the resident or you could be injured. Loosen clothing, especially around the neck, place head on pillow. If possible, roll onto side to prevent aspiration of secretions or vomitus.
    - Usually drug treatment includes more than one type of medication. Be aware of toxic effects or cumulative effects.

- **Stroke–Cerebrovascular Accident (CVA):** interruption of the blood supply to the brain with tissue death in a portion of the brain.
  - **Thrombosis–**blood clot in a blood vessel in the brain or neck.
  - **Cerebral embolism–**fat globules, air, or blood clot from heart occludes circulation to a portion of the brain.
  - **Ischemia–**decreased blood flow to an area of the brain**.**
  - **Cerebral hemorrhage–**rupture of a cerebral blood vessel with bleeding into brain tissue causing pressure and death of tissue.
  - **A stroke can occur without warning.**
  - **Symptoms** are dependent on which area of the brain is damaged.
    - Damage on the right side of the brain will affect the left side of the body.
    - Damage on the left side of the brain will affect the right side of the body.
  - **Symptoms may include** one or more of the following:
    - Dizziness (vertigo)
    - Memory loss

- Headache
- Fainting
- Blurred vision
- Speech difficulty
- Loss of balance
- Partial paralysis

Related medication and treatment:

- **Anticoagulants** or drugs to prevent clot formation may be used depending on the type and extent of injury.
  - heparin (administered subcutaneously or intravenously by licensed nurse)
  - warfarin (Coumadin)
  - dipyridamole (Persatine)
  - ticlopidine hydrochloride (Ticlid)
  - aspirin

  Nursing care and side effects:
  - Bleeding, bruising.
  - Monitor for signs of excessive bleeding from minor injuries. Report bleeding gums, unusual bruising, black tarry stools and blood in the urine.
  - Prothrombin times (PT) or INR (International normalized ratio) will be conducted by a laboratory frequently until the correct dose is established. Laboratory tests will be conducted at least every three to four weeks as long as the resident is on an anticoagulant. Results of tests must be communicated to the resident's physician by the licensed nurse promptly. Physician will adjust the dose of blood-thinning medication based on the results of the laboratory tests.
  - Resident should avoid alcohol, salicylates (aspirin, numerous products over the counter which have ASA as base ingredient).
  - May cause orange color if urine is alkaline.
- **Anti-platelets** decrease platelet aggregation and inhibit clot formation. Common anti-platelet drugs are clopidogrel (Plavix), ticlopidine (Ticlid), dipyridamole (Persantine), and prasugrel (Effient).

- **Tumors–**abnormal growth in the brain. A tumor may originate in the brain or metastasize or migrate from another site in the body.

- **Infection and inflammation**
  - **Encephalitis** is an inflammation of the brain.
  - **Meningitis** is an inflammation of the lining of the brain and spinal cord.
  - **Neuritis** – inflammation of nerves
  - Treatment depends upon the causative organism. Some infections can only be treated symptomatically.
  - Antibiotics and non-steroidal anti-inflammatory drugs, immunosuppressants and anticonvulsants may be used. The blood brain

barrier prevents many medications from reaching the areas of the brain affected by an infection.

3. CNS Stimulants and Depressants

- **CNS Stimulants–**there are three general categories of CNS stimulants: cerebral stimulants, respiratory stimulants and antidepressants. These drugs are often abused due to the effect of euphoria, a false sense of well-being. Cerebral stimulants–"speed" up brain activity and other body functions. Clinical use is limited but may be used in depression, obesity, hyperactivity in ADD children, narcolepsy.
  - **Examples of CNS stimulants**
    - methylphenidate (Ritalin)
    - pemoline (Cylert)
    - caffeine (Vivarin, No Doz)
    - amphetamine (Dexedrine, Desoxyn)

    Nursing care and side effects:
    - Causes excitement, dizziness, dry mouth.
    - Restlessness.
    - Palpitation (irregular heart rhythm).
    - Give early in the day so the stimulating action does not interfere with sleep.

- **CNS Depressants–**depress or slow the functions of the CNS. Include sedatives, analgesics, tranquilizers, anticonvulsants**.**
  - **Oral Opioid analgesics for moderate to severe pain.**
    - codeine
    - oxycodone
    - morphine sulfate (MS)
    - hydromorphone (Dilaudid)
    - Dosing interval for the above drugs is every 4 hours or less.

4. Analgesics–pain medications. Antipyretic analgesics (acetaminophen, aspirin, ibuprofen, naproxen) also reduce fever. *(Instructors, be sure combinations are current.)*

- **Oral Combination Opioids for Moderate Pain**
  - Percocet (325 mg acetaminophen, 5 mg oxycodone hydrochloride)
  - Roxicet (325 mg acetaminophen, 5 mg oxycodone hydrochloride)
  - Tylenol #1,2,3,4 (300 mg acetaminophen, 7.5 (#1), 15 (#2), 30 (#3), 60 (#4) mg of codeine)
  - Vicodin (500 mg acetaminophen, 5 mg hydrocodone bitartrate)
  - Vicodin ES (750 mg acetaminophen, 7.5 mg hydrocodone bitartrate)
  - Darvocet N 50 (325 mg acetaminophen, 50 mg propoxyphene napsylate) **Not recommended for use in the elderly.**
  - Darvocet N 100 (650 mg acetaminophen, 100 mg propoxyphene napsylat) **Not recommended for use in the elderly.**
  - Darvon Compound (325 mg ASA, 32 mg propoxyphene

hydrochloride, 32.4 mg caffeine)
- Lortab (acetaminophen, hydrocodone bitartrate) Available in different doses; check dosages carefully.
- Wygesic (650 mg acetaminophen, 65 mg propoxyphene hydrochloride)
- tramadol (Ultram)
- oxycodone (OxyContin)
- hydromorphone (Dilaudid)
- methadone
- NOTE: Total daily dosage of acetaminophen should not exceed 4 Gm in 24 hours.

o **Non-Opioid Analgesic Medications for Mild or Moderate Pain**
- acetaminophen (Tylenol)
- aspirin (ASA)
- ibuprofen (Motrin, Nuprin)
- naproxen (Aleve)
- buffered aspirin (Ascriptin, Bufferin)
- nabumetone (Relafen)
- salsalate (Mono-Gesic, Disalcid)
- tolmetin (Tolectin)
- Note: acetaminophen is noneffective on inflammation

o **Common side effects of pain medications**
- Constipation.
- Drowsiness.
- Dizziness.
- Respiratory depression.
- May cause paradoxical excitement in the elderly.
- aspirin (ASA)–Give with food to reduce gastric upset. Can interfere with blood clotting. Residents receiving Coumadin must not take aspirin or any medications containing aspirin.
- acetaminophen (Tylenol)–liver damage.
- ibuprofen (Motrin)–kidney failure, GI bleeding.

5. **Considerations regarding pain management** in the elderly

➢ Almost all medications which relieve pain, cause constipation. The supervising licensed nurse should ensure that there is an order to treat constipation. Report to nurse if resident does not respond to treatment for constipation.

➢ **Believe the resident's report of pain**. (adapted from Kansas Certified Nurse Aide Curriculum Guidelines 90-Hours)

o Comfort (relief of pain) is necessary for the resident to experience quality of life**.**
- Calling pain the "fifth vital sign" reinforces the importance of observing for pain and acting on "abnormal" findings.
- Pain may cause the resident to restrict physical activity and social

interaction. Other consequences can be sleep deprivation, poor nutrition and depression.
- Pain must not be ignored or accepted as routine, but must be observed and reported.

- Pain is a subjective experience.
  - Pain is what the resident reports.
  - Pain is individual, what each person experiences. Two individuals with the same condition may experience and report different levels of pain.
  - The resident's previous experience and cultural background may influence if/how pain is reported and described.
  - Anxiety increases perception and intensity of pain.
- Use the resident's words to describe the location, intensity and duration of the pain, as well as what aggravates/alleviates the pain.
  - A pain rating scale may be used by the nurse to help the resident describe pain/pain relief. Facilities use a variety of pain scales, which may include a numeric 0-10 scale, facial recognition, and/or verbal descriptor. (Instructors should consult current nursing textbooks and websites for samples of these and other methods of pain recognition.)
  - Residents with cognitive deficits may not be able to verbalize the need for pain relief.
  - General methods of recognizing pain if resident is unable to describe pain include the following nonverbal clues:
    1. Has there been a change in resident's behavior?
    2. Does the resident's face show grimacing, frowning, tightness?
    3. Is the resident restless and/or irritable, shifting position, tense?
    4. Does the resident moan or cry out?
    5. What aggravates/alleviates the resident's expression of pain?
  - Report observations of pain to nurse.

➢ Controlling Pain:
- World Health Organization three step-analgesic ladder is the standard of practice for pain control
  1. **Mild Pain**–ASA, Tylenol, **n**on **s**teroidal **a**nti-**i**nflammatory **d**rug**s** (NSAIDS)
  2. **Moderate Pain**–weak opioids with or without non-opioids Tylenol #3
  3. **Severe Pain**–potent opioids, morphine with or without non-opioids
- Schedule doses on a regular basis (i.e., "by the clock") to maintain the level of drug that will help prevent recurrence of pain. Physician may order additional doses or medications for "break through" pain. Giving

medications before the previous dose has worn off gives best continued pain control.
- PRN – to be given when necessary after nurse assessment and instructions. (See unit 23, objective 5, for additional material.)
- Patches
  - ✓ Fentanyl patches are used for long-term or chronic pain requiring continuous pain relief that is not helped by less powerful pain medicines or less frequent dosing.
  - ✓ Lidoderm patches are used topically to help control neuropathic type pain such as the type of pain that is found with shingles.
- Ask and record resident's report of level of pain as outlined above.
- Use non-drug measures to promote comfort.
- Report to licensed nurse when a resident expresses fear of addiction or that pain medication must be "saved" until pain is severe.

➢ Determining the effectiveness of pain relieving measures
- Use the observations that identified pain as a means to find out if the pain was relieved.
- Report observations to nurse.
- Report to licensed nurse when resident reports that pain is not relieved by ordered medication(s).

➢ Definitions related to issues of addiction established by the American Pain Society:
- **Psychologic dependence.** A pattern of compulsive drug use characterized by continued craving for an opioid and the need to use the opioid for effects other than pain relief or for non medical reasons.
- **Physical dependence.** The occurrence of withdrawal symptoms when an opioid is suddenly stopped or an opioid antagonist is administered. Withdrawal symptoms usually can be controlled by gradually withdrawing the drug.
- **Tolerance**. The resident experiences a decrease in the analgesic effect of the drug. Tolerance to analgesia may be treated with increased doses of the drug. However, in most instances, disease progression, not tolerance to the drug is the primary reason for increasing drug dosage.
- **Addiction.** An acquired, chronic disease characterized by a persistent pattern of dysfunctional drug use (for non medical reasons) and aberrant (abnormal) behavior involving loss of control over use and continued use despite adverse physiologic, psychologic, and/or social consequences. A pattern of compulsive drug use characterized by a continued craving for the opioid and the need to use the opioid for effects other than pain relief. Fewer than 1% of patients develop addiction to a medically prescribed opioid.

6. Psychotropic drugs–given to treat mental conditions such as anxiety, depression, and psychosis. Also known as psychoactive or psychotherapeutic drugs.

➢ **Depression** - Two types: Major depression and dysthymia

- Major depression – substantial psychological, social, occupational disability
  - Person experiences considerable suffering.
  - Significant change in usual functioning.
  - May have recurrent suicidal thought.
  - 60% possibility of recurrence.
- Dysthymia – minimal psychological, social, occupational disability.
  - Occurs in early childhood to early adulthood.
  - At risk for developing major depression.
- See treatment options under psychotropic medications.

➢ **Antidepressants–**several different classes with different modes of action. The newer SSRI (selective serotonin reuptake inhibitors) are generally preferred for use in elderly because of a relatively low incidence of harmful effects. Some have a sedating effect while others result in a more stimulating therapeutic effect.

- **Monoamine Oxidase Inhibitors (MAOI)**
  - phenelzine (Nardil)
  - tranylcypromine (Parnate)
  - Emsam - patch
- **Tricyclic Antidepressants (TCA)–*** indicates that the medication is not recommended for use in the elderly.
  - amitriptyline (Elavil, Etrafon, Endep, Limbitrol, Triavil)*
  - imipramine (Tofranil)*
  - nortriptyline (Pamelor)
  - desipramine (Norpramin)
  - doxepin(Sinequin)
  - clomipramine (Anafranil)

  Note: *Elavil and Limbitrol may be the medication of choice for treating neurogenic pain (such as trigeminal neuralgia, peripheral neuropathy).*
- **Selective Serotonin Reuptake Inhibitors (SSRI)**
  - fluoxetine (Prozac)
  - paroxetine (Paxil)
  - sertraline (Zoloft)
  - trazadone (Desyrel)
  - escitalopram oxalate (Lexapro)
  - venlafaxine (Effexor) (Effexor XR)
  - (Prstiq) (Desvenlafaxine)
  - citalopram (Celexa)
  - fluvoxamine (Luvox)
- **Other:**
  - bupropion (Wellbutrin)–Combination of serotonin/norpramine/dopamine -may cause seizures, therefore is usually not the medication of first choice.
  - Combination of serotonin and norpramine – Cymbalta

  Nursing care and side effects:

For MAOIs

- Therapeutic effect may be noted in one week or may take up to three to four weeks.
- Postural hypotension can place resident at risk for falls.
- Can cause dangerous reactions with other psychotherapeutic medications.
- Monitor for constipation.
- Must avoid pickled fish or meats, dairy products (cheese, yogurt), alcohol, non-alcohol beer or wine, yeast extracts and coffee.
- Usually selected when other types of therapy have failed.

For TCAs

- Sedating effect. Administer at bedtime.
- Administer just before or after meal to reduce GI irritation.
- Monitor for blood pressure and pulse rate in residents with preexisting cardiovascular disease. Report a rise or fall in the systolic pressure or sudden change in pulse rate to supervising nurse.
- Monitor for constipation.
- Monitor weight. May have an increase in appetite.
- Confusion, hallucinations, anxiety, agitation, insomnia.

For SSRIs

- Some of these medications have a prolonged half-life which means it may be days or weeks before all of the medication has been metabolized and excreted from the body.
- Should never be given with MAOIs due to serious, sometimes fatal interactions.
- Can be either stimulating or sedating, depending on product. Monitor for restlessness and anxiety.
- May increase or decrease appetite.
- Nausea, diarrhea/loose stools, dyspepsia
- Tremor
- Sexual dysfunction
- Dry mouth

➢ **Tranquilizers–Now referred to as Anti-anxiety medications:** act as depressants to the central nervous system and are used to calm, induce sleep, or decrease anxiety.

Sedative/hypnotic medications ("minor tranquilizers, the more common tranquilizers")- must be used with **caution in the elderly**.

- **Barbiturates** cause adverse effects in the elderly. Use is generally limited to controlling seizures. Can depress respirations, cause paradoxical excitation in elderly and "hang-over" effect.
  - phenobarbital
- **Hypnotics** produce sleep but interfere with normal sleep cycles. Should only be used for short-term.

- flurazepam (Dalmane)
- temazepam (Restoril)
- zolpidem tartrate (Ambien)
  Hypnotics should be used for no longer than two weeks. Non-medication methods to assist the resident to sleep should be initiated.

- **Antihistamines** can induce drowsiness and sleep, but have anticholinergic effects causing constipation, dry mouth, orthostatic hypotension, difficulty voiding and confusion in elderly. The use of Benadryl and other antihistamines for sleep is **strongly discouraged** in the literature.
  - **Long-Acting Benzodiazepines** - Management of anxiety disorders and for short term relief of anxiety symptoms.
  - diazepam (Valium)
    1. Medication of choice for status epilepticus.
    2. Long half life. Therefore can have cumulative effect in elders.
  - chlordiazepoxide (Librium)
  - clorazepate (Tranxene)
  - clonazepam (Klonopin)
  - quazepam (Doral)
  - halazepam (Paxipam)

  Nursing care and side effects:
  - Side effects of the above medications include drowsiness, ataxia, confusion, constipation, urinary retention and hypotension.
  - Avoid the use of caffeine and alcohol.
  - Habituation may occur. Dose reduction must be performed gradually over time.
  - Not recommended for use in elders.
- **Short-Acting Benzodiazepines** - Management of anxiety disorders and for short term relief of symptoms of anxiety.
  - alprazolam (Xanax)
  - lorazepam (Ativan)
  - oxazepam (Serax)
  - midazolam (Versed)

  Nursing care and side effects:
  - The half life of the above medications is less than 24 hours. Therefore, there is less cumulative effect.
  - Side effects include drowsiness and sedation which usually disappear with continued use or a reduced dosage.
  - May experience hypotension, and blurred vision.
  - Avoid the use of caffeine and alcohol.
- **Hydroxyzine HCL–**antipruritic (relieves itching), antihistamine, antiemetic and used to treat anxiety, tension, and psychomotor agitation.
  - Atarax, Vistaril

  Nursing care and side effects:
  - Watch resident for drowsiness.

- Dry mouth is a significant problem. Avoid abrasion of the gums. Provide good oral care.

- **Neuroleptics** (referred to as "major tranquilizers")–most commonly prescribed as antipsychotics; used to treat psychotic disorders and manage non psychotic behavior symptoms of persons with dementia.
  - Psychosis – defined as:
    - Impaired ability to recognize reality
    - Demonstration of bizarre behaviors
    - Inability to deal with life demands
    - Characterized by hallucinations and/or delusions
    - Schizophrenia has many types – is a mental illness in which psychosis is the classic feature.
  - thioridazine HCL (Mellaril)
  - chlorpromazine (Thorazine)
  - haloperidol (Haldol)
  - mesoridazine (Serentil)
  - risperidone (Risperdal)
  - clozapine (Clozaril)
  - loxapine (Loxitane)
  - trifluoperazine (Stelazine)
  - fluphenazine (Prolixin)
  - quetiapine (Seroquel)
  - olanzapine (Zyprexa)

  Nursing care and side effects:
    - Constipation.
    - Drowsiness.
    - Dizziness.
    - Blurred vision.
    - Orthostatic hypotension.
    - "Extrapramidal symptoms"–may be irreversible restlessness, muscle spasms, symptoms like Parkinson's disease. May treat by giving Cogentin or other antiparkinsonian medication with psychiatric medication.
    - Must not be combined with alcohol–potentiates sedation of tranquilizer.
    - High doses of major tranquilizers may cause tardive dyskinesia. Symptoms include abnormal movements of the extremities, in and out movement of tongue, sucking and smacking lips, lateral jaw movements.
    - Reduced awareness of thirst.
    - Abrupt withdrawal may cause seizures.
    - Monitor for postural hypotension by taking blood pressure just before each dose of the medication with the resident standing, and check with supervising licensed nurse if systolic pressure is less than 90.

- **Anti manic psychotherapeutic –**also known as mood stabilizers: control and prevent manic (hyper-activity) episodes due to bipolar disorders.
  - lithium carbonate (Lithane, Eskalith, Lithobid, Lithonate)
  - aripiprazole (Abilify)
  - quetiapine (Seroquel)
  - risperidone (Risperdal)
  - valproic acid (Depakote)
  - lamotrigine (Lamictal)

    Nursing care and side effects:
    - Fluid and sodium intake must be adequate.
    - Unusual fluid or salt loss from body may result in toxicity. Observe for and report profuse sweating, diarrhea or vomiting.
    - Toxicity symptoms include nausea, tremor, muscle weakness.

- **Placebos–a tablet containing presumably inert ingredients rather than active medication ingredient–**also are called "sugar" pills, though placebos aren't strictly composed of sugar. Placebos may or may not be effective. There is some research that suggests that they enhance the effects of the body's own biochemicals called endorphins. Endorphins work to reduce pain and produce a sense of well-being. Placebos are used only in certain circumstances, such as for research, and must only be given with the resident's knowledge and approval.

7. Medication-induced Movement Disorders–this is the result of widespread use of phenothiazine, thioxanthene, and butyrophenone antipsychotic and antiemetic medications. All of these medications block CNS dopamine receptors, which may result in medication-related syndromes mimicking spontaneously occurring neurological disorders. Extrapyramidal (involuntary movements or jerking of limbs or facial muscles) effects of newer antipsychotics may still occur.

- **Caution should always be exercised in the administration of these medications.**
  - phenothiazine (Mellaril, Compazine, Prolixin, Stelazine, thorazine)
  - thioxanthene (Navane, Taractan)
  - haloperidol (Haldol)

Unit 15. Drugs and Body Systems--Drugs Affecting the Special Senses: Eye

Objectives

1. **Identify major structures and functions of the eye.**
2. **Describe the mechanisms of sight.**
3. **Describe the effects of aging on the structures of vision.**
4. **Identify general symptoms of eye disorders.**
5. **Identify terms and diseases, related medications and nursing care and side effects of major disorders of the eye. Note actions, uses and names for eye lubricants.**
6. **List terminology used to identify how to administer eye medications. Be familiar with general nursing care and special considerations regarding eye medications.**
7. **Describe the proper procedures for administering eye drops and ointments.**

See Appendices:
- Administration of Eye Medications
- Medication Classification

See Performance Evaluation – Drug Card – Sample

Content

1. Visual Senses (Eye)–Major Structures and Functions

- **Eyes–**housed in a bony socket of the face.
- **Eyelids–**cover the outer surface.
- **Conjunctiva–**mucous membrane lining the inner surface of the eyelids and the anterior portion of the eyeball.
- **Lashes–**whisk away dirt and dust, shade eye from light.
- **Lacrimal glands** (inside corner of eyes)–produce tears.
- **Nasolacrimal duct–**drains the fluid away from the surface of the eye down through the nose.
- **Eye structure–**three layers
  - **Sclera and cornea–**outer layer–white of the eye.
    - **Cornea–**clear surface of the anterior eye, covers the iris and lens. Cornea is the front portion of the sclera. Protects the delicate structures (retina).
  - **Choroid, ciliary body, and iris–**middle layer–highly vascular, nourish the eye.
    - **Iris–**pigmented circular muscle which adapts the eye to light and gives color to the eye. Contracts over the opening to the lens and posterior chamber, reducing the amount of light. Dilates to allow more light.
    - **Pupil–**opening in the center of the iris regulating the light to the lens and the retina.
    - **Lens–**clear disk-shaped structure behind the iris; elasticity allows it to change shape, focus image short and long distance.
  - **Retina–**inner layer–sensitive to light and contains the nerve endings which sense light and dark (rods) and colors (cones).
    - **Rods and cones–**come together and exit the eye at the back and form the optic nerve which connects to the brain.
    - **Optic nerves–**carry the "sight" messages back to the part of the brain which interprets it.

2. Mechanisms of sight

- Light entering the eye passes through the cornea then the pupillary opening of the iris, on through the lens and the vitreous body to the retina.
- Refraction is accomplished through the aqueous humor, lens, and vitreous body.
- Light is focused on the retina through changes in the curvature of the lens, because of the elasticity and contractility of the ciliary muscles.

- Rods and cones are stimulated by the light (sensory receptors). Cones are concerned with color vision; rods are concerned with vision in dim light.

- Sensory impulses are conveyed to the brain through the optic nerve where, in the visual area of the cerebral cortex of the occipital lobe, visual sensations are registered.

- **Shape –maintained by two major fluid-filled compartments.**
  - Anterior or ocular chamber–in front of the lens. It is divided by the iris into the anterior and posterior chamber and is filled with watery **aqueous humor**. Aqueous humor bathes and nourishes anterior chamber of eye.
  - Posterior chamber–behind the lens–filled with jelly-like **vitreous humor**. Vitreous humor helps maintain intraocular pressure to prevent eyeball from collapsing.

3. Possible Effects of aging on the structures of vision

- Presbyopia–farsightedness that normally occurs with aging, usually after age 40. Near-focus capability is reduced due to loss of lens elasticity.

- Sclera yellows

- Conjunctiva has formation of small yellow spots

- Cornea has yellow ring form around it

- Blurred vision

- Decreased tear production

- Decreased pupil size and slower dilatation of exposure to light

- Decreased color perception

- Vitreous humor has floaters

- Cataracts form over lens

4. **Eye disorders–General symptoms**

- Blurred vision

- Loss of sight

- Pain

- Bloodshot eyes

- Abnormally dilated pupils

- Nausea and vomiting

5. **Terms and diseases**
   - **Blepharitis–**inflammation of the edges of the eyelids, involving the hair follicles and glands of the lids.

   - **Cataracts**-clouds of the eye's natural lens.

   - **Conjunctivitis–**infections of the conjunctiva–membrane of the eye; may also be referenced as "pink eye." Contagious.
     - Alamast is a medication used for allergic conjunctivitis.

   - **Diplopia–**double vision–can also mean a CNS disorder.

   - **Dry eyes–**individuals, as they grow older, may have insufficient tear production.

   - **Floaters–**cells in the form of specks that float across the visual field.

   - **Glaucoma–**fluid that is made in the anterior cavity of the eye does not drain fast enough, so it builds up, causing the pressure in the eye to become too high. May cause blindness. Intraocular pressure (pressure within the eye) builds. Surgical, medical and laser therapies may be used. **Types:**
     - Chronic open-angle (high-pressure or normal pressure).
     - Pupillary block (acute, sub-acute, chronic angle-closure or combined).
     - Developmental (congenital, juvenile, others).
     - Associated with other ocular diseases.
     - Associated with elevated episcleral venous pressure.
     - Associated with inflammation and trauma.
     - Post intraocular surgery.

   - **Macular degeneration**-progressive loss of centered vision.

   - **Photophobia–**an extreme sensitivity to light.

   - **Sty–**inflammation of a sebaceous gland of the eyelid. Hordeolum.

     Related medications and treatments:
     - **Antibiotics–**decrease bacteria growth in the eye, reduce inflammation. May be used for specific infection or as a preventative after cataract surgery. Can cause irritation or allergic response.
       - Neosporin Ophthalmic (combination of three antibiotics)
       - Polymyxin B
       - bacitracin
       - neomycin
       - tobramycin

- **Steroids–**reduce inflammation, reduce body's immune response.
  - Neo-Cortef
  - Maxitrol
  - Poly-Pred
  - Tobradex
- **Sulfonamides/combinations–**bacteriostatic, interfere with functioning of enzyme systems necessary for bacteria to grow and reproduce.
  - sodium sulfacetamide (Sodium Sulamyd)
- **Glaucoma agents– Identify measures which help ensure safety for residents with glaucoma. Identify names and actions of medications used to treat glaucoma.**

  Miotics constrict the pupil to open drainage channels and promote decreased fluid in anterior chamber and decrease pressure. May cause eye pain, itching, blurring, dryness of the eye area, bitter taste, head ache.
  - pilocarpine (IsoptoCarpine, Piloptic, Pilostat)

  Mydriatics dilate the pupil. May cause blurred vision, headache, and light-sensitivity.
  - atropine.
  - homatropine (Isopto Homatropine)
  - scopolamine (Isopto-Hyoscine)

  Carbonic anhydrase inhibitors slow the production of aqueous humor. May raise blood sugar for those with diabetes. May increase risk of acidosis or trouble breathing for those with emphysema.
  - acetazolamide (Diamox)

  Beta-adrenergic receptor blocking agent reduces intraocular pressure.
  - timolol (Timoptic)
  - betaxolol (Betoptic)

  Additional anti-glycoma agent:
  - latanoporst (Xalatan)

  Nursing care and side effects:
  - Provide adequate lighting, especially at night.
  - **Pain in the eye may be a sign of increasing pressure. Report this to the licensed nurse immediately**.
- **Lubricating agents–**provide moisture to the eye, similar to tears. Used temporarily after cataract surgery, with contact lenses and with artificial eyes.
  - polymeric dextran, hydroxypropyl methylcellulose (Tears Naturale II)

6. **Terminology–**used to identify how to administer eye medication (based on Latin)
   - O.D.–right eye (oculus dexter)
   - O.S.–left eye (oculus sinister)
   - O.U.–both eyes (oculus unitas)

Nursing care for eye medications:

- May be applied as ointment or drops
- Proper application is critical for effectiveness.
- Watch for increased symptoms, irritation, other signs of possible drug allergy.

Special considerations:

- Mucous membranes of the eye are the most sensitive in the body.
- Absorption of eye medications is rapid.
- Ophthalmic ointments must be in contact with the eye for a longer time than drops. It can cause blurred vision for awhile after application.
- Some eye drops cause stinging and discomfort to the eye. Warn the resident if this may occur.
- Medications that dilate the pupil cause sensitivity to light. Tinted or sunglasses may be needed until effect wears off.
- Eye medications must say “Sterile for opthalmic use.”

Unit 16. Drugs and Body Systems–Drugs Affecting the Special Senses: Ear

Objectives

1. **Identify major structures and functions of the ear.**
2. **Describe the mechanisms of hearing.**
3. **Describe the effects of aging on auditory structures and functions.**
4. **Identify general symptoms of disorders of the ear for which medications are given.**
5. **Identify terms and diseases, related medications and nursing care and side effects of major disorders of the ear.**
6. **Be familiar with general considerations regarding ear medications.**
7. **Describe the methods/steps/proper procedure for correctly administering ear medication. See appendix.**

See Appendices

- Medication Classification

See Clinical Performance Evaluations

- Drug Card – Sample
- Ear Medications

Content

4. Auditory or Hearing Sense (Ear) – Major Structures and Functions

- **External ear**–collects and directs sound waves toward ear drum.
  - **auricle, or pinna** that projects from the head
  - **external auditory canal**–leads from the outside to the ear drum
  - **cerumen**–produced by glands which coat the canal (ear wax)

- **Ear drum** or tympanic membrane–connects the external ear canal to the middle ear.
  - vibrations of the membrane send sound waves to the inner ear

- **Middle ear**–transfer of sound to the inner ear through specialized bony structures.
  - **hammer, anvil and stirrup** vibrate and transfer the sound to the inner ear.
  - **Eustachian tube**–connects the nasopharynx and the middle ear. Equalizes air pressure.

- **Inner ear** or labyrinth–boney and membranous structures transmit sounds to the brain through the auditory nerve.
  - **specialized hearing cells**.
  - **vestibule and semicircular canals**–sense movement in three planes, balance, position, equilibrium.
  - **cochlea**–sensory receptor for hearing.

- **Auditory (or acoustic) nerve**–transmits the sound impulses to the brain.

5. Mechanisms of hearing

- Sound is conducted by air vibrations collected and directed through the structures of the ear.

- Vibrations of the ear drum transfer sound to boney and membranous structures of the inner ear.

- Sensory cells transfer to impulses directed through the auditory nerve to the brain.

- Perception of sound is interpreted by the brain.

3. Possible effects of aging on the auditory structures

- **Presbycusis**–diminished ability to distinguish sounds. This lessening of hearing may be affected by heredity or environmental factors. Persistent exposure to loud noises can damage organs of hearing. Usually the higher pitched sounds are lost first which impacts the resident's ability to hear speech. Lower pitches may diminish over time. Other factors may include underlying disease processes, accidents, reduced flexibility of the boney structures, reduced hydration producing drier cerumen and membranes.

- External ear – increased cerumen, increased ear hair, drier cerumen.

- Middle ear – conductive hearing loss.

- Inner ear – decreased ability to hear high pitched sounds, tinnitus, alteration in balance.

4. Ear disorders – General Symptoms

- Tinnitus–perception of sound in the absence of an acoustic stimulation. Associated with numerous causes including side effects of medications.

- Earache–pain located in the general area of the ear due to inflammation or infection.

- Headache–May be caused by nerve inflammation, localized infection and inflammation of the ears.

- Difficulty hearing–may be due to mechanical, neurological, or inflammation.

- Vertigo–perception of rotary movement associated with imbalance and dizziness.

- Drainage–may indicate severe infection, ruptured ear drum, or other disease process.

- Swelling–usually can be distinguished by visually comparing ears. Painful when touched–external ear or surrounding area, especially in front of or behind ear.

- Congestion–because the Eustachian tube connects to the nasal passages, congestion may be communicated to the ear and result in infection and inflammation of the ear.

Terms and diseases

- **Dermatitis–**inflammation of the skin of the outer ear or external ear canal.
  - Eczema–characterized by itching, redness, peeling or scaly skin. Discharge may be present.
  - Frequently recurs.
  - May be associated with middle ear infection.

- **Obstruction**–accumulated earwax because of excess production or dry consistency associated with aging.
  - Insects and foreign objects may be inserted in the ear, causing intense annoyance, itching, pain, and impairing hearing.
  - Tumors may arise which obstruct the ear canal.
  - Cysts or boils.

- **Otitis externa, or external otitis**
  - Infection of the external ear canal.
  - "Swimmer's ear."

- Associated with swimming in contaminated water or persistent retention of water in the ear (creating environment for bacterial or fungal growth).

➢ **Otitis media**
  - Bacterial or viral infection usually associated with an upper respiratory infection.
  - Pain is usually the primary sign/symptom.
  - Hearing loss may occur.
  - Fever, nausea and vomiting may occur.
  - Ear may drain fluids that are bloody or purulent especially if the eardrum perforates spontaneously. This may relieve pain but creates complications.
  - Serious complications can occur including mastoiditis, facial paralysis, hearing loss, abscess, meningitis, and brain abscess.

Related medications and treatments:
  - **Antibiotics–**used to reduce bacterial growth and inflammation. May be given orally. Topical antibiotic solutions alone may not be effective when inflammation, wax, or infection debris is in the ear canal. Topical solutions are ineffective for middle-ear infections.
    - penicillin V, amoxicillin, erythromycin, sulfonamides, cephalosporins.

  - **Anti-inflammatory–**used to reduce swelling, inflammation.
    - hydrocortisone.
    - Anti-inflammatory medications are not used for fungal infections. Nystatin is used for fungal infections.

  - **Combination therapies–**medications that combine actions of more than one type of drug.
    - polymyxin, neomycin and hydrocortisone, acetic acid and hydrocortisone.
    - Chloromycetin otic.
    - ciprofloxacin, dexamethasone (Ciprodex).

  - **Vasoconstrictive–**used to open the eustachian tube.
    - ephedrine, pseudoephedrine.

  - **Antihistamines–**reduces allergic response.

  - **Analgesics–**reduce pain, provide comfort. Ineffective as a treatment of the source of the pain and should never be used alone in persistent ear pain. Symptoms of serious complications may be covered up by analgesics.
    - topical antipyrine, benzocaine, glycerin (Auralgan), Tylenol,

Tylenol with Codeine.

- **Wax-softeners**–help keep ear wax from building up. Should not be used when there are signs of infection.
  - triethanolamine (Cerumenex).
  - carbamide peroxide (Debrox)

6. General considerations in administering ear medication

- Medications may be in a variety of forms. It is important to have the correct form of the medication as ordered.

- Topical medications may be ointments for outer ear or drops instilled in the ear.

- Certain drugs cause ototoxicity
  - Aspirin
  - loop diuretics
  - quinidine
  - antineoplastics
  - aminoglycosides

Unit 17. Drugs and Body Systems –Musculoskeletal System

Objectives

1. **Identify the major structures, functions of the musculoskeletal system.**
2. **Identify the major disorders that affect the musculoskeletal system, especially associated with aging.**
3. **Discuss malfunctions of bone marrow and their effects on the blood.**
4. **Name related medications, their actions, uses, side effects and implications in treatment of musculoskeletal disorders.**
5. **Describe the usual care of residents with musculoskeletal disorders, especially as it relates to medication administration.**

See Appendices

- Medication Classification
- Medications and the Elderly

See Performance Evaluation – Drug Card – Sample

Content

1. **Musculoskeletal system**–composed of **Muscular and Skeletal Systems – Major Structures and Functions**
   - **Major structures**
     - **Bones**–form the body's supporting and protective framework. Blood cells are produced in bones. Muscles are supported by bones. Fat and calcium are stored in bones. Vulnerable organs are protected by bones (such as the heart by the rib cage).
       - Bones are made of organic material–collagen, and inorganic material–calcium and phosphate. Bones are hard because the spaces between bone cells are filled with calcium.
       - Skeleton has 206 bones.
     - **Marrow**–the soft, center part of bone. Red bone marrow produces red blood cells, white blood cells and platelets. Yellow marrow is storage for fat.
     - **Cartilage**–a softer tissue covering parts of some bones, lining joints, and giving shape to ears and nose.
     - **Joints**–where bones connect to each other.
     - **Ligaments**–bands of connective tissue which hold bones together and facilitate or limit motion.
     - **Muscles**–give the body movement, protection, and function. Most of the organs are composed in part by muscle. There are three types, described primarily by their functional location and structure:
       - **skeletal**–work together with bones to allow voluntary movement;
       - **smooth**–line the GI tract, urinary tract and blood vessels;
       - **cardiac**–specialized muscle of the heart.
     - **Tendons**–attach muscles to the bones.
     - **Muscle tone**–muscles that are well exercised are always a bit contracted and ready for action.

   - **Major functions**–provide movement and support the other systems of the body in performing functions such as digestion, movement, and respiration.

2. **Disorders of the musculoskeletal system associated with aging**
   - **Atrophy**–muscles that get little or no exercise decrease in size and strength.

   - **Contracture**–a shortening of the muscle or ligament due to lack of movement. Permanent disfigurement and loss of function.

   - **Physical injury**
     - **Strains**–when muscles and tendons are stretched beyond normal capacity.
     - **Sprain**–sudden, forceful stress or tearing of a ligament.
     - **Fracture**–break in the bone.

   - **Osteomyelitis**–infection inside a bone.
     - Risk factors may include diabetes, cancer, hemodialysis, radiotherapy or

other serious infection process which may enter the blood system.
- IV antibiotics usually are required initially and orally for a prolonged period of time.
- Surgical debridement may be necessary to promote healing.

- **Osteoporosis**–a generalized, progressive decrease in bone density
  - Net rate of bone resorption is greater than the rate of bone formation.
  - Decrease in estrogen and testosterone affect the rate of bone resorption.
  - Loss of bone mass, bones become porous.
  - Porous bones do not offer enough support and may result in bone fracture. Fracture may occur spontaneously.

- **Bursitis, fibrositis, synovitis**–inflammations of:
  - Bursa–the small fluid-filled pouches in the joints to provide cushioning and lubrication.
  - Fibrositis–inflamed muscles, ligaments, tendons fascia–also known as tendonitis.
  - Synovial capsule–the capsule around the joint.
  - All cause pain, tenderness, stiffness, swelling.
  - Due to repeated physical stress on joints or muscles.

- **Gout, gouty arthritis**–inflammation of the joints due to an excess of uric acid in the bloodstream. **(NOTE: Be able to explain the difference between gout, osteoarthritis, and rheumatoid arthritis.)**
  - Uric acid crystals deposit in the cartilage around the joints.
  - Causes joints to be red, hot, swollen, painful.
  - Can flare up with heavy alcohol drinking, prolonged fasting, trauma, surgery or infection.

- **Osteoarthritis**, also known as degenerative joint disease, also known as **"D.J.D."** Pain occurs with movement.
  - Degenerative disease that causes destruction of the weight-bearing joints.
  - Cartilage in joints wears away.
  - Pain is worse in the evening after a day's activity. Stiffness most apparent in early morning. Improve with movement.
  - Bones rub against each other, thicken and become knobby.
  - Primarily affects older adults or is associated with sports injuries.

- **Rheumatoid arthritis**–a chronic, systemic disease affecting more than just the joints. Cause is unknown. There is no specific cure or treatment.
  - Inflammation of the cartilage in the synovial capsule.
  - More common in women than in men.
  - Affects all ages.
  - Affects mainly the small joints, fingers, wrists, etc.
  - Pain and stiffness is worse in the morning and gets better as the day goes on.
  - Also causes fever, anorexia, weight loss, weakness, tiring, aching muscles.
  - Joints are red and warm to touch.

- Cartilage is destroyed, bones fuse, movement is lost, joints become deformed.
- Characterized by periods of exacerbations and remissions.
- Affects joints bilaterally.

Rheumatoid arthritis medications

- hydroxychloroquine (Plaquenil)
- methotrexate
- gold

- **Myalgia**–muscle pain
  - Overexertion, inflammations, sprains, arthritis, crippling conditions like Parkinson's, paraplegia, cerebral palsy, spinal cord injury.
  - Treatment might include:
    - RICE = Rest, Ice, Compression, Elevation
    - …followed by moist heat, rest, physical therapy.

- **Myositis -** inflammation of muscles

3. Bone marrow disorders

- Normal WBC = 5000 to 9000.

- Aplastic anemia–bone marrow fails to produce RBCs.

- Leukemia–marrow produces too many, ineffective WBCs.

- Bone marrow depression–a serious side effect of some medications–marrow may stop producing RBCs, WBCs and platelets.
  - Decreased RBCs = anemia.
  - Decreased WBCs = infections.
  - Decreased platelets = bleeding.

4. Related medications and treatment:

- **Supplements–**vitamin, mineral, hormonal preparations may be added to promote healthy bones**.**
  - calcium, magnesium, vitamin A, D, E
  - estrogen
  - salmon calcitonin
  - sodium fluoride

- **Bone resorption inhibitor–**decrease the removal of bone by absorption, thus maintaining bone density.
  - alendronate (Fosamax)
  - risedronate (Actonel)
  - Boniva – given once a month
  - calcitonin – given by injection or nasal spray

- **Non-aspirin pain relievers–**provide relief of pain with little side effects. Are most helpful in reducing pain in order to proceed with other therapeutic

interventions to retain mobility of joints.
- acetaminophen (Tylenol)

- **Anti-inflammatories, NSAIDs (**non-steroidal anti-inflammatory drugs) relieve swelling, pain, stiffness associated with inflammation.
  - ibuprofen (Motrin, Nuprin)
  - ASA (aspirin)
  - indomethacin (Indocin)
  - naproxen (Naprosyn)
  - meloxicam (Mobic)
  - celecoxib (Celebrex)

- **Anti-gout, antihyperuricemics** (reducing monosodium urate–MSU crystals).
  - probenecid (Benemid)
  - colichicine (or combination of Probenecid and Colichicine)
  - allopurinol (Zyloprim)
  - Patients with gout should avoid foods high in purine.

- **Corticosteroids–**act on the immune response. Decrease inflammation by suppressing immune response.
  - prednisone (Deltasone)

- **Antibiotics**–treat inflammatory response due to infection (particularly osteomyelitis).
  - nafcillin or oxacillin
  - aminoglycoside

- **Muscle relaxants –** Antispasmotics. CNS depressant that relieves pain and stiffness in muscles from orthopedic disorders and injuries**.**
  - chlorzoxazone (Parafon Forte–muscle relaxant)
  - methocarbamol (Robaxin)
  - cyclobenzaprine (Flexeril)
  - dantrolene (Dantrium)
  - baclofen (Lioresal)
  - carisoprodol (Soma)

- **Anti-neoplastic or anti-cancer medications**–may be used in malignancies affecting the bones.
  - methotrexate (Imuran)
  - penicillamine (Depen)

- **Non pharmacological** treatment for musculoskeletal injuries includes heat, cold, ROM.

5. Nursing care and side effects:

- Adequate weight-bearing exercise, walking, to *prevent* **osteoporosis.**

- Long-acting Benzodiazepines increase risk of falls.

- Reduced caffeine, alcohol, smoking.

- Administer medications exactly as directed. In order to be effective some medications must be taken on empty stomach, others will cause gastric distress and must be taken with food or after eating. Resident's tolerance for and adherence to medication regimen will be affected by how the medication makes him/her feel. Example: Fosamax must be taken on an empty stomach, alone (no other medications given at the same time), and requires the resident to be upright, not lying down, for 30 minutes after taking the medication.

- Adequate fluid intake (especially for gout treatment).

- Many medications cause stomach irritation, be sure to follow instructions.

- Salicylates (ASA) can cause tinnitus, prolong blood clotting time, interfere with blood thinning medication.

- Cortisone can cause increased appetite, fluid retention, psychological or emotional changes.

- Be mindful of any medication that can cause dizziness, instability when a resident is diagnosed as having osteoporosis.

- Provide comfort, assistive devices to reduce strain on muscles and bones, give medications, especially for pain, on time.

- Keep proper body alignment when in bed, sitting or walking. Remind resident and assist as needed.

- Use empathy and use good communication.

- Reassure resident to help him/her understand that you have taken steps to consider his/her needs, such as positioning, comfort items, pain medications, etc. before moving.

Unit 18. Drugs and Body Systems – Endocrine System

Objectives

1. **Identify the major structures, their functions, and the regulatory mechanisms of the endocrine system.**
2. **Identify the major disorders that affect the endocrine system. Tell why disorders may be prefixed with "hypo" or "hyper". Give examples of disorders of the endocrine system named in this manner.**
3. **Name related medications, their actions, uses and implications in the treatment of endocrine disorders. Identify complementary/alternative therapies.**
4. **Describe nursing care and implications with regard to therapies and medications used to treat endocrine system disorders.**
5. **Facts about Diabetic Acidosis and Hypoglycemia**
6. **Throughout this unit, using information from the unit content and the appendices, give particular attention to diabetes and related therapies and treatments:**
    - **A. Describe how the body malfunctions in diabetes and what changes occur in the urine of an untreated diabetic.**
    - **B. State what factors influence the insulin needs of a resident who has diabetes.**
    - **C. Identify diet, activity and medication as treatments of diabetes.**
    - **D. List the kinds of insulin available for treatment of diabetes mellitus.**
    - **E. Recognize the sympoms of hyperglycemia and hypoglycemia and explain how they are treated.**
    - **F. Give examples of oral hypoglycemics used for diabetes treatment and explain how they work.**
    - **G. State names, action and side effects of oral hypoglycemia agents.**
    - **H. Explain why residents with diabetes must have frequent blood tests.**

Unit 22 provides detailed information on vitamins and minerals.

See Appendices:

- Medication Classification
- Medications and the Elderly

See Performance Evaluation – Drug Card – Sample

Content

1. **Endocrine system – glands which secrete biochemicals that have direct affect on body functions. Hormones are constantly adjusted to meet the body's needs. (Use correct medical terms when referring to parts of the endocrine system and symptoms of hormone imbalance.)**

   - **Major structures**
     - **Hypothalamus–**located below the thalamus gland in the neck. Modulates the activities of the anterior and posterior lobes of the pituitary. Has a "releasing" and "inhibiting" function.
     - **Pituitary–**located in the base of the brain. It synthesizes and releases several protein hormones needed in normal growth and development and the stimulation of target glands.
     - **Thyroid gland–**located in the neck just below the larynx.
     - **Parathyroid glands–**four small glands which are located in the neck, behind the thyroid.
     - **Adrenal glands–**located at the top of each kidney. Produce adrenocorticosteroids.
     - **Pancreas gland–**located in the abdomen–left side, near the stomach.
     - **Gonads–**include the ovaries (female, egg-producing) and testes (male, sperm-producing).

   - **Regulatory Mechanisms–**numerous feedback relationships exist among the structures of the endocrine system and the rest of the body. These involve complex changes in function, growth, development, and processes. Some of the more important things to know about the regulatory functions are as follows.
     - **Pituitary**
       - adrenocorticotropic hormone (ACTH) stimulates the adrenal cortex.
       - antidiuretic hormone (ADH) or vasopressin acts to promote water conservation by the kidney. It can also cause vasoconstriction in high concentrations. Like aldosterone, ADH helps maintain fluid balance.
       - thyroid stimulating hormone (TSH) stimulates the thyroid.
     - **Adrenal cortex–**corticosteroids regulate the use of sugars and proteins by the cells. Glucocorticoids regulate the metabolism of carbohydrates and fats and have an anti-inflammatory effect. Mineralocorticoids regulate the reabsorption of fluids and salts in the kidney, promote sodium and water retention and urinary excretion of potassium.
     - **Thyroid–**thyroxine controls metabolism–the rate at which cells produce energy (heat, muscle strength, etc.). Iodine is needed for the thyroid to produce thyroxine.
     - **Parathyroid–**parathormone (PTH) controls the calcium content of the blood. Calcium is needed in the blood for the muscles to work properly, including the heart muscle. Extra calcium is stored in the bones, and when calcium is needed parathormone causes calcium to be released from the bones into the bloodstream.

- **Adrenal**–epinephrine and norepinephrine (also called adrenaline) prepare the body for "fight or flight" when there is perceived threat, stress or an emergency situation. Heart rate increases, pupils dilate, extra sugar is released for large muscles to use, blood pressure increases, bronchial tubes dilate to enhance breathing.
- **Pancreas**–insulin controls the use of sugars by the cells, causes the liver to store sugar in the form of glycogen. Glucagon causes the liver to release stored sugar into the bloodstream for extra energy when it is needed.

2. **Disorders of the endocrine system**

- **Terms-"hypo"** means too little; **"hyper"** means too much. Imbalances in the endocrine system cause abnormal functions of the body. The causes of the imbalances vary. **Goiter** is an enlargement of the thyroid gland.

- Hypothyroidism–thyroid produces too little hormone. It is more common than hyperthyroidism and typically results in dryness of skin, hair, nails, low blood pressure, sluggishness of functions, constipation, subnormal temperature, intolerance to cold. Mild hypothyroidism is common in elderly women. Example: "Myxedema."

- Hyperthyroidism–thyroid produces excess hormone. It is less common and typically results in increase in body temperature, respiration and heart rate, nervousness, feeling of warmth (heat intolerance), increased sweating, goiter, hair and weight loss, hand tremors, change in skin thickness, and sometimes protruding eyeballs. Example: "Graves' disease."

- Hyperparathyroidism–too much parathormone is released which causes too much calcium to be released into the blood.

- Hypoparathyroidism–too little parathormone is released which causes too little calcium in the blood. Spasms of the muscles, mostly the face and hands, but can also affect the heart and other muscles.

- Diabetes Mellitus–pancreas does not secrete insulin or the insulin produced is inadequately utilized.
  - **I**nsulin **D**ependent **D**iabetes **M**ellitus (IDDM)–onset is usually before age 25. Insulin is not produced by the pancreas. Also called Type I diabetes. Insulin must be administered by injection.
  - Non-Insulin Dependent Diabetes Mellitus (NIDDM)–onset is usually after the age of 40. Also called Type II diabetes. Often can be controlled with diet and exercise and antidiabetic drugs.
- **Insulin shock -** caused by an overdose of insulin resulting in hypoglycemia.

- **Ketoacidosis** - occurs when insulin has metabolized available glucose and fat is broken down for energy, causes the release of ketones which increases the acidity of the blood. Can lead to coma and death.

3. Related medications and treatment:

- **Hormone replacement therapies–**replace the hormone which is either inadequately produced or is missing.
  - **Thyroid–**levothyroxine (Synthroid, Levothroid, Levoxyl) are synthetic thyroid.
  - **Insulin–**is an injection administered by a licensed nurse.
    - Oral anti-diabetics (Precose, Glucotrol, Amaryl), actose, metformin (Glucophage), (Januvia)
  - **Pituitary–**ACTH may be given to stimulate adrenal function or to diagnose an adrenal problem.
  - **Pituitary–**vasopressin (Pitressin) replaces the antidiuretic hormone in cases of diabetes insipidus.
  - **Corticosteroids.** Generally used to: (1) supplement or replace inadequately produced hormones, and (2) suppress inflammation and immune response, reduce pain, edema, erythema, fever, itching associated with allergies, skin disorders, cancer, respiratory diseases (such as asthma), 'autoimmune' diseases (Rheumatoid arthritis, Lupus Erythematosus). Two major types are:
  - **Glucocorticoids**-protecting against stress, affect protein and carbohydrate metabolism.
    - prednisone (Deltasone)
    - prednisolone (Prelone)
    - dexamethasone (Decadron)
    - methyl prednisolone (Medrol, Solu-Medrol)
    - triamcinolone (Aristocort, Kenacort)

    Mineralocorticoids–regulate salt/water balance.
    - aldosterone
    - desoxycorticosterone
    - fludrocortisone (Florinef)

- **Complementary/alternative therapies–**may include prescriptive diet, herbal supplements, vitamins, minerals. All therapies should be under the physician's order and supervision. Some herbs, vitamins and mineral supplements can interfere with medications.
  - **Low thyroid–**diet with iodine-rich foods such as vegetables, seafood, iodized salt, molasses, egg yolks, parsley, apricots, dates and prunes. Avoid processed and refined foods, including white flour and sugar. Vitamins and mineral supplements may include: Kelp, L-Tyrosine, B Complex, extra B 2 and B 12, essential fatty acids, Vitamins A, C, E, beta-carotene. Large doses of Vitamin C may be avoided because of its affect on thyroid hormone production. Herbs such as bayberry, black cohosh.
  - **Diabetes–**diet rich with fresh fruits and vegetables (green leafy), brown rice, nuts, legumes, whole grains, fish. Garlic, onions, shiitake mushrooms and pearl barley may stimulate the immune system. Avoid fats, fried foods, ham, pork, highly processed foods, red meats, sodas, sugar and white flour. Similarly, alcohol, caffeine and tobacco should be limited or avoided. Attending physician may order supplements or herbs. These are only administered with physician's order. Supplementary

vitamins/minerals: Vitamin B complex, Vitamin C, L-Tyrosine, Coenzyme Q 10, multivitamin and mineral complex, zinc. Herbs: Astragalus improves adrenal gland function and aids in stress reduction. Echinacea can increase white blood count; milk thistle extract aids liver function, which in turn helps adrenal function. Residents who report allergies to pollen, ragweed, hay fever, molds, dust, etc. may have negative reactions to herbal supplements.

4. Nursing care and implications:

- **Thyroid replacement therapy.** Side effects are uncommon since dosage is regulated individually. Excessive dosage produces effects similar to hyperthyroidism. Watch for changes/increases in vital signs, nervousness, weight loss, tremors. Monitor appetite and sleep pattern. Medication should be given at the same time each day, preferably in the morning.

- **Insulin.** Several types which vary in their effect (Fast-acting = regular insulin and Semilente; Intermediate-acting = NPH insulin; Long-acting = Ultralente insulin). Sometimes are given together in one dose, then another dose later in the day when blood sugar normally rises. When regular insulin is given in the morning, it will rapidly lower the blood sugar level so the resident needs to eat within at least 30 minutes after the insulin is given. Having too low blood sugar can result in "insulin reaction." Insulin used to be made from pancreases of animals, but today it is usually manufactured in a laboratory through genetic engineering, and is called "Humulin" insulin.
  - Need for insulin varies according to diet, exercise, emotions or illness. Changes in these factors affect the insulin need.
  - Too little insulin = "hyperglycemia." Symptoms are "dry" and "drowsy." Treatment is for licensed nurse to give extra insulin.
  - Too much insulin = "hypoglycemia." Symptoms are "wet" and "wild," sudden onset, hunger, sweating, nervousness, heart palpitations and confusion. Treatment is to give glucose (or sugar) in some form. It is better to give milk with bread or crackers. Juice is only given for urgent response, to prevent loss of consciousness. DO NOT give anything by mouth if person is unconscious.
  - Make sure residents eat something within at least 30 minutes of the time they get their morning insulin to prevent hypoglycemic episodes.
  - Watch for hypoglycemic reactions at other times when you know the insulin's action is peaking. This depends on type of insulin administered.
  - Good foot and good oral care are essential.
  - Recognize and report any signs of hypoglycemia immediately.
  - Be aware of medications that commonly interact with insulin.
  - Drugs that **increase glucose**
    - CNS stimulants
    - corticosteroids
    - diuretics
    - estrogen
    - nicotine
  - Drugs that **decrease glucose**

- alcohol
- salicylates
- sulfonamides
- MAOIs
- acetaminophen
- anabolic steroids

- Glucometer testing requires use of electronic devices that can analyze the test strip and give a numerical readout of the glucose level. A finger is pricked with a lancet, a drop of blood is placed on test strip and placed in the machine for analysis. The machine gives an immediate blood sugar result. (Normal blood sugar level 60-110 mg/dl.)
- **NOTE: Policy for glucometer testing will be according to your facility. A medication aide in the state of Kansas should refuse to perform test unless he/she is properly trained. Medication aides must be trained and found to be competent before performing glucose testing.** Refer to information regarding Nurse Delegation at Kansas Department on Aging's website, or use the following link: http://www.aging.state.ks.us/AdultCareHomes/Medication_Aides_Nurse_Aides_Position_Statement.pdf

➢ **Oral Antidiabetic Medications.** Used for stable adult-onset diabetes mellitus Type II (NIDDM). Cause the pancreas to release insulin, improve the effect of insulin.

- Most common side effect is hypoglycemia.
- Allergies should be identified before these products are given as hypersensitive reactions may occur.
- Should not be used in diabetic ketoacidosis, juvenile diabetes, severe renal disease, or severe hepatic disease.
- Should be used with caution in the elderly, in cardiac disease, pregnancy, lactation, and in the presence of alcohol.
- Should be given 30 minutes before meals.
- Oral antidiabetic medications include the following:
  - metformin (Glucophage)
  - nateglinide (Starlix)
  - pioglitazone (Actos)
  - repaglinide (Prandin)
  - rosiglitazone maleate (Avandia)
  - glimepride (Amaryl)
- Older oral antidiabetic medications which are used less frequently now:
  - glipizide (Glucotrol).
  - glyburide (DiaBeta, Glynase, Micronase).
  - tolbutamide (Orinase).
- Some newer forms of insulin include:
  - insulin detemir (Levemir)
  - insulin glargine (Lantus)
  - These are both long-acting forms of insulin, and should be given subcutaneously at the same time of day every day. CMAs are not allowed to administer insulin subcutaneously.

- Exenatide (Byetta) is another medication for diabetes that is given subcutaneously as adjunctive therapy to improve glycemic control in patients with type 2 diabetes who take oral meds but have not achieved complete control. It is administered twice a day within 60 minutes before morning and evening meals.
- One of the newest advances in technology is the insulin pump. It is a small device attached to a thin plastic tube that has a plastic needle at the end through which insulin passes. The needle is usually inserted into the abdominal wall and allows for continuous insulin delivery 24 hours a day. The needle is changed by the licensed nurse every two days.
- Be alert for continued advances in insulin forms and delivery and treatment options for diabetes.
- Insulin may be administered via insulin pens. CMAs must be trained and found to be competent before performing any tasks related to the administration of insulin per insulin pens. Refer to Nurse Delegation website listed on previous page for more information.

➢ **Corticosteroids**
- Side effects for corticosteroids are limited in short term use.
- Resident will receive a decreasing dose of corticosteroids over time rather than immediate discontinuation of medication. Abrupt withdrawal, or omitting a dose may cause severe, even life-threatening symptoms.
- Long term side effects may include: (Be able to list.)
  - Weight gain (extreme hunger, hyperglycemia).
  - Fluid retention ("Moon Face").
  - Increase in BP.
  - Interferes with healing and lowers resistance to infection. Prevents the body's usual response to infections.
  - Personality changes.
  - Diabetes, easy bruising, thinning of the skin, gastric ulcers.
  - Osteoporosis.
- Corticosteroid therapy interferes with the normal feedback mechanism that controls hormone production, so when the drug is withdrawn it takes weeks or even months for the gland to begin producing on its own.

5. Facts about Hyperglycemia and Hypoglycemia

	Hyperglycemia high blood sugar (diabetic ketoacidosis)	**Hypoglycemia** low blood sugar (insulin shock)
Cause	Excess of food or lack of insulin	Excess insulin or lack of food
Onset	Days or gradual	Sudden
Skin	Dry - flushed	Pale - moist
Mouth	Dry	Drooling
Thirst	Intense (needs water to flush out sugar)	Absent
Hunger	Absent (just doesn't need food)	Intense
Vomiting	Relatively common	Rare
Abdominal Pain	Frequent	Absent
Respiration	Exaggerated (air hunger)	Normal or even shallow
Blood Pressure	Low	Normal
Pulse	Weak - rapid	Full
Eyeball	Soft (actually)	Normal
Vision	Quite dim	Double vision (diplopia)
Tremors	Absent	Frequent
Convulsions	None	Do have in later stages
Lab: Urine Glucose Level Urine Ketones Blood Sugar	Positive Positive High	Absent by 2nd specimen Absent Below 60 mg/dl
Improvement	Comes out gradual 6-12 hours back to normal Gradual following insulin	Very rapid following carbohydrates - 5 minutes after eating candy bar
Breath	Fruity or sweet	No odor

Unit 19. Drugs and Body Systems–Reproductive System

Objectives

1. **Identify the female reproductive structures and functions.**
2. **Identify the male reproductive structures and functions.**
3. **Name the hormones produced by the male and female gonads and tell what they do. Describe the actions of gonatropins, oxytocin, and prolactin.**
4. **Recognize descriptions of the major disorders that affect the reproductive system.**
5. **List the main uses of hormones in drug therapy.**

See Appendices:
- Administration of Suppository - Vaginal
- Medication Classification

See Performance Evaluation – Drug Card – Sample

Content

1. **Female reproductive structures and functions**
   - **Genitalia**
     - **Internal**
       - **Two ovaries**–produce ova (female sex cells) which are released from the ovary once a month–ovulation. Also produce estrogen and progesterone.
       - **Two fallopian tubes**–fertilization takes place in the tube, then the fertilized egg travels to the uterus.
       - **Uterus**–holds the fetus as it develops into a baby–bottom portion is called the cervix.
       - **Vagina**–organ of sexual intercourse, and also the birth canal.
     - **External**
       - **Mon pubis**–pad of fat over the symphysis pubis bone.
       - **Labia majora and minora**–the folds of tissue covering the vaginal opening.
       - **Clitoris**–similar to the penis in the male. The clitoris is erectile tissue and creates the good feelings during sex. It is also responsible for producing an orgasm.
       - The true **perineum** is the area from the back of the vaginal opening to the anus, and the entire perineum usually refers to the area from the umbilicus in the front to the top of the gluteal fold in the back.

2. **Male reproductive structures and functions**
   - **Genitalia**
     - **Internal**
       - **Testes**–produce sperm and testosterone.
       - Several **glands**–prostate, seminal vesicles, and Cowper's glands. The prostate produces semen.
       - Coiled tiny tubes called the **epididymis** carry the sperm from the testes to the vas deferens, which carries sperm to the urethra and out of the body during ejaculation.
     - **External**
       - **Scrotum**–contains the testes.
       - **Penis**–made of spongy tissue, becomes engorged with blood during sexual excitement.

3. **Sex hormones-gonadotropins**
   - A few from the adrenal cortex.

   - Most are produced by the gonads.
     - Female–estrogen and progesterone.
       - **estrogen**–responsible for female sex characteristics. Maturing of the female body and maturing and developing of the ovum every month.
       - **progesterone**–prepares the uterus for a fertilized ovum each

month.
        - If the ovum is not fertilized, then menstruation or menses occurs.
        - Menopause occurs when the ovaries stop production of ova, estrogen and progesterone.
    - Male–**testosterone**–produced in testes
        - Responsible for male sex characteristics.
        - Stimulates development of sperm.
    - Both males and females produce the same hormones, just in different amounts.
    - Sex hormones are needed for many other body processes–growth, bone formation, protein production, mineral storage, etc.
    - **Pituitary hormones**
        - FSH–follicle stimulating hormone.
        - LH–luteinizing hormone.
        - Control ovulation and the production of estrogen and progesterone.
        - Oxytocin–controls the contractions of labor–can be given to induce labor and to contract the uterus after childbirth to prevent or control bleeding. Also controls the "let-down" reflex which allows the breast milk to come down into the ducts for release.
        - Prolactin–controls the production of milk by the breasts.

4. Disorders of the reproductive system

- **Vaginal infections**
    - Vaginitis–inflammation of the vagina.
        - Common because the vagina opens to the outside of the body.
        - Most common:
            - Trichomoniasis
            - Yeast
    - May spread to other internal organs.
        - Cervicitis–inflammation of the cervix.
    - Treatment examples
        - Creams
        - Vaginal suppositories
        - Monistat 7
        - Gyne-Lotrimin

- **Sexually transmitted diseases (STDs)**.
    - AIDS (Autoimmune Deficiency Syndrome) - treated with antiviral drugs.
    - Hepatitis B and other types of hepatitis.
    - Syphilis and gonorrhea–many strains are resistant to antibiotics.
    - Chlamydia–the most common STD, causing pelvic inflammatory disease (PID) and infertility. Resistant to antibiotics.
    - Trichomoniasis–a vaginal infection, treated with Flagyl.
    - Genital herpes simplex–treated with an antiviral, like acyclovir (Zovirax).

- **Prostate Diseases**
    - Infection of the prostate–prostatitis.

        - Symptoms: blood in the urine or cloudy urine.
        - Treatment: antibiotics, antiinflammatory drugs.
    - BPH–benign prostatic hypertrophy–enlarged prostate narrows the urethra, making urination difficult.
        - Symptoms: difficulty starting stream of urine, distended bladder, inability to urinate.
        - Treatment: surgical.
        - Treatment: new drug Proscar–inhibits one form of testosterone which causes the gland to grow. Prostate–specific antigen (PSA); a blood test to screen for prostate cancer.
    - Prostate cancer–common in men over 60. Treat with surgery and female hormones to slow down tumor growth.

- **Cancer**
    - Breast
    - Uterus
    - Prostate–80% occur in men over 65 years old
    - Testicles

5. Use of sex hormones in drug therapy

- **estrogen**
    - Replacement therapy after menopause (Hormone Replacement Therapy–HRT)
        - Treat symptoms of menopause.
        - Prevent osteoporosis, hot flashes and vaginal thinning.
        - Prevent osteoporosis–lack of estrogen after menopause causes bones to thin.
    - Vaginal inflammation in older women is due to thinning of the vaginal walls and dryness.
    - Breast cancer.
    - Treatment for prostate cancer – may have a feminizing effect on men.
    - **Side effects–minimal**
        - Nausea.
        - Breast tenderness, abnormal bleeding.
        - Increased risk of uterine cancer (endometrial) and breast cancer.
    - **Drug examples**
        - estradiol
        - esterone
        - Premarin–conjugated estrogens
        - diethylstilbestrol (Stilbestrol)

- **progesterone–mostly for menstrual disorders**
    - Given to treat abnormal uterine bleeding
    - Endometriosis
    - Dysmenorrhea–painful menses
    - Given with estrogen after menopause to decrease risk of uterine cancer
    - Side effects–minimal
        - Nausea

        - Headache
        - Dizziness
        - Depression, apathy, edema
    - **Drug examples**
        - medroxyprogesterone acetate (Provera)
        - Depo-Provera
        - Megace

- **Contraceptives–combinations of estrogen and progesterone**
    - Prevent pregnancy in peri-menopausal nursing home residents
    - Many mild side effects
        - Nausea
        - Breakthrough bleeding
        - Water retention, edema
        - Vaginal infection
        - Headache
        - Risk of developing blood clots in the legs
        - Cancer
    - **Drug example**
        - norgestrel (Lo Ovral)
        - Loestrin

- **Testosterone–action and use**
    - Replacement therapy when enough testosterone is not being produced naturally. Given to females with breast cancer to relieve symptoms and to slow tumor growth. It has virilizing effect on women.
    - **Side effects**
        - Retention of salt and edema controlled with diuretics
    - **Drug examples**
        - testosterone cypionate (Depo-Testosterone)
        - oxymetholone (Anadrol)
        - methyltestosterone
    - **Nursing care and side effects:**
        - To be effective, hormones given for anabolic effect must be accompanied by improvement of nutrition.

Unit 20. Drugs and Body Systems–Integumentary System

Objectives

1. **Identify three layers of skin, their location, structure, and other structures located within the skin.**
2. **Describe the major functions of the skin.**
3. **Identify common changes in the integumentary system associated with aging.**
4. **Describe major disorders affecting the skin. Identify related medications, nursing care and side effects.**
5. **Identify general issues for skin and skin care, specific types of dressing and methods of administering skin medications.**
6. **Identify ways to reduce itching and scratching.**

See Appendices

- Dressings, Topical Medication and Soaks
- Medication Classification
- Skin Ointment and Lotion

See Performance Evaluation – Drug Card – Sample

Content

1. **Major structures (layers) of the skin**
   - **Epidermis**–outermost layer; cells are constantly being shed.
     - Melanocytes–gives skin its color.
     - Keratinocytes–waterproofing; provide a barrier to pathogens and chemicals.
   - **Dermis**–middle layer.
     - Made up of collagen, blood vessels, nerves, lymphatic tissue, sweat glands, sebaceous glands and connective tissue.
   - **Subcutaneous layer**–innermost layer.
     - Attaches skin to bone.
     - Provides support, nutrition, insulation and padding.

2. **Major functions of the skin**
   - **Protective** barrier.
   - **Temperature** regulation.
   - **Sensory stimulus** (temperature, pain, touch).
   - Produces **Vitamin D**.
   - **Body image –** provides visual and tactile image.

3. **Common changes in integumentary system**
   - **Delayed** shedding of epidermis cells.
   - **Decreased** skin elasticity.
   - **Reduced** melanocytes leads to graying of hair and increased photosensitivity.
   - **Diminished** blood supply to the skin leads to decreased thermo-regulatory function. Reduced subcutaneous tissues increases risk of bruising, damage to tissues and delayed healing of wounds.

4. **Major disorders**
   - **Contact dermatitis**–inflammation often along with itching as a result of contact with a substance.
     - Usually because of a sensitivity or allergy to substances such as soaps, lotions, cosmetics, detergents, laundry softeners or perfumes, plant oils such as poison ivy or oak. May also appear as result of contact with topical drugs (antibiotics, antihistamines, anesthetics, antiseptics), dyes, airborne substances (pollen, insecticides) or materials such as water-proofed pads.

     Related medications:

- Anti inflammatory drugs—used to treat contact dermatitis and eczema.
- Topical steroids–reduce swelling and itching by reducing the inflammation.
- Antihistamines–topical or oral–reduce inflammation by affecting the immune response.

Nursing care and side effects:

- May cause itching, redness, burning, dryness.

➢ **Eczema (dermatitis)**–a symptom, not a disease in and of itself.
  - Inflammation with or without drainage, pimple like blisters, scales, scabs, itching.
  - May include crusting, scaling, peeling or flake-like desquamation.

Related medications:

- Anti-inflammatory drugs—used to treat both contact dermatitis and eczema.
- Topical steroids–reduce swelling and itching by reducing the inflammation.
- Antihistamines–topical or oral–reduce inflammation by affecting the immune response.

Nursing care and side effects:

- May cause itching, redness, burning, dryness.

➢ **Psoriasis**–chronic inflammation with red, raised lesions often covered with dry, silvery scales and accompanied by itching.
  - Extensor surfaces of elbows, knees, scalp, back, anogenital region are affected. Flexor surfaces of the tip of the fingers, penis, palms of hand or foot.

Related medications:

- Keratolytics–used to soften and destroy the outer layer of skin so it can be sloughed off. Used in conditions such as psoriasis, corns, warts.

Nursing care and side effects:

- Must be applied carefully only to the affected skin to prevent destruction of healthy tissue.
- May irritate and cause burning sensation.

➢ **Burns**–may be either heat (thermal) or chemically induced:
  - First degree burns–involves only the epidermis. Skin appears reddened, painful, blanches with pressure, and mild swelling.
  - Second degree–involves both epidermis and the dermis. Red, fluid-filled blisters develop.
  - Third degree–complete destruction of epidermis, dermis and involvement of underlying tissue.

Nursing care and side effects:

- Care in keeping burned area protected from injury, infection.
- May cause a sensitization to the medication (allergy).
- Topical anesthetics may be used with first and second degree burns.

➢ **Pressure ulcers**–damage to skin and underlying tissue due to unrelieved pressure,

often occur over a bony prominence such as hip, shoulder, knee, heels, elbows, others. First symptom is reddened skin at the site of pressure but may rapidly progress to full skin breakdown and an open wound.

Related medications:

- Debridement agents
- fibrinolysin and desoxyribonuclease (Elase)
- Promote tissue growth/health
- becaplermin (Regranex Gel)

Nursing care and side effects:

- Prevention is best care–provide adequate skin protection, repositioning, hydration and nutrition.
- Follow manufacturer's instructions carefully when using a product for pressure ulcers. Apply the product correctly, prevent and monitor for side effects.

➢ **Parasites**–microbes that invade the skin.

- Scabies (itch mites)–burrow under skin, later itching and possible development of red streaks or watery blisters.
- Pediculosis (lice)–either on head or in pubic area. Itching is the primary symptom. Either the lice, or more likely their nits (eggs) are sometimes visible with the naked eye upon close inspection.

Related medications:

- Miticides (anti-parasitic)–used to treat scabies or lice infestations.

Nursing care and side effects:

- Apply carefully following manufacturer's instruction to be effective.
- May cause irritation and itching. Neurotoxicity with excessive use or if skin is damaged and medication is absorbed internally.
- Treatment of infestation relies on destruction of the parasites and eggs so sufficient exposure of parasites to the miticide is important.
- Bedding, clothing and personal grooming items are possible means of transmission so they must also be washed thoroughly at the same time skin is treated.

➢ **Infections**–inflammation as a result of overgrowth of microorganisms.

- Symptoms include swelling, redness, warmth to touch, pain or itching, thick yellow drainage (pus).

Related medications:

- Anti-infectives (topical)–used to treat local skin infections and to prevent infection in second or third degree burns.

Nursing care and side effects:

- May cause pain, burning, stinging, super infections (reduce one type of microbe while another may overgrow), allergic reaction, development of resistance (medication no longer works).

5. General issues for skin and skin care

➢ **Wet dressings** may be used to soften the skin and increase absorption of the medication.

- **An occlusive dressing** which does not permit air to enter the dressing may be ordered to aid in the absorption of the medication. Plastic wrap and petroleum jelly are examples.

- **Fat soluble or lipid soluble topicals** are absorbed better than water soluble ones.

- **Rubbing in an ointment** aids in the absorption, and stimulates circulation. Do NOT rub vigorously if skin is fragile or there are lesions present.

- **Do NOT allow medication to contact mucous membranes** such as the mouth, eyes, rectum or vaginal area when using topical medications unless specifically to be used to treat those areas.

- **Transdermal patches** should be applied with care, using gloves to protect medication aide from absorbing medication. Follow instructions carefully. The old patch is removed first, the area washed and the new patch applied to another site. Mark the date on the new patch.

6. Prevent or reduce itching and scratching

- Keep skin dry.

- Perfumes and alcohol in over-the-counter (OTC) hand and body lotions may irritate the skin or be excessively drying. Unscented products actually contain chemicals to counteract the scent of the other ingredients. Encourage resident to use fragrance free lotions, which contain no added perfumes.

- Keeping a layer of cloth between the itchy area and the fingernails may help reduce itching as well as decrease the chance of damaging the skin if a resident does continue to scratch. Examples include long sleeves or pants and cotton gloves. Remember that mittens could be considered a restraint.

- Tepid water is less irritating than hot water. Rinse off soap thoroughly and pat dry rather than rubbing skin.

- Distraction can be a useful anti-itch strategy. Suggest activities the resident enjoys, especially ones that involve the use of the hands.

7. Skin condition and body image

- Changes in skin appearance have a significant impact on how the resident feels about him/herself, so be considerate of the residents' expressions regarding their appearance.

- If desired by resident and when appropriate, cover lesions if resident is distressed by them.

Unit 21. Drugs and Body Systems–Anti-Infective Agents

Objectives

1. Understand the nature of infection and identify causes, transmission and control measures.

7. Identify signs and symptoms of infection and explain why the elderly are at increased risk.

8. Name topical anti-infective agents and actions.

9. Identify terms describing systemic anti-infective agents.

10. Recognize the common drugs, nursing care and side effects in following groups:

- penicillins
- cephalosporins
- sulfonamides
- fluoroquinolones
- tetracycline
- aminoglycosides
- macrolide, lincomycin, and clindamycin
- vancomycin
- metronidazole
- antiviral
- antifungal

See Appendices

- Medication Classification

See Performance Evaluation – Drug Card – Sample

Content

1. **The nature of infection**
   - **Causes**
     - **Overgrowth of microorganisms** when growth conditions are met
       - Suppressed immune system
       - Food source
       - Oxygen or lack of it
       - Moisture
       - Warm environment
       - pH of 5 to 8 (slightly alkaline)
       - Dark environment
     - **Microorganisms**
       - Bacteria
         - ✓ Aerobic–must have oxygen
         - ✓ Anaerobic bacteria–thrives in spaces without oxygen
       - Fungi
       - Protozoa
       - Rickettsia
       - Viruses

   - **Transmission of microorganisms**
     - Body fluids
     - Touch
     - Contact with contaminated equipment
     - Inhalation

   - **Control measures**
     - Effective handwashing
     - Proper disposal of contaminated materials
     - Proper cleaning of equipment
     - Appropriate use of isolation precautions

2. **Signs and symptoms–not as prominent in the elderly**
   - Elderly are at increased risk because of:
     - Decline in function of body systems due to aging process.
     - Less clear signs and symptoms of infections.
     - Co-existing diseases.
     - Urinary retention.
     - Decline in subcutaneous tissue, less protection from injury.
     - Environment–exposure to infections (nosocomial).
     - Exposure to other elderly residents and staff who may have infections.
   - Signs and symptoms of localized infection:
     - Local redness
     - Purulent drainage
     - Warmth
     - Swelling
     - Pain

- Limitation of movement

- Signs and symptoms of infections (general):
  - General decline
  - Increasing weakness
  - Headache
  - Confusion
  - Temperature elevation (fever)
  - Nausea, vomiting and diarrhea
  - Chills and sweating

- **Topical anti-infective agents**
  - triple antibiotic ointment (Neosporin) – used for first aid and prevention of infection to minor cuts, lacerations, and abrasions.
  - mupirocin (Bactroban) – used for skin lesions infected with Staphylococcus aureus or Streptococcus pyogenes, also used to eradicate nasal colonization of MRSA in adults.
  - retapamulin (Altabax) -impetigo infection.
  - silver sulfadiazine (Silvadene) – often used to prevent or treat wound infections in second- and third-degree burns.

- **Systemic anti-infective agents**
  - Bactericidal - kills most bacterial microorganisms.
  - Bacteriostatic - prevents bacterial microorganisms from multiplying so that the body's immune system can kill the microorganism.
  - Broad-spectrum - kills many different microorganisms.
  - Microbe-specific - narrow-spectrum, kills only a few different microorganisms.
  - Resistance - render anti-infective ineffective; caused by overuse of antibiotics, not taking medications as instructed.

- **Hypersensitivity/allergic**–a reaction to the drug. **Do not give a medication to a resident who is sensitive to the drug or drugs of similar class. Notify licensed nurse for instruction.** Be able to name signs and symptoms of reactions and to respond appropriately.
  - Mild–rash, nausea and vomiting. Document observations, notify licensed nurse supervisor.
  - Severe–anaphylactic shock and death. Emergency situation–notify licensed nurse supervisor immediately, provide respiratory and cardiac support as instructed, trained.

3. **Antibiotics–class of medication.** Note ways to increase effectiveness and avoid sensitivity reactions. Note interactions with food or other drugs, contraindications, and special nursing care.

- **Penicillins** (bactericidal)–used in bacterial infections where microorganism is susceptible to being killed or reproduction limited/impaired by drug.
  - penicillin VK (Pen Vee K, Veetids, V-Cillin K)
  - ampicillin (Omnipen, Amcill, Polycillin)
  - amoxicillin (Amoxil, Trimox)

Nursing care and side effects:

- **Hypersensitivity reaction** (allergy) rash; GI–abnormal taste sensation, nausea, vomiting; swollen joints; unusual bleeding or bruising.
- **Drug-food.** Food decreases absorption of penicillin. Ampicillin (give 1 hour before or 2 hours after a meal).
- **Drug-drug**. Allopurinol increases incidence of rash.

➢ **Cephalosporins**–related to penicillins (bactericidal)–used in bacterial infections when microorganism is susceptible to being killed or reproduction/limited/impaired by drug.

- cephalexin (Keflex)
- cefaclor (Ceclor)
- cefadroxil (Duricef)
- cefpodoxime (Vantin)
- cefprozil (Cefzil)
- cefuroxime (Ceftin)
- cefdinir (Omnicef)
- ceftriaxone (Rocephin)

Nursing care and side effects:

- Dizziness, headache, fatigue, diarrhea.
- Resident with impaired kidney function may require lower doses to avoid toxicity because of the slowed "renal clearance."
- Superinfections (other microorganisms may overgrow) of microbes such as fungus and/or other bacteria.
- **Drug–drug.** Antacids may reduce serum levels (especially cefaclor)
- H_2 antagonist (Pepcid) may decrease serum level.
- Loop diuretic (Lasix or Bumex) may increase risk of nephrotoxicity.
- May create a false positive reaction for urine glucose.

➢ **Sulfonamides**–bacteriostatic

- sulfisoxazole
- sulfamethoxazole (Gantanol)
- trimethoprim and sulfamethoxazole (Bactrim)

Nursing care and side effects:

- Headache, tinnitus, vertigo.
- Nausea, diarrhea.
- Hypersensitivity–can appear as much as 7 days after course of therapy completed.
- Should be administered by drinking 8 ounces of water.
- Should maintain at least 1500 cc fluids/day.

➢ **Fluoroquinolones**–broad-spectrum antibacterial

- ciprofloxacin (Cipro)
- norfloxacin (Noroxin)
- ofloxacin (Floxin)
- levofloxacin (Levaquin)

Nursing care and side effects:

- Resident should drink sufficient fluids to assure hydration, kidney

function, and urinary output.

- Resident may be sensitive to sunlight (photosensitive) during and several days following drug use.
- Resident with renal function impairment may require a lower than usual dose to avoid toxicity because of the slowed renal clearance.
- Superinfections (other microorganisms may overgrow) of microbes such as fungus and/or other bacteria.
- Physical symptoms of side effects may be: headache and dizziness; nausea, vomiting and diarrhea; skin rash (may indicate allergy to medication).
- **Drug-drug.** Antacids bind with the drug.
  - ✓ cimetidine (Tagamet) may interfere with the elimination of this class.
  - ✓ May affect digoxin levels.
  - ✓ May increase clot-forming time.
  - ✓ May slow the elimination of theophylline, making blood levels of theophylline higher.
- **Drug-food.** Decreased absorption when given with food.
  - ✓ Dairy products bind with the drugs similar to antacids. Avoid coadministration.
  - ✓ Give 2 hours before or 6 hours after antacids, sucralfate, and products containing iron or zinc.

➢ **Tetracyclines**–bacteriostatic.
- tetracycline (Sumycin)
- doxycycline (Vibramycin)
- minocycline (Minocin)

Nursing care and side effects:

- Resident may be sensitive to sunlight (photosensitivity).
- Minocycline may cause dizziness.
- Resident with renal function impairment may require a lower than usual dose to avoid toxicity because of the slowed renal clearance.
- Superinfections (other microorganisms may overgrow) of microbes such as fungus and/or other bacteria.
- Physical symptoms of side effects may include: nausea, vomiting, diarrhea.
- **Drug–drug** interactions.
  - ✓ Antacids–decrease the absorption of the class.
  - ✓ Anticoagulants–may increase clot-forming time.
  - ✓ Cimetidine (Tagamet)–decreases absorption of tetracyclines.
  - ✓ Digoxin–serum level of digoxin may be increased.
  - ✓ Iron preparations decrease the absorption of tetracyclines.
- **Drug–food** interactions.
  - ✓ Dairy products may decrease (by 50%) the absorption of tetracyclines (not minocycline or doxycycline).
  - ✓ Must be given on empty stomach - either one hour before, or, two hours after meals.

- **Aminoglycosides–**bactericidal.
  - tobramycin (Nebcin) (IV)
  - gentamicin (Garamycin) (IV)
  - kanamycin (Kantrex) (oral)
  - neomycin

  Nursing care and side effects:
  - Resident with renal function impairment may require a lower than usual dose to avoid toxicity because of the slowed renal clearance. Keep resident well hydrated.
  - Ototoxic–increases with increase in dose.

- **Macrolides, lincomycin, and clindamycin–**bacteriostatic or bactericidal, depending on drug concentration.
  - clarithromycin (Biaxin)
  - azithromycin (Zithromax)
  - erythromycin (E-Mycin, EES, Ery-Tab)

  Nursing care and side effects:
  - Monitor for abdominal pain or discomfort (somewhat dose related in susceptible patients), nausea, vomiting, diarrhea, and headache.
  - **Drug-food.**
    - ✓ Food delays absorption of clarithromycin.
    - ✓ Food increases absorption of azithromycin.

- **Miscellaneous Antibiotics**
  - vancomycin–bactericidal against enterococci, microorganisms that are resistant to other antibiotics.

    Nursing care and side effects:
    - Ototoxic–transient or permanent.
    - Resident with renal function impairment may require a lower than usual dose to avoid toxicity because of the slowed renal clearance. Should avoid giving multiple types of hepatotoxic drugs.
    - Superinfection.
  - metronidazole (Flagyl) – bactericidal (particularly with anaerobic infections, gynecologic infections), amebicide.

  Nursing care and side effects:
  - Can cause urine to darken.
  - GI symptoms (nausea, vomiting and diarrhea).
  - Headache, dizziness, incoordination.
  - Alcohol can cause severe GI distress.

- **Antiviral Drug–**work in different ways to intervene in the viral attachment to the host cell, inhibiting cellular receptor or factor required for replication, or blocking enzymes essential for viral replication.
  - acyclovir (Zovirax)
  - valacyclovir (Valtrex)
  - amantadine (Symmetrel)
  - rimantadine (Flumadine)

- zidovudine (Retrovir)
- famciclover (Famvir)

Nursing care and side effects:

- Common adverse reactions, especially severe headache, nausea, insomnia, and myalgia.

- **Antifungal Agents–**work to suppress fungal infections.
  - amphotericin B
  - ketoconazole (Nizoral)
  - fluconazole (Diflucan)
  - itraconazole
  - terbinafine HCL (Lamisil)

Nursing care and side effects:

- Hepatotoxicity.
- Allergic or hypersensitivity reactions.
- May have significant interactions.

Unit 22. Drugs and Body Systems--Vitamins, Minerals and Herbs

Objectives

1. **Be familiar with the Dietary Guidelines for Americans.**
2. **Identify the meaning of RDA.**
3. **Discuss the role of vitamins. Know the difference between Fat Soluble and Water Soluble vitamins.**
4. **Discuss the role of minerals. Know the difference between macrominerals and microminerals.**
5. **Define and identify electrolytes.**
6. **Identify nursing care and side effects regarding vitamins and minerals and their relationship to medications.**
7. **Discuss the role of herbs with regard to medications.**
8. **From the appendices, take special note of recommendations for iron, calcium and potassium.**
9. **Note which herbs are unsafe to use.**
10. ***Be familiar with fat soluble vitamins.**
11. **Be familiar with water-soluble vitamins.**
12. **Be familiar with macrominerals.**
13. **Be familiar with microminerals.**

*RDAs are not included for vitamins and minerals. Instructors may check current information.

Content

1. **Dietary Guidelines**
   - **The Dietary Guidelines for Americans provide science-based advice to promote health and to reduce risk for chronic diseases through diet and physical activity.** Be able to locate and utilize related websites.
     - The guidelines recommend six categories of foods and the numbers of servings that are recommended daily for a balanced, healthy diet. Know these categories.
     - See www.cnpp.usda.gov/dietaryguidelines.htm, and www.mypyramid.gov.

   - **Supplements should not be necessary for a generally healthy person who eats a well-balanced diet, but may be needed when:**
     - Medication interactions, action of disease process/medical interventions cause depletions.
     - Daily diet consists of less than 1200 calories/day.
     - Person has increased physical activity.
     - Illness or disease exists.

2. **Recommended Daily Allowance (RDA)**
   - **RDA** is the level of intake for essential nutrients that is considered to be adequate to meet the nutritional needs of healthy individuals.
     - The RDA includes the total nutrients in the diet and in all supplements from vitamins or any other sources.
     - Taking supplemental vitamins may result in overdoses because doses may then exceed the RDA.
     - RDA is based on the diet of a healthy adult.

   - **Most vitamins are obtained from outside sources**–that is, the diet–since most vitamins cannot be made by the body. (Vitamin D is manufactured by the body from sunlight.)

3. **Vitamins**–are organic substances needed by the body in small amounts for normal growth, nutrition and to carry out metabolism.
   - In general, vitamins act as regulators of body processes.
     - Vitamins are organic, carbon-based compounds.
     - Necessary for metabolism and normal growth and development.
     - Highest vitamin content is in food that is used quickly and is not exposed to air or heat and water used in cooking.

   - **Fat-soluble vitamins = A, D, E, K**
     - They are not soluble in water, so not easily or quickly eliminated from the body.
     - These are stored in the body in the fatty tissues.
     - Deficiencies are rare.
     - Toxicity can result from too high a dose over a period of time.
     - See Appendix for more detailed information about the fat soluble

vitamins.

- **Water-soluble = B Complex, C**
  - Body does not store. Must be absorbed daily.
  - Widely found in plants and animals.
  - Some water-soluble vitamins can be destroyed by cooking.
  - Readily eliminated in urine and sweat.
  - Some can be toxic if megadoses (large, excessive quantities) are taken.
  - Water-soluble vitamins act as catalysts in metabolic reactions.
  - See Appendix for more detailed information on Water-soluble Vitamins.

- Megadose–10 to 20 times the RDA of a vitamin. All vitamins for residents must be given by the order of a physician.
  - Especially dangerous for the fat-soluble vitamins because they are stored in the body and are not easily eliminated.
  - Vitamins can be bought over the counter (OTC) without a prescription.

- People who have an inadequate diet, or have vitamin requirements which exceed their dietary intake of vitamins may benefit from vitamin supplements.

4. Minerals–inorganic compounds (do not contain carbon).

- Essential to the body for health and growth.

- **Macrominerals–those with an RDA of 100 mg. or more–see Appendix**
  - These can dissolve in water and become electrolytes.
  - Electrolytes are particles that are electrically charged.

- **Microminerals–those with an RDA of less than 100 mg.–see Appendix**

- Minerals are not damaged by heat or light, but may leach out into the water used in cooking foods.

5. Electrolytes–solutions of minerals that are electrically charged.

- **Macrominerals** dissolved in the body's water form electrolytes.
  - Calcium (Ca)
  - Potassium (K)
  - Sodium (Na)
  - Magnesium (Mg)

- **Water** content of human body = between 45% and 75%.
  - Infants and children have more body water than an adult.
  - Elderly have less body water than a younger adult.

6. Nursing care and side effects:

- Water-soluble vitamins (B and C) if taken in excess are excreted in urine, so cause few symptoms unless there is kidney or urinary tract impairment.

- Fat-soluble vitamins, especially A and D, if taken in excess may be stored in body

fat tissue and cause overdose symptoms. Vitamins may be released erratically if there is fat reduction (weight loss).

- Examples of vitamins:
  - Multiple vitamins–Stresstabs, Theragran
  - Many others

- Medications and vitamins and minerals have an interdependency and sometimes negative interaction:
  - Diuretics or purgatives may deplete certain electrolytes (potassium) which can cause cardiac arrhythmias.
  - Alcohol (ethanol) impairs thiamine (B) absorption.
  - Alchohol and certain hormones inhibit folic acid absorption.
  - Anticonvulsives may induce Vitamin D deficiency.
  - Drug metabolism may be enhanced, decreased, or impaired by deficiencies or simply the presence of certain nutrients.

- Appetite may increase or decrease with certain drugs. Assessing dietary intake and pattern of nutrition is critical in complete nursing care.

7. Herbs–plant substances, some with known or purported curative properties.

- Long-standing cures or treatments for illness.

- Increased use in recent years in the U.S.

- Some are harmless, some are harmful, some interact with other drugs and can become harmful.

- No standards for preparation, content, effect in the U.S. Not FDA approved.

- Some drugs today still come from plant sources.
  - Lanoxin–from Foxglove.
  - Vincristine–from Periwinkle.

- **Unsafe herbs – see chart below**
  - If these herbs are ingested, call the local poison control center.
  - Advise people to avoid ingesting these herbs.
  - **A chart of safe herbs has not been included because information changes quickly. Instructors are advised to consult current, accurate information.**

8. Herbs That Are Not Safe

These herbs are always poisonous. If ingested, call the poison control center in your area.

Herb Official Name	Common Name
Aesculus hippocasteranum	Buckeye, horse chestnut
Arnica Montana	Wolfsbane, mountain tobacco
Artemisia absinthium	Wormwood, madderwort, absinthium, mugwort
Atropa belladonna	Deadly nightshade
Conium maculatum	Hemlock, spotted parsley, St. Bennet's herb
Lobelia inflata	Indian tobacco, asthma weed, emetic weed
Vinca major, vinca minor	Periwinkle, vinca

9. Fat-Soluble Vitamins

Fat-Soluble Vitamins

Vitamin (Generic)	Trade Name	Activity in health	Food sources	Deficiency symptoms	Excess or overdose
Vitamin A (Retinol)	generic	Promotes healthy night vision, cornea, skin cells, normal growth of bones & teeth, immunity	Whole milk, milk products, eggs, butter, leafy green & yellow vegetables, liver, fish, fortified foods	Night blindness, dry skin, lowered resistance to infection, corneal changes, growth retardation, fetal malformation	Mild: nausea, vomiting, abdominal pain. Severe: growth retardation, liver and spleen damage, hair loss
Vitamin D (cholcalciferol, ergosterol)	generic	Maintains healthy bones and teeth, regulates calcium metabolism	Fortified foods (milk and other dairy products), sunlight, liver, fish	Rickets (a mal-formation of the long bones in children), osteomalacia in adults (a loss of calcium from the bones), muscle twitching & spasm	Weakness, headache, anorexia, weight loss, nausea & vomiting, hypercalcemia, kidney stones
Vitamin E (tocopherol)	generic	Antioxidant, especially of dietary fatty acids	Green leafy vegetables, whole grains, wheat germ, vegetable oils, nuts, seeds, liver, milk, eggs, cereal	Rare. Breakdown of RBCs	Nausea, vomiting, headache, lethargy, increased bleeding
Vitamin K	generic	Necessary for the formation of prothrombin (an ingredient in blood clotting)	Vit. K is created by normal flora (bacteria) of the intestinal tract. Also found in cabbage, cauliflower, liver, egg yolks, leafy vegetables	Inability of the blood to clot within a normal time period, may cause hemorrhage in newborns	Nausea, vomiting, headache, blood clots formation in adults, anemia & jaundice in neonates

10. Water-Soluble Vitamins

Vitamin (Generic)	Activity in health	Food sources	Deficiency Symptoms	Excess or overdose
Vit. B-1 (thiamine)	Normal heart function, carbohydrate metabolism, and normal conduction of nerve impulses	Whole grains, especially wheat germ, meat, especially pork and liver, fish, raw vegetables, peas, beans, nuts, peanuts, eggs	Tingling in extremities, fatigue, sensitivity to noise, neuritis, muscle weakness, confusion, paresthesia of toes or feet	Pruritus, rapid heart beat, headache, restlessness, insomnia, GI upset
Vit. B-2 (riboflavin)	Normal body metabolism, and various tissue respiration systems	Dairy products, whole grains, enriched flour, organ meats, chicken, nuts, legumes, green leafy vegetables	Dermatitis, stomatitis, fatigue, eye inflammation, cracks at the corners of the mouth	Rare, easily eliminated from the body
Vit. B-3 (Niacin, nicotinic acid)	Metabolism of lipids (fats) and proteins	Green leafy vegetables, meat, fish, eggs, fish, milk, peanut butter, whole grains, soybeans	Pellagra: dermatitis, sore tongue, weakness, memory loss	GI upset, flushing, pruritus, headache, nausea, diarrhea
Vit. B-6 (pyridoxine)	Formation of RBCs, metabolism of all nutrients	Bananas, green leafy vegetables, potatoes, lima beans, whole grains, meats, fish, eggs, legumes	Rare. Nausea, depression, dermatitis, anemia, increased susceptibility to infection	Paresthesias, sleepiness, numbness of feet and unstable gait, headache, bloating
Folic Acid (folacin, folate)	Helps with the formation of normal pregnancy, body proteins and genetic material, helps with the production of red and white blood cells	Raw fruits and vegetables, (especially broccoli, asparagus, and corn), whole grains, foods made with yeast, legumes	Anemia, weakness, fatigue, irritability, cold intolerance	Masks symptoms of pernicious anemia, irritability, diarrhea
Vit. B-12 (cobalamin)	Needed for the functioning of the nerves, and for formation of RBCs	Animal product sources: seafood, egg yolk, cheese, milk, oysters, yogurt, meat	Pernicious anemia, pallor, neuropathies, sore tongue, psychosis	Hives, itching, diarrhea, edema, thrombosis, low potassium levels

Vitamin (Generic)	Activity in health	Food sources	Deficiency Symptoms	Excess or overdose
Vit. B-5 (Pantothenic Acid)	Formation of RBCs, cell metabolism, hormone production	Meat, whole grains, nuts, a wide variety of foods	Rare. Anemia	None known
Vit. H (Biotin)	Aids in the use of protein, folic acid, Vit. B-5 and B-12, assists with fatty acid production	Egg yolk, liver, brewer's yeast, peanuts, cauliflower, mushrooms	Rare, it is synthesized by bacteria in the GI tract, but can be caused by eating raw eggs over a long time. Symptoms can include scaly dermatitis, grayish pallor, lethargy, anorexia, muscle pains, insomnia	None known
Vit. C (Ascorbic acid)	Needed for the formation of collagen, so helps with wound healing, supports blood vessels, maintains health of teeth and bones	All citrus fruits, strawberries, pineapple, cabbage, green peppers, cantaloupe, broccoli, Brussel sprouts, tomatoes	Scurvy: malaise, fatigue, pain in joints, bleeding gums, wounds that will not heal, petechiae, bruising	GI upset, headache, fatigue, skin flushing, kidney stones, thrombosis

11. Macrominerals

Macrominerals: Minerals with a daily requirement of 100 mg or more; can dissociate in water and become electrolytes, or solutions that are electrically charged.

Macro-mineral	Activity in health	Food sources	Deficiency symptoms	Excess or overdose
Sodium	Maintains acid-base balance, controls fluid balance, regulates nerve, heart and muscle activity	Abundant in most all foods−beef, cheese, canned or prepared foods	Hyponatremia: cold clammy skin, decreased skin turgor, apprehension, confusion, irritability, anxiety, hypotension, orthostatic hypotension, tachycardia, headache, tremors, convulsions, abdominal cramps, nausea, vomiting	Hypernatremia: fever, hot skin, dry sticky mucous membranes, rough dry tongue, edema, weight gain, intense thirst, excitement, restlessness, agitation, decreased urine production
Potassium	Muscles activity, nerve transmission, intracellular acid-base balance, water retention. Diuretics can deplete. No storage; must replace daily	Meat, whole and skim milk, bananas, prunes, raisins, fresh vegetables (potato), fresh fruits,	Hypokalemia: anorexia, nausea, vomiting, mental depression, delayed or impaired thought processes, muscle weakness, fatigue, flaccid paralysis, weak irregular pulse, leg cramps, serious ECG changes, irregular heartbeat	Hyperkalemia: anxiety, irritability, mental confusion, nausea, diarrhea, abdominal distress, weakness & heaviness of the legs, hypotension, flaccid paralysis, serious ECG changes, irregular heartbeat
Calcium	Bone & tooth formation, blood coagulation, neuromuscular irritability, muscle contractility, myocardial conduction.	Milk and milk products, fish, eggs, cereal products, leafy green vegetables, beans, fruits	Hypocalcemia: hyperactive reflexes, muscle twitching, & cramps, tetany, cardiac arrhythmias, nausea, vomiting, anxiety, confusion, osteoporosis in adults	Hypercalcemia: kidney stones, loss of tone in GI tract, psychosis, increased thirst & urination, muscle weakness, cardiac arrest

Macro-mineral	Activity in health	Food sources	Deficiency symptoms	Excess or overdose
Magnesium	Bone & tooth formation, nerve conduction, muscle contraction, enzyme activation	Green leafy vegetables, whole grains, nuts, legumes, seafood	Hypomagnesemia: neuromuscular irritability, leg and foot cramps, disorientation, hallucinations, paresthesias, convulsions	Hypermagnesemia: hypotension, respiratory failure, cardiac disturbances
Phosphorus	Bone & tooth formation, acid-base balance, component of nucleic acids, energy production	Meat, fish, milk and dairy products, poultry, whole grains, nuts, legumes	Hypophosphatemia: irritability, weakness, blood cell disorders, GI tract and renal dysfunction, bone pain, pathological fractures	Hyperphosphatemia: loss of calcium from the bone, renal failure & kidney stones, GI upset

12. Microminerals

Microminerals: Minerals with a daily requirement of less than 100 mg; also called "trace minerals."

Micro-mineral	**Activity in health**	**Food source**	**Deficiency symptoms**	**Excess or overdose**
Iron	Hemoglobin & myoglobin formation, vitamin synthesis	Soybean flour, organ meats, beans, clams, peaches, grains ***Not in dairy products***	Anemia, dysphagia, pallor, weakness & fatigue, lowered resistance to infection	Taking iron in any amount can cause constipation, black stools, skin pigmentation, nausea, vomiting
Zinc	Component of enzymes that digest food, skin integrity, wound healing, growth	Sea food, meat, liver, poultry, legumes, (plant sources variable in bioavail-ability)	Growth retardation, cirrhosis, skin outbreaks or poor healing	Decreased calcium absorption from the GI tract, diarrhea, fever, muscle pain, nausea, vomiting
Copper	Enzyme component, helps form RBCs	Organ meats, shellfish, dried legumes, whole grains, raisins	Anemia in malnourished, demineralized bones, softening and fractures	GI upset, dizziness, headache
Iodine	Thyroxine (T4) & triiodothyronine (T3) formation, energy-control mechanisms, thyroid health/function	Seafood, iodized salt, dairy products, water, additive in many commercial foods	Simple goiter, cretinism, deaf-mutism, impaired fetal growth & brain development	Hyperthyroidism, myxedema, causes dangerous changes in metabolism

Unit 23. Administration of Medications--Preparing to Administer Medications

Objectives

1. **Identify ways in which medications are supplied to the nursing home.**
2. **Describe unit dose and multiple dose packaging of medications.**
3. **Explain proper storage of medications, biologicals, equipment and supplies in the medication room, nurses room or work area, medication cart and resident's bedroom.**
4. **Know how to dispose of unused medications.**
5. **Know who may receive medication orders and how they are received and recorded. Know how to check medication orders. Understand automatic stop orders, standing orders, PRN and STAT orders.**
6. **Explain the responsibility of the medication aide in questioning medication orders, including what to do if the order is not clear or legible.**
7. **Discuss methods for ordering medications from the pharmacy.**
8. **Explain how a Kardex, medication cards, and a Medication Administration Record (MAR) are used to communicate medication orders. Demonstrate how to document administration of a medication. (Documentation is also covered in Unit 24.)**
9. **Know general guidelines for medication preparation. Throughout unit, identify potential sources for errors.**
10. **Identify and demonstrate specific techniques to administer medications using the "Seven Rights" of medication administration including techniques for specific forms of medications. (Note change from previous 5 Rights. Material added to aid in accurate administration.)**
11. **Know techniques specific to liquid, crushed and controlled medications.**

Content

Note: Reference the following regulations throughout this unit.
KAR 26-39-431
KAR 26-41-205
KAR 26-42-205
KAR 26-43-205
KAR 28-39-156

1. Medication Supply

- Medications may be supplied in several ways. All medications must be clearly labeled. If labels are loose or illegible the pharmacist should be notified.

- Prescription medications are supplied to the facility by a licensed pharmacy. Over the counter medications (OTC) can be brought to the facility and administered by authorized facility staff as long as the requirements are followed:
  KAR 28-39-156(b)(3)
  KAR 26-42-205(g)(3)
  KAR 25-43-205(g)(3)
  The container must be unopened and in the original package. A licensed nurse or pharmacist shall place the resident's full name on the package.

2. Medication packaging

- Single Unit dose–each dose is individually packaged and labeled.
  - Each single-dose package contains the proper dose for one administration.
  - Each dose is labeled with the medication name, strength, expiration date, and in some instances, the resident's name.
  - Requires little handling and usually there is no special preparation before administering the medication to the resident.
  - This method of unit dose is usually found in hospital-based units. It is seldom used in other long-term care settings, except for emergency medications.

- Multiple Unit Dose–each dose is individually packaged on a card which can contain the doses of a specific medication or medications for a week or a month. The term commonly used for this method of packaging is a **bubble pack**. Another form of packaging may be a cartridge.
  - Multiple doses of a medication are placed in plastic "bubbles" or affixed in a cardboard container.
  - The label on each bubble pack card must contain the following information:
    - Resident's full name
    - Name of prescribing practitioner
    - Prescription number
    - Date prescription was filled
    - Directions for administration including dosage and time frame for administration for each medication
    - Brand name or generic name of medication(s)

- Any precautions or special instructions
- Expiration date

- The label on the bubble pack should match the physician's order and the information on the Medication Administration Record (MAR).
- Unused doses still in the packaging may be returned to the pharmacy for credit if facility and pharmacy policies allow. Unused doses of controlled medications cannot be returned to a pharmacy. This is a Drug Enforcement Agency (DEA) requirement.
- This type of packaging decreases opportunity for error in administration.

➢ Multiple dose packaging–this system is used when an individual purchases a prescription at a pharmacy or medications are provided by the Veterans' Administration. The container or tube must be labeled with the same information listed above for multiple unit dose packaging.
- These medications require more handling.
- More chance for error.
- Unused doses cannot be returned to the pharmacy for credit.

➢ Stock Supply–bottles of over the counter medications. See KAR 28-39-156(b)(3) for proper handling of these medications.
- The proper bottle and dose must be selected by the person administering the medications.
- Has the greatest potential for error.
- Nursing facilities which participate in the Medicaid program are required to provide selected stock medications to Medicaid recipients.

3. Medication Storage–medications can be stored in several ways. Note proper storage of controlled medications.

➢ **Medication cart**
- Frequently used for storage of unit dose medications.
- Doors or drawers must be kept locked when the nurse or medication aide is not within eyesight of cart.
- Cart can be wheeled from room to room.
- Sections in the drawers may be divided to hold routine doses and PRN medications.
- A special locked drawer holds the controlled medications–Schedule II, III, IV. It is re-locked immediately after taking a dose out of the drawer.
- When controlled medications are removed from the separately locked, controlled medication compartment, the nurse or medication aide administering the medication must complete the documentation required by the facility. Each facility must have a system for accounting for the receipt and disposition of controlled medications. It is the responsibility of each nurse or medication aide to report any misuse of controlled medications to the facility administrator or operator.
- Some controlled medications can be placed in multiple unit dose systems. This is usually done with medications such as Tylenol #3 and Valium. The number of medications is limited and doses administered can be accounted for. Controlled medications such as Lortabs, Dilaudid and

Morphine are usually stored in the locked controlled medication drawer in a cart or in the medication room. A documentation system must be used to account for the number of medications received from the pharmacy for each resident. A record is maintained of when the medications are removed for administration to the resident. These records should correlate with the Medication Administration Record.

- A folder or notebook on top of the cart holds the Medication Administration Records (MAR) for each resident.

- **Medication room**
  - Storage for stock medications and supplies.
  - Only personnel who are authorized to administer medications may have access to the keys to the medication room, medication cart or medication storage areas. In nursing facilities, the licensed administrator may have access to the medication room keys. See the following:
    KAR 28-39-156(d)(2)
    KAR 26-41-205(h)(1)
    KAR 26-43-205(h)(1)
  - This room is usually located near the nurse's station in nursing facilities. Assisted living and other residential-type facilities and adult day care are required to have an area where medications can be safely stored. **See regulations for the type of facility.**
  - Medication rooms contain a sink, a refrigerator, and cabinets for storage of medications.
  - The medication room in a nursing facility must contain a locked cabinet for controlled substances.
  - Stock medications–shared by many residents–are stored in a specific drawer of the medicine cart or in a specific cabinet in a medication room or nurses station. Stock supply medications can be in bottles for individual residents or in bottles from which doses are dispensed for several different residents. Aspirin, Tylenol, milk of magnesia and stool softeners are examples of stock medications.
  - An emergency medication kit may be maintained in all types of adult care homes. The emergency medication kit must be in compliance with pharmacy regulations found at KAR 68-7-10(d). Medication aides must have permission from a licensed nurse to administer medications from the emergency medication kit. The facility should have a written policy and procedure for use of the emergency medication kit.
  - All topical medications must be in a separate cabinet, box or drawer from the oral medications.
  - Medications commonly stored in a refrigerator include insulin, suspension of antibiotics and suppositories. Only food used for administration of
  - medications or tube feeding formulas may be stored in the medication refrigerator.
  - The temperature in the medication room must not exceed 85° F. Heat can destroy the effectiveness of medications.
  - Cabinets in the medicine room should be closed when not in use. Many medications break down chemically when exposed to light. These

medications are usually packaged in brown or colored bottles.
- To prevent medication errors, keep the medication room and medication storage areas in the nurses station and resident's room clean and tidy at all times.

- **Medication tray**
  - A way to carry medications about the facility.
  - May be flat, with medicine cups placed next to small medication cards.
  - May be molded with recesses for holding cups and cards.
  - If the medication tray is placed on a surface other than in the medication room, the tray must be washed with soap and water and dried before returning it to the medication room.
  - All medications must be identified to point of administration. For medications removed from a package or container with the prescription label, a medication card must be used which contains the resident's name, the name of the medication, the route of administration, special instructions for administration and time of administration. This card must be checked against the MAR before administering the medication to a resident.

4. Disposing of unused medications

- Unused doses of medications are never returned to the stock supply bottles or multiple dose containers when refused by the resident.

- Each facility is required to have policies and procedures for disposal of discontinued medications or medications not used by a resident following discharge. Follow facility regulations.

- Leftover medications in bottles or cards of unused unit dose medications must be placed in a safe area until they are disposed or returned to a pharmacy according to facility policy. In nursing facilities, disposal of unused medications is performed by a pharmacist. In other adult care facilities, disposal of unused medications is performed according to appropriate regulation.

- KAR 26-41-205
  KAR 26-42-205
  KAR 26-43-205(i)(2) specifies who can destroy meds in the residential homes.

- In a residential adult care home, i.e. assisted living, residential health care, homes plus, or adult day care, a medication aide may destroy or witness destruction of a medication with a licensed nurse or a licensed pharmacist. In a nursing facility, a CMA may not destroy medication or witness destruction of medication.

5. Checking the medication order

- Medication orders are recorded on the resident's chart by an ordering practitioner who may be a physician, advanced registered nurse practitioner (ARNP), a physician's assistant (PA), or dentist.

- A licensed nurse may receive a verbal order from a physician, ARNP or PA. The verbal order must be recorded in duplicate by the nurse receiving the order. The duplicate copy is placed on the resident's clinical record. The original copy of the verbal order is sent to the ordering practitioner for signature, returned to the facility and placed on the resident's clinical record. The duplicate copy of the verbal order is then removed from the record.

- A medication aide **may not** take a verbal order from a physician, ARNP or PA. In facilities without a licensed nurse on duty 24 hours a day, seven days a week, the medication aide must contact the licensed nurse on call. The licensed nurse will contact the physician, ARNP or PA, obtain the order, record the order and give the medication aide verbal or written instructions for administration of the medication. The medication aide must record the phone call to the nurse and the directions provided by the nurse in the resident's clinical record. The nurse must also record the directions given to the medication aide in the resident's clinical record on the next visit to the facility.

- Verbal orders must be signed by the ordering practitioner and returned to the facility within seven days of the date of the order.
  Follow regulations:
  KAR 28-39-156(b)(4)
  KAR 26-41-156
  KAR 26-42-156
  KAR 26-43-205

- Medication orders should–
  - Be recorded on resident's clinical record by the ordering practitioner, or recorded on a prescription form, or on a verbal order form.
  - Include date of the order–including time of the order. Some physicians and facilities use "military time." **Correctly use military time.**
  - Name of the medication. May state that a generic equivalent may be used.
  - Identify the dosage–including the amount of the medication and the strength, when and how often, if the order is for a limited number of doses or to be used as a PRN (whenever necessary) basis.
  - Identify the route of administration.
  - Reflect the physician's, ARNP's, PA's, or dentist's, signature, or the nurse's signature who took the verbal order.
  - Describe administration instructions.
  - Specify the time of day for administration of a medication if indicated.
  - Antibiotics are usually ordered for a specific number of doses.

- **Standing orders** may be used for over the counter medications and treatments given for specific situations. Standing orders must be signed by the resident's attending physician before a medication can be administered. A copy of the signed standing order must be on the resident's clinical record. A licensed nurse must be involved in the decision to implement a standing order. A medication aide **cannot make the decision** to implement a standing order.

- **PRN**–to be given whenever necessary. Ordering practitioners may write a PRN order for a medication or treatment. The order must contain specific parameters for implementing the order. The order must include the name of the medication, the dosage and specific reasons for administration. An example would be: "Tylenol #3 every 6 hours for pain at incision site." If the resident requests medication for a headache, the Tylenol #3 should not be administered as the site of the pain is not covered by the order. Medication aides may not administer PRN medications which require an assessment. For example, a medication aide could not administer a PRN medication order for Ativan PRN for agitation. Standard of practice is for a nurse to assess the resident and decide the best method for reducing the resident's agitation. The medication aide would need to call a nurse for instructions.

- **STAT** orders–medication is to be administered as soon as possible. STAT orders must be implemented under the direction of a licensed nurse. Source of medications for STAT orders is usually the emergency medication kit.

6. Questioning a medication order

- It is your right and your duty to check any order with a nurse when the prescription label is unreadable or you are unsure of the order.

- **Never** administer a medication when the directions on the MAR and/or medication package are not clear. Ask a licensed nurse for assistance.

7. Ordering medications from the pharmacy

- Each facility will have a policy and procedure for ordering medications from a pharmacy.

- If the medication order is sent directly to the facility, a licensed nurse must review the order and transmit the order to the pharmacy.

- Medication aides may reorder medications if the facility's policy allows.

- The licensed nurse is responsible for notifying a pharmacy of a new order.

- Some facilities prefer to fax the original physician/ARNP/PA/dentist order to the pharmacy. Re-faxing a faxed order from a physician can be problematic, as the order may not be legible. Decimal points may fade. This can cause a major error in dispensing and administration of some medications. The safest method is to send the pharmacy a carbon copy of the physician's original written order. There is no recopying and less chance for error.

- Pharmacy delivery schedules will vary. Be aware of the delivery policies of the pharmacies serving the facility. Out of town pharmacies will have difficulty delivering stat medications. Usually an arrangement is made with a local pharmacy or hospital to provide stat or other medications needed before the next scheduled delivery. The licensed nurse managing the medication order should be aware of the policy.

- Routine refills are done about every two weeks or monthly in nursing homes which use a unit dose system.

- The facility should have a policy and procedure for reordering medications. Most facilities keep a record of pharmacy reorders to avoid duplication of orders.

8. Medication documentation system

- The facility is required to **ensure that each medication and treatment is recorded** when administered according to the physician/ARNP/PA/dentist's order. Most facilities use a document called a Medication Administration Record. A procedure for completing the MAR should be available. It is the responsibility of the medication aide to review this policy and ask for assistance from a licensed nurse.

- The MAR is a legal document and must be completed accurately. All medications and treatments must be recorded during the medication aide's time on duty. If the medication aide fails to record a medication or treatment, a late entry must be entered in the resident's clinical record.

- Medication cards–used less often today because of the unit dose system. Medications cards may be needed when stock medications or medications in multiple dose packaging are used.
  - Orders must be copied from the physician's order sheet and MAR onto small cards for each medication.
  - Cards must be checked for accuracy before each dose, by comparing them to the Kardex or the MAR.
  - Medication cards must be legible. If a card is damaged so that it is difficult to read, the card must be recopied. The person recopying the card must use the original ordering practitioner's order and MAR as the source for the information recorded on the medication card. A medication aide may perform this function.

- **Medication Administration Record (MAR)** The MAR provides a method for recording the administration of medications to residents by facility by licensed nurses and medication aides.
  - The MAR must contain the name of the resident and other information, such as room, as defined by facility policy.
  - Each medication order is recorded as written by the physician, dentist, ARNP or PA.
    - The name of the medication, dose, time medication is to be administered, and any specific instructions related to administration.
    - The pharmacist may add additional information to the label for the medication container. An example would be the brand name along with the generic name of the medication dispensed. There may be precautions such as administering the medication with food, before meals, avoiding dairy products, etc. This information should be

recorded on the MAR.
- A licensed nurse may add nursing instructions, when appropriate.

- The MAR will have space to record all medications administered for a week, two weeks, or a month.
- Medications given on a routine schedule are usually listed first on the MAR with PRN medications below. Each facility should have a written policy for recording information on the MAR.
- There are three acceptable methods for recording the administration of medications on a MAR when a unit dose system is used.
- **First method:**
  - Remove the unit dose package or card from the storage compartment, check the information on the package or card with the information on the MAR.
  - Place the unit dose package(s) in a medication cup or punch out each medication from the unit dose card and place in a medication cup. Several medications which are to be administered at the same time may be placed in the medication cup.
  - Take the medication to the resident and administer as ordered. The medication aide must observe the resident swallow the medication or apply the medication as ordered. Never, under any circumstances, leave a medication cup with a resident without observing the resident taking or applying the medication.
  - Return to the location of the MAR and place an identifying initial in the boxes related to the medications administered and time administered.
- **Second method:**
  - Same as the first, except the medication aide sets up the medications for one resident and initials the MAR before administration. If the resident does not take the medication, the medication aide circles their initial and records on the back of the MAR or in the interdisciplinary notes the reason the resident did not take the medication.
- **Third method:**
  - The medication aide sets up the medications for a group of residents. Medication cards are available for each different medication. Medication is placed in a medication cup and the appropriate medication cards are placed on the tray in a slot or under the cup.
  - Administration of the medications is recorded after the medications are administered, using the medication cards as the resource for recording.
- MARs for the current time period are usually kept in a notebook on top of the medication cart or in the medication room or area. The MAR contains confidential clinical information. Staff members who do not administer medications should not have access to the MAR.
- Medications to be administered for a limited time or subject to automatic stop orders should be identified on the MAR according to a written facility policy.

- After administering a PRN medication, the medication aide will record the dose on the MAR. The medication aide will also record the reason the medication was administered and later record the resident's response to the medication. In some facilities this documentation will be placed on the back of the MAR, and in other facilities the documentation will be placed in interdisciplinary progress notes. Follow documentation policies for the facility.

9. Medication preparation or "set up"– general guidelines

- The medication aide must **know the expected effect, adverse consequences, and, if needed monitoring** of each medication before administration. Each facility should have a **nursing medication manual** available to staff. If the medication aide is unfamiliar with the medication and cannot find it in a resource, he or she should **contact a licensed nurse** for that information. The nurse may contact the pharmacist or physician for information. A Physician's Desk Reference does not include all the information necessary for safe administration of medications.

- **Clear your mind of all distractions; concentrate, do not allow people to talk with you while you are setting up medications.**

- **Prevent transfer of infection.**
  - Wash your hands before setting up medications. If, during administration of medications, you touch a resident's mucous membrane or an area which contains infected material, the medication aide must immediately wash his/her hands again. It is not necessary to wash hands between each resident. Follow facility policy with regard to handwashing.
  - Avoid touching the medication. Medications can be punched out of unit dose systems into a medication cup without touching. When applying topical medications, handwashing should be done before and after administration. In some facilities, disposable gloves will be used when administering topical medications. Hands must be washed after the removal of gloves. For example, if two residents are to have eye drops administered, the medication aide should wash hands and don gloves before instilling eye drops in the first resident's eyes. The gloves would be removed and placed in a waste basket or container and hands washed again. A second pair of gloves should then be donned, eye drops instilled in the second resident's eye, gloves removed and hands washed.
  - Clean the medication tray and the top of the medication cart after each use.
  - Keep the medication tray in a clean area while passing medication.
  - Do not leave medications on the top of an unattended medication cart.
  - See also unit 3.

- **The environment should promote safety.**
  - There should be plenty of lighting so that labels can be read accurately.
  - It should be free of distractions and interruptions. The medication aide must concentrate on accuracy.
  - The area should be kept neat, orderly and clean.

- **Safety checks help prevent errors.**
  - Read the label three times.
    - When removing the medication package from a drawer, shelf or tray.
    - When pouring the medication or removing it from the dose container.
    - When returning the container to the shelf, drawer or tray.
  - **Never** administer a medication that has fallen on the floor. Discard the medication. Check to see if there are enough doses available until a new supply is delivered by the pharmacy. Many facilities require another person to witness the discarding of medications.
  - Check the expiration date. Note if there is a change in color, smell or texture of the medication. Report any irregularities to licensed nurse.
  - To cut a tablet in half, place it on a clean paper towel and use a clean knife edge or a pill cutter to cut it along the scored line. Instructions to cut a tablet in half should be recorded on the MAR. Only tablets which are scored may be halved.
  - If taking a pill or capsule from a stock bottle, pour it first into the cap of the bottle, then into the medicine cup.

10. Always follow the "7 Rights" of Medication Administration. (Note addition of 2 rights to 2010 curriculum revision)

1. Right resident--always make a positive identification of the resident. Know 3 ways to identify residents.
   - Read the identification wristband.
   - Ask resident to state his or her name.
   - Ask a family member or another staff member for a positive identification.
   - Compare the picture of the resident on the MAR with the resident.
2. Right medication
   - Give medications only from correctly labeled containers.
   - Keep medications in unit dose packages until ready to use.
   - Give only medications that you have set up. Never give medications prepared by someone else.
   - Read the label three times.
   - Make sure label on medication container matches exactly with the physician's order recorded on the MAR.
   - Never leave the medicine tray or medication cart unattended.
   - Watch carefully for medications with names that are similar, for example, Ornade and Orinase.
   - Graciously recheck any medication that the resident thinks is wrong or shows hesitancy, puzzlement, or questions the medication.
3. Right dose
   - Read the label carefully and compare it to the physician's order recorded on the MAR.
   - Know correct abbreviations and have an understanding of various units of measurement.
   - Medication aides must never calculate the correct dosage of a medication.

If the dosage requires calculation, contact a licensed nurse. The dosage information on the MAR should provide specific information related to the dose to be administered.
- Use the correct device for measuring doses.
- Stay with the resident until all the medication is ingested or applied.
- Help resident take the full dose by being patient while they are taking the medications. Offering water before offering oral medications may assist the resident in swallowing.
- A licensed nurse or a pharmacist must make the decision to crush a medication, open a capsule or cut a tablet to assist residents in swallowing medications. This information must be recorded on the MAR.

4. Right route
   - As ordered by the physician.
   - Know correct abbreviations for routes.
   - Notify the licensed nurse when a resident has difficulty swallowing a medication. The nurse should contact the pharmacist and the resident's physician concerning alternative forms of the ordered medication.
5. Right technique
   - Know the technique that is appropriate for administration of the medication. If necessary, review the technique before administering the medication.
6. Right time
   - Know correct abbreviations for when medication is to be given.
   - Medications to be given on empty stomach should be given 1 hour before, or 2 hours after meals.
   - Medications may be ordered to be given before meals (ac), with food or after meals (pc). Medications ordered ac and pc can be given within 30 minutes of the scheduled time.
   - Routine medications are to be administered within a hour before or an hour after the scheduled time unless there are specific instructions ordered by the physician. Medication for treating Parkinson's disease must be administered in very specific time frames. Effort must be made to administer these medications as close to the ordered time frame as possible and not more than 30 minutes before or after the scheduled times. This is very important to maintain needed blood levels of the medication.
   - If the clock time is not specified on the MAR, a CMA must refer to the facility policy to determine the actual time period the medication may be administered. A CMA cannot make the decision for the time administration of a medication that requires nursing judgment.
7. Right Documentation. Record the following: (Documentation is covered in-depth in Unit 24.)
   - Date and time medication was given.
   - If an event for the administration of the medication is listed instead of a clock time, i.e. AM or upon arising, the actual clock time the medication was administered must be documented on the MAR.
   - Name of medication.
   - Dose administered.
   - Route of administration.

- Name of person administering medication.
- Regulations allow documentation before or after administration. Follow facility policy.
- Documenting before administration helps prevent blanks on MARs and allows CMA to double check for right medication and right dose. If documenting before administration, and resident refuses medication, circle your initials and document that it was refused. If documenting after administration, be sure to document immediately and accurately.

11. Techniques specific to medications–setting up methods.

- **Liquid medications**
  - Pour away from the label. Do not allow spills or drips to obscure the label.
  - View the medication cup at eye level.
  - Read the level of the medication from the bottom of the meniscus or curve of the liquid surface.
  - Recap all bottles tightly after wiping off the neck with clean wet paper towel.

- **Crushing medications**
  - Enteric coated and sustained-release forms of medications cannot be crushed or removed from capsules for administration.
  - The decision as to whether a medication can be crushed is made by a licensed nurse or pharmacist.
  - Use a mortar and pestle or pill-crusher.
  - Make sure that equipment is not damp and it is free of residue from other medications.
  - Capsules can simply be opened and poured out.
  - Mix with food or liquid only if indicated and it is appropriate for that medication.
  - Mix only with food appropriate to resident's diet. Mix with minimum amount of food to assure that resident consumes all of medication. Mix with food right before administering.
  - Applesauce, cottage cheese, pudding, yogurt, pureed foods are commonly used because they are easy to swallow. Be aware of food-medication interactions, such as dairy products should never be used with tetracycline. A licensed nurse should indicate on the MAR, the food product to be used with the medication.

- **Controlled medications**
  - Narcotics, stimulants and anti-depressant medications require special record-keeping.
  - The medication aide must follow the policy and procedure of the facility in recording the use of controlled medications.

Unit 24. Administration of Medications–Recording Medication Administration

Objectives

1. **Identify general guidelines to follow in recording medication administration.**
2. **Describe the content of a resident's clinical record.**
3. **Accurately document activities related to administration of medications and treatment. Review documentation using MAR. (See also Unit 23.)**
4. **Describe the principles of clinical documentation. Demonstrate the medication aide's responsibility to document in progress notes.**
5. **Identify principles of documentation.**
6. **Identify appropriate response and documentation for the specific situations listed.**

Content

1. General guidelines (See also 7 "Rights" in Unit 23.)

- Document clinical information according to facility policy.
  - Prior to administering medication
  - After administering medication

- Write clearly using ink.

- Initial or sign all documentation according to facility policy.

2. The resident's clinical record. (Note that the record is a legal document.)

- A permanent record of care received and the resident's response to that care.

- A form of communication among members of the health care team.

- A legal document that can be subpoenaed by a court of law.

- Organization and forms used for documentation will vary between facilities.
  - Examples:
    - ✓ Documentation by exception
    - ✓ Focus charting
    - ✓ Computerized clinical records

3. The Medication Administration Record (MAR) (See also Unit 23.)

- Clinical record of medications administered to a resident.

- MAR contains name of medication, dose, route of administration, and the time the medication was administered.

- Licensed nurses may choose to add additional nursing directions for administration on the MAR. Examples would be to crush medication or to take blood pressure before administration.

- MAR may also contain monitoring required before administering a medication, i.e. check pulse, blood pressure, adverse consequences of medication, and resident's diagnosis or condition for receiving the specific medication.

4. Progress or interdisciplinary notes - a narrative form of documenting symptoms, behavior, and other pertinent information.

- Progress notes could include a record of the resident's response to a medication, identification of possible side effects, and a record of the medication aide's oral or telephone reports to supervising licensed nurse. The medication aide should record the reasons a resident did not receive a medication. When a resident is given a PRN medication, the response to that medication should be documented.

5. Principles of documentation (Note documentation of errors and corrections.)

- Record information in the correct resident's chart.
- Check the prescription label with the order recorded on the MAR.
- Follow facility policy for charting medications either before or after administration.
- Be specific–make sure all seven rights get documented. (Note change from previous five rights.)
- Record only facts. Record only those things you observed, heard, or performed.
- Record events in the order that they occurred.
- Write D/C after the last dose of a med has been given, and cross out any remaining scheduled times according to facility policy.
- Do not skip lines or leave empty spaces on a page of interdisciplinary notes.
- If you make an error, do not erase it. Place ONE line through the error, and initial and date above the line, then continue writing the rest of your charting. NEVER erase or use white-out or obliterate by repeated marking over. Make sure the error is still readable after you correct it.
- Never use ditto marks.
- Always use correct terminology and facility approved abbreviations.
- It is recommended that a black pen be used to record in a resident's chart. Some facilities may have policies to record evening progress notes in green ink and night progress notes in red ink. Follow facility policy.
- Always print or write legibly. Identify charting with date, time and your name and title.
- Chart anything that seems important to you in regard to medications.
- Consult the supervising nurse and facility policy about charting procedures.
- All information recorded in a resident's clinical chart must be kept confidential. Access to clinical records is restricted by law. Follow facility policy.

6. Specific situations

- Medication not given at scheduled time, refused by the resident, or "held".
  - Circle the scheduled time on the MAR and initial.

- Record in the interdisciplinary notes or on the back of the MAR the reason the medication was not administered.

- PRN and STAT medications
  - Chart on the MAR according to facility procedure.
  - Record the reason the medication was administered including pertinent observations of the resident prior to and after administration of the medication in interdisciplinary notes.
  - Always report PRN and STAT medication administered to the oncoming staff in the shift change report.

- Medication errors
  - Wrong drug to resident.
  - Wrong dose to resident.
  - Wrong route to resident.
  - Wrong time for medication.
  - Reporting error to licensed nurse immediately is crucial so that necessary remedial measures may be taken.
  - Complete a medication error report form or incident report, according to facility policy.
  - Review why the error occurred, and evaluate how you can avoid making the error again.

Unit 25. **Administration of Medications−Administering Medications to the Elderly.** This unit contains some new material, but also includes review of major points of medication administration to the elderly. Performance evaluations are in appendices.

Objectives

1. **Define Gerontology.**
2. **Define Geriatrics.**
3. **Describe the major changes that take place in the various body systems during aging.**
4. **State why treatment of elderly residents must be individualized according to each person's needs. Identify changes in individual body systems in elderly residents.**
5. **Describe issues regarding pharmokinetics and aging, including effects of aging on absorption, distribution, metabolism and excretion of medications. Explain how medication orders are usually adjusted to take into account the pharmacokinetics of the older resident, why the presence of more diseases in old age makes drug therapy more complicated, and what types of adverse reactions health care workers must look for in administering medications to elderly residents.**
6. **Explain how elderly residents are affected by the attitudes and actions of health care workers.**
7. **Review safe medication administration practices and the principles that are specific for the elderly resident. Explain how you can overcome the difficulties of administering medications to the elderly. List ways in which residents can take an active part in their own medication therapy.**
8. **Review preparation for administration of medications to the elderly. See also Unit 23.**
9. **Review identification of resident and administration of medications to the elderly. See also Unit 23.**
10. **Review, identify and demonstrate methods of safe and effective drug administration by the specific routes listed.**
11. **Review curriculum and demonstrate the use of standard precautions when administering medications.**
13. **Review curriculum and correctly identify, use and write abbreviations for medication forms, routes, administration times and general medical abbreviations. Correctly use military time.**

Resources
Measurements

See Appendix - Medications and the Elderly
See Appendix - Report: Placebo effect not found in many studies
See Performance Evaluation section

Content

1. **Gerontology**–the study of aging.

2. **Geriatrics**–the study of the diseases of aging.

3. **The Aging Process**
   - Diminished ability to deal with stress.
   - More difficult to recover from illnesses, even minor ones, like colds.
   - Healing takes longer.
   - Complications are more likely to develop.
   - Flu, pneumonia, broken bones are much more serious for the elderly.
   - Aging does not occur at the same rate for each person.

4. **Body systems age at different rates.**
   - **Integumentary system**
     - Skin–thinner, dryer, wrinkled.
     - Less subcutaneous tissue (less cushion).
   - **Musculoskeletal system**
     - Less muscle mass–hormonal production influences muscle development.
     - Diminished range of motion as joints may become diseased, connective tissue is less resilient, loss of elasticity.
     - Less bone density with changes in exercise, diet, hormonal production.
   - **Cardiovascular system**
     - Various parts of the heart and the blood vessels lose their elasticity.
     - Fatty substances may be deposited on the inner layers of vessels.
   - **Respiratory system**
     - Respiration less efficient, not as much oxygen delivered to the body.
     - Breathing is shallower.
   - **Nervous system**
     - Brain cells die, brain weight decreases.
     - Poor supply of oxygen to the brain can result in confusion and personality changes.
   - **Sensory system**
     - Taste and smell are dulled so eating is less pleasurable.
     - Hearing and sight fade.
     - The sense of touch is dulled.
   - **Gastrointestinal system**

- Elderly produce less stomach acid, food is harder to digest, moves through the system slower.
- Indigestion and constipation are common.
- Tooth loss makes eating difficult.
- Absorption of nutrients from the intestines is less efficient.
- Ability to taste flavors diminishes.

- **Urinary system**
  - Wastes are excreted more slowly, fluid and electrolytes become unbalanced easier.
  - Urgency and stress incontinence are more common due to relaxation of muscle tone in the perineum.

- **Endocrine system**
  - All glands secrete less of their hormones.
  - Body cannot react as quickly to stress.

- **Reproductive system–**sex hormones decrease in production, but many elderly still enjoy sex.

- **Musculoskeletal system–**loss of strength and flexibility, thinning bones.

5. Pharmacokinetics in the aged

- Absorption and distribution affected by two main changes:
  - Slower blood circulation.
  - Slower absorption of oral medications through the intestines.

- Peristalsis is slower and weaker, so absorption and distribution are slower and less predictable in the elderly.

- Drugs stay in effect longer and can build up in the body with repeated doses, with the result of cumulation and even drug toxicity.

- Usually use the rule of "start low, go slow." Doses may be given farther apart. Helps prevent cumulation and toxicity.

- More diseases, so more drug interactions.

- Greater risk for adverse drug reactions, especially cumulation.

- Multiple drug use with many interactions is called "polypharmacy."

- Be alert for drug interactions, toxic reactions, adverse reactions, etc.

- Sometimes the doctor must order medication that the resident needs even though interactions or side effects occur.

- **Antihistamines–**elderly residents are usually more sensitive to the effects. May

lead to confusion, difficult urination, dizziness, and falling. May have opposite effect of excitability, irritability, restlessness or nervousness.

- **Anticholinergics**–elderly may be especially sensitive to the effects of these medications. Side effects include constipation, difficult urination, and dry mouth.

- **Some common drugs that interact**:
  - alcohol + sedatives = CNS depression, especially respiratory depression.
  - tetracycline + metals (minerals) = reduced absorption, less effect, so do not give with milk, Mg, Fe, Al (antacids).
  - antipsychotics + antiparkinsonian agents + antihistamines + antidepressants = all have anticholinergic effects, when combined, can cause dry mouth, blurred vision, urine retention, constipation, increased intraocular pressure.
  - NSAIDS + anticoagulants + ASA = increased anticoagulant effect, increased bleeding.
  - bisacodyl (Dulcolax) + antacids = the enteric coating of the Dulcolax will dissolve in the stomach, causing gastric irritation.
  - cathartics = increased intestinal motility caused by cathartics can decrease absorption of any drug.
  - warfarin (Coumadin) + phenobarbital = the anticoagulant breaks down more quickly, so has less effect; increases risk of thrombus formation.
  - vitamin D + anticonvulsants phenytoin (Dilantin) and phenobarbital = vitamin D breaks down more quickly; resident may require vitamin D supplements.
  - allopurinol (Zyloprim) + mercaptopurine (Purinethol) or azathioprine (Imuran) = allopurinol slows the breakdown of other drugs; can lead to toxicity.
  - penicillins + probenicid = excretion of penicillin blocked.
  - digitalis + diuretics = diuretics can cause potassium loss, making the heart more sensitive to digitalis effects, can cause arrhythmias.
  - phenytoin + enteral feedings = reduced phenytoin absorption.

6. Social and psychological aspects of aging

- America is a youth-oriented culture.

- Although younger people can do things more quickly, do not take over for the elderly–let them do as much as they can.

- Elderly can and should take a part in their own medicine therapy.

- Encourage them to take their own medications under your supervision.

- Give care **with** the resident, **not for** him/her.

- Individualize your treatment of each resident.

- Do not abuse your power.

7. Tips on medicating the elderly

- Identify the right resident. Names on beds or clothing is **not** adequate. Use at least two of the several methods taught in this class to identify.
- Explain what you are doing.
- Be patient, don't rush.
- Explain what the medication is supposed to do.
- Start with the most important medication first.
- Help a resident who has trouble swallowing pills.
  - Place medications well back on the tongue.
  - Give liquids before and after administering the medication.
  - Crush and mix with applesauce, Jell-O or juice, if appropriate.
- Assist drug absorption–give plenty of **fluids**.
- When a resident appears confused, assess the environment, resident's history, recent changes in daily pattern, changes in medication, fluid intake, fluid output, bowel function, social contacts–other possible causes.
- Respect each resident's customs and beliefs.
- Adapt to hearing and vision problems.
- Keep eye drops refrigerated if instructed. Allow to come to room temperature before administering.
- Watch for the dangers of the over-the-counter medications. Even these medications must be given with physician's order.
- Make sure all ordered medications are given.
- Explain the need for medication to asymptomatic residents. Especially important for antibiotics, etc.
- Never force a resident to take a medication. Under the facility regulations, residents have the right to free choice, including the right to refuse treatment. Residents are also to be free from abuse, neglect, and exploitation. Forcing a resident to take medication can be dangerous to the resident and could be interpreted as abuse or battery. If a resident refuses medication, report it to the supervising licensed nurse.
- Keep medications secure.

- Chart medications promptly. Charting later is dangerous and can lead to medication errors and errors in documentation.

- **Use caution with PRN medications.**
  - Make sure you chart PRN medications immediately.
  - If you don't, someone else could give another dose.
  - Follow up with charting about resident's response to medication.

8. Preparation for administration of medications

- Wash your hands.

- Gather equipment for setting up medications.

- Review medications which require checking pulse or blood pressure before administering.

- Address the resident with dignity and respect.

9. Identify the resident

- Introduce yourself.

- Explain what you are going to do.

- Do what you just explained.

- Wash your hands.

- Document.

10. Routes of Administration

- **Oral** – Review curriculum.

- Respiratory – See Unit 12.

- Rectal suppository – See Appendix - Suppository – Rectal.

- Vaginal suppository and cream – See Appendix - Suppository – Vaginal.

- Eye drops and ointment – See Unit 15.

- Ear drops and ointment – See Unit 16.

- Skin ointment and lotion – See information following.

Appendices

Topics that might be referenced in multiple units are listed in Appendices. Topics that are referenced primarily in specific units are included at the end of the appropriate units, and are noted in the list of objectives.

Administration of Dressings, Topical Medication, Soaks

Application of Non-Sterile Dressing
Topical Medication and Medication Soaks

Application of Topical Medication

1. Gather supplies: gloves, medication, clean wash cloth.
2. Confirm medication order.
3. Identify resident.
4. Provide for privacy–take resident to his/her room, close door, draw curtains.
5. Explain procedure.
6. **Wash hands**.
7. Position resident for comfort and ease of observation and medication application.
8. Inspect area medication is to be applied to. Cleanse area of old medication or drainage as needed.
9. Apply medication with gloved hand. Rub medication into skin. Rub creams in gently, rub vigorously with liniments.
10. Remove gloves and discard.
11. **Wash hands**.
12. Chart medication application and pertinent observations. Alert charge nurse to changes in affected area, drainage types or amount.

Non-Sterile Dressing Change

1. Gather supplies: gloves, clean wash cloth, medication, appropriate dressing and tape or other means of securing the dressing, bag for disposal of old dressing, as needed.
2. Confirm medication order.
3. Identify resident.
4. Provide for resident privacy–take resident to his/her room, close door, draw curtains.
5. Explain procedure.

6. **Wash hands**.

7. Position resident for resident comfort and ease of dressing application and observation, arrange supplies so that are easy to reach as needed throughout procedure.

8. Remove old dressing, making note of amount and color of drainage and the condition of the surrounding skin. Dispose of dressing in bag.

9. Put on gloves. With clean cloth, cleanse skin of any drainage. Be careful to rinse thoroughly as some topical medications are inactivated by wound drainage or soaps. Remove gloves. Wash hands.

10. Put on clean gloves. Apply a thin layer of medication to the affected area. Remember, only medication in contact with the skin is absorbed, so over application is not any more effective.

11. Apply dressing as ordered and secure in a safe fashion. Tape may be used, but some residents are sensitive to certain adhesives or may not have sufficient healthy skin for the tape to adhere to. Other means of securing dressings include elastic bandages or mesh wraps.

12. Remove gloves.

13. **Wash hands**.

14. Chart procedure, along with observation. Alert charge nurse of changes in affected area or type or amount of drainage.

Medication Soaks

Soaks are used to soften exudate, facilitate debridement, cleanse wounds or burns, apply medications and increase local blood supply.

1. Gather supplies and equipment: basin or arm or foot tub, bath thermometer, water or prescribed solution, towels, over bed table or footstool, dressings if prescribed, gloves if needed.

2. Confirm medication order.

3. Identify resident.

4. Explain procedure.

5. Provide for privacy–take resident to his/her room, close door or draw curtains as needed.

6. **Wash hands**.

7. Place the basin or tub where it will be comfortable for the resident, such as the floor where the resident will be comfortable sitting the prescribed time for a foot soak. Use towels as

necessary to prevent the bed or floor from getting wet. Fill the basin with water or solution, checking temperature with thermometer.

8. Expose treatment site, wear gloves to remove and discard dressings that are present in a plastic bag. If dressing is encrusted with drainage, it may be necessary to soak before removal. Lower the resident's arm or leg into the basin gradually to allow him/her to adjust to the temperature. Support body parts or bony prominences with pillows as needed.

9. Stay with any resident who may have difficulty tolerating or cooperating with treatment.

10. Check water or solution temperature every five minutes, warming it if it falls below the prescribed temperature. To prevent burns, lift the resident's limb from the basin while adding hot liquid.

11. Observe resident for signs of fatigue, pain or tissue intolerance, such as bleeding at the site, excessive drainage, or reports of pain.

12. At the end of the prescribed time, assist the resident in removing the limb from the basin, pat the limb dry gently to prevent injury.

13. While skin is hydrated, use gauze to remove loose scales or crusts.

9. **Wash hands**.

15. Redress wound if ordered.

17. Assist resident to a comfortable place and position.

18. Discard soak solution, dispose of soiled materials according to facility policy.

5. **Wash hands**.

20. Chart procedure and observations, alert charge nurse to changes or other pertinent information.

Administration of Ear Medication

Ear Drops and Ointment

Purpose: To provide medication to treat ear disorders.

Materials:
1. Medication.
2. Medicine dropper (usually is included with the prescription bottle).
3. Cotton ball.

Procedure:
1. **Wash hands** before and after administering. If signs of infection, put on gloves to administer medication.
2. Confirm medication order.
3. Identify resident.
4. If medicine is not at body temperature as it comes from bottle, it may be warmed by holding or gently rolling container it in your hands for a few minutes. Avoid heating above body temperature to prevent loss of potency.
5. Explain procedure and position resident lying down with head turned to side.
6. Clean and dry ear canal if necessary with cotton balls or wash cloth.
7. Gently pull ear to straighten canal - upward and backward.
8. Instill medication into ear without touching dropper to ear canal. Steady hand by resting it against resident's head. Drop ointment or liquid onto the wall of ear canal, don't "bull's eye" the opening or it may form a bubble or seal and not coat the canal properly.
9. Wipe up any spills around ear.
10. Have resident remain in the side lying position for at least five minutes or more so that medication can be absorbed.
11. May put cotton ball at ear canal opening to prevent excess medication from leaking onto clothing.
12. Record according to procedure.

Administration of Eye Medication

Eye Drops and Ointment

Purpose: To provide medication to treat eye disorders.

Materials:
1. Liquid or ointment medication.
2. Cleansing tissue.

Procedure:
1. **Wash hands** before and after treatment. If signs of infection, put on gloves to administer medication.

2. Confirm medication order.

3. Identify resident.

4. Clean around eyes with a fresh washcloth if there are crusts. Use separate areas of the cloth for each eye to prevent transfer of infection. Wipe from the inside to the outer edge. Change cloth and repeat on other eye.

5. Ask resident to look upward or tilt head back.

6. Pull down lower lid to instill drop inside lower lid. Apply ointment in a thin "string" just inside lower lid. Steady hand by resting it against the resident's face. Do not touch dropper or ointment tube to lashes or eye.

7. Have the resident close eyes gently and apply light finger pressure over the lacrimal sac for one minute. This allows the medication to be absorbed into the eye circulation rather than draining into the nasopharnyx or being absorbed into the general circulation.

8. If more than one drop is to be administered, sufficient time must be provided before the next drop is instilled. The time for optimal eye drop absorption is approximately 3 to 5 minutes.

10. Ointment may temporarily cause blurred vision. Provide precautions for resident activity.

11. Record according to procedure.

Administration of Inhaler Therapy

Purpose: To administer medication into the respiratory tract.

Materials: Medication in inhaler.

Procedure:

1. **Wash hands** before and after inhaler use.
2. Confirm medication order.
3. Identify resident.
4. Assist the resident to upright position. Unless lungs can expand fully, the medication will not reach deeply into lung tissue.
5. Shake medication, as directed on inhaler container.
6. Instruct resident to breathe out fully. Place mouthpiece of inhaler well into mouth behind the teeth. Resident should hold lips loosely around the mouthpiece. As resident begins to inhale around mouthpiece, he/she should activate the inhaler, continuing to inhale as deeply and for as long as he/she can. Resident should hold his breath for as long as comfortable to allow absorption of the medication.
7. Repeat, if directed by physician's order or prescription.
8. Clean inhaler, especially mouthpiece, after use or at least once a day if it is kept in resident's room.
9. Advise resident that some medications may cause "jittery" feeling for 15-20 minutes. Also, a feeling of a "pounding" or "bounding" pulse may occur. Report to supervising licensed nurse if resident experiences lightheadedness, abnormal pulse rate or rhythm, or other side effects.
10. Record according to procedure.

Remarks: Residents may become very dependent on the use of their inhalers. Excessive use of bronchodilator inhalers results in the loss of effectiveness or even aggravates the respiratory condition and makes it worse.

Administration of Medication Patches

Purpose: To provide medication for absorption through skin. Nitroglycerin frequently administered in this fashion.

Materials:
1. Pre-packaged medicated patch.
2. Gauze square or non-sterile examining glove.

Procedure:
1. **Wash hands** before and after administering.

2. Confirm medication order. Verify if there is a patch which needs to be removed, and if skin at the existing site of patch is to be cleaned after the patch is removed.

3. Identify resident. Explain the procedure.

4. Prepare skin area to be treated. Previous patch should be located and removed. Usually the site of the previous patch should be washed away, the skin rinsed and patted dry. Follow facility's procedures or prescription's directions.

5. *Protect your skin from contact with the medication.* Rotate where you place the patch, do not replace the patch in the same location. Once pouch is opened, apply patch immediately to clean, dry area of skin. It is often helpful to use a permanent marker to mark the date/time on the patch.

6. Remove old patch from room and dispose as directed by policy or instructions. Some prescriptions will require a "rest period" where the resident has a patch removed and no other placed until several hours later. This may aid in the reduction of nitrate "tolerance."

12. Advise resident to be cautious with physical activities, changes in position as BP may drop with use of nitroglycerin.

7. Record according to procedure.

Administration of Nasal Inhaler Therapy

Purpose: To administer medication into the respiratory tract.

Materials: Medication in inhaler.

Procedure:

1. **Wash hands** before and after inhaler use.
2. Confirm medication order. Read package insert instructions carefully.
3. Identify resident.
4. Assist the resident to upright position. Have resident blow nose, clearing nasal passage.
5. Shake medication, as directed on inhaler container. Hold inhaler in upright position with thumb on bottom, fingers on top.
6. Instruct resident to breathe out fully. With resident's head slightly tilted back, insert nozzle into one nostril, close the other, pinch gently against septum.

13. Have resident inhale while you depress dispenser.

14. Wipe off nozzle with tissue until clean.

9. Repeat, if directed by physician's order or prescription. As with metered dose inhalers, nasal inhalers may differ in dispensing instructions. Follow manufacturer's or pharmacist's instructions.

6. Clean inhaler, especially nosepiece, after use or at least once a day if it is kept in resident's room.

7. Advise resident that some medications may cause "jittery" feeling for 15-20 minutes. Also, a feeling of a "pounding" or "bounding" pulse may occur. Report to supervising licensed nurse if resident experiences lightheadedness, abnormal pulse rate or rhythm, or other side effects.

8. Record according to procedure.

Remarks: Residents may become very dependent on the use of their inhalers. Excessive use of inhalers may result in the loss of effectiveness or even aggravate the respiratory condition and make it worse.

Administration of Nebulizer Therapy

Purpose: To administer medication into the respiratory tract.

Materials:
1. Hand-held nebulizer, such as Maximist or Pulmonaide.
2. Medication and diluent.

Procedure:
1. **Wash hands** before and after treatment.
2. Confirm medication order.
3. Mix medication and diluent as ordered.
4. Identify resident.
5. Assist the resident to upright position. Unless lungs can expand fully, the medication will not reach deeply into lung tissue.
6. Instruct resident to place mouthpiece in mouth, behind teeth and breathe in deeply through mouth, and hold breath for 5-10 seconds, then exhale slowly and completely.
7. After completing the treatment, clean and dry equipment according to manufacturer's and facility instructions.
8. Record according to procedure.
15. Advise resident that some medications may cause "jittery" feeling for 15-20 minutes. Also, a feeling of a "pounding" or "bounding" pulse may occur. Report to supervising licensed nurse if resident experiences lightheadedness, abnormal pulse rate or rhythm, or other side effects.

Remarks:
1. Bronchodilator medication is frequently given by this route. Respirations should improve. Tachycardia is a side effect. Take pulse before, after.
2. Hyperventilation may occur during therapy. Encourage resident to breathe deeply but slowly.

Administration of Oxygen*

Purpose: To help the resident breathe more easily by increasing the oxygen (O_2) available.

Materials:
1. Oxygen tank on carrier.
2. Gauge or regulator.
3. Humidifying bottle with sterile distilled water.
4. Mask or cannula and connecting tubing.

Procedure:
1. To prepare the tank–verify that the tank is coded and labeled as "oxygen." Before the regulator is attached to a new tank, "crack" the tank. That is, open the valve and close quickly to blow out any dust or foreign matter which might be forced into the regulator. Since this is noisy, crack the tank near the storage area rather than in the resident's room.

2. To attach the regulator to tank:
   a. Hold regulator assembly upright when attaching.
   b. Fill humidifying bottle with sterile distilled water to indicated level.

3. To start oxygen:
   a. Leave oxygen tank securely fastened to cart and place in upright position while oxygen is administered.
   b. With liter flow valve turned off, open tank valve completely. Then turn liter flow valve slowly until the steel ball, or liter flow needle, rises on the liter gauge to the liter number ordered by the doctor.

4. To use mask or cannula:
   a. Connect plastic mask or cannula to the oxygen connecting tube and regulator.
   b. Place mask or cannula on resident with oxygen flowing. Mask should cover the nose and mouth.
   c. Persons with chronic respiratory disorders should receive oxygen at no more than 2L/minute. A cannula is usually used.
   d. When using a mask, oxygen should be delivered at 5-6L/minute to assure CO_2 washout from mask.

5. To maintain oxygen therapy:
   a. Distilled water should be kept at indicated level. If oxygen is not moistened, it is very damaging to the respiratory tract.
   b. Do not allow water to flow into liter valve to prevent damage.
   c. A shrill whistling may be caused by a kink in the tubing.
   d. Mask or cannula, tubing and humidifying jar should be changed every 72 hours.
   e. Give special care to skin under mask or cannula. Give mouth care regularly. Lubricate lips with water soluble moisturizer.

6. To discontinue oxygen:
    a. Remove mask or cannula.
    b. Turn off oxygen tank, then liter valve.
    c. Record according to procedure.

Dangers: Oxygen ***supports*** combustion.

1. No smoking is allowed in room. Post signs where they may be easily seen.
2. All electrical equipment should be properly grounded.
3. Remove sources of static electricity.
4. Do not use oil based lubricants or solutions containing alcohol near oxygen administration.

Toxic Effects: Result from oxygen being supplied in greater amounts than the body needs. Symptoms may include:

1. Dusky colored skin.
2. Bluish red fingernails.
3. Drowsiness.
4. Confusion.
5. Respiratory depression (dangerously slowed breathing).

Notify licensed nurse immediately if any of these symptoms occur!

* Some facilities have oxygen available through other means. Follow the directions of the facility's policy and procedure.

Administration of Skin Ointment and Lotions

Purpose: To provide medication to treat skin disorders.

Materials:
1. Liquid or ointment medication.
2. Gauze square or non-sterile examining glove.
3. Occlusive dressing, if needed.

Procedure:
1. **Wash hands** before and after administering.

2. Confirm medication order.

3. Identify resident.

4. Prepare skin area to be treated. Usually the previous medication should be washed away, the skin rinsed and patted dry. Consult your supervisor to see if this should not be done.

5. *Protect your skin from contact with the medication.* Ointment may be applied with a gauze square or examining glove. Apply a thin coat of medication. Use gauze squares or similar material to apply liquid. (Follow manufacturer's application instructions for nitroglycerin ointment.)

6. An occlusive dressing may be ordered by the physician for specific medications to enhance their absorption. Cover the medicated area with plastic wrap and secure with tape. Remove plastic wrap after the prescribed time. Follow facility's procedures.

7. Record according to procedure.

Administration of Suppository - Rectal

Purpose: To administer medication into the rectum.
Rectal medications may be given to: lower temperature, control nausea, stimulate bowel movement, soothe local lesions.

Materials:
1. Medication.
2. Glove or finger cover.
3. Lubricant (water soluble).

Procedure:
1. **Wash hands** before and after administering.
2. Confirm order.
3. Identify resident.
4. Explain procedure and expected result of suppository. Explain that the suppository may stimulate the urge to defecate. Identify to resident whether or not this is the expected result, and if not, what resident should do if the urge occurs.
5. Position resident comfortably on (left, if possible) side with as little exposure as possible.
6. Remove wrapper from medication, put on glove and lubricate suppository as directed by instructions on medical literature or card.
7. Gently insert pointed end of suppository the length of the index finger into the rectum. Have the resident relax mouth and breathe in and out through the mouth (this will help relax the anal sphincter). Make sure the suppository is pressed against the wall of the rectum and not lodged in feces.
8. If the resident is weak or debilitated, one may need to compress the buttocks together for several minutes to keep the medication from being expelled.
9. **Remove glove, dispose of and wash hands.**
10. Resident should avoid having a bowel movement for 20 minutes so that medication can be absorbed through rectal wall.
10. Record according to procedure.

Administration of Suppository - Vaginal

Purpose: To administer medication into the vagina. Medications administered by this route may be for treating vaginal irritations and infections.

Materials:
1. Medication (it may be in wax bolus or tablet form, or tube of cream).
2. Gloves.
3. Applicator for cream.
4. Tissues and sanitary napkins if needed.

Procedure:
1. **Wash hands** before and after administering.

2. Confirm medication order.

3. Identify resident and explain procedure.

4. Have resident empty bladder as much as possible.

5. Position resident comfortably on back with knees bent and legs apart. Drape resident so there is as little exposure as possible.

6. Put on gloves and prepare medication for insertion.

7. Observe genital area and locate vaginal opening. Insert medication:
   By hand: gently, about 2-3 inches along back of vagina.
   By applicator: gently insert applicator 2-3 inches into vagina, push plunger, releasing medication along back wall of vagina.

8. Wipe vaginal opening if necessary. Provide sanitary pads as necessary to prevent staining underclothing or discomfort. Medication will be less likely to leak out before being absorbed if resident avoids upright position for about 20 minutes.

16. Clean applicator.

17. Record according to procedure.

List of Common Medications

This list is current at time of release of curriculum. Instructors should note that medications change frequently, and update this list as necessary.

Cardiovascular
Apresoline - hydralazine - vasodilator
Calan - verapamil hydrochloride - antianginal - calcium channel blocker
Capoten - captopril - antihypertensive, ACE inhibitor
Cardizem - diltiazem - antihypertensive, antianginal, antiarrhythmic
Catapres - clonidine hydrochloride - vasodilator
Cozaar - losartan potassium – antihypertensive
Diovan - valsartan - antihypertensive
Imdur - isosorbide mononitrate – antianginal
Inderal - propranolol - antiarrhythmics/antidysrhythmics - beta-adrenergic blocking agent
Lanoxin - digoxin - cardiac glycoside - antiarrhythmic, inotropic
Lopressor - metoprolol tartrate - antihypertensive - beta-blocker
NitroBid, Nitrostat - nitroglycerin - vasodilator
Norvasc - amlodipine - antihypertensive - calcium channel blocker
Pacerone – amiodarone – ventricular fibrillation – take pulse before giving.
Procardia, Adalat - nifedipine - antianginal, antihypertensive - calcium channel blocker
Tenormin - atenolol - antihypertensive, antianginal - beta-blocker
Toprol XL - metoprolol tartrate - antihypertensive, antianginal - beta-adrenergic blocking agent
Vasotec - enalapril maleate - antihypertensive - ACE inhibitor
Zestril, Prinivil - lisinopril - antihypertensive, ACE inhibitor

Specialized meds
Calciparine - heparin - anticoagulant (IV, SubQ)
Coumadin - warfarin sodium - anticoagulant
Plavix - clopidogrel - antiplatelet
Ticlid - ticlopidine

Antilipemics
Pravachol - pravastatin sodium - lowers lipids
Side Effects: Headache, nausea, vomiting, constipation, diarrhea, rash, muscle pain, weakness
Crestor – rosuvastatin
Lescol - fluvastatin
Lipitor - atorvastatin calcium - lowers lipids
Lopid - gemfibrozil
Mevacor - lovastatin - lowers lipids
Questran - cholestyramine
Zocor - simvastatin

Diuretics
Aldactone - spironolactone - K+ sparing diuretic

Bumex - bumetanide - loop diuretic
clorothiazide - thiazide diuretic
Demadex - - loop diuretic
Dyazide, Maxzide - tiramterene and hydrochlorothiazide - combination diuretic
Dyrenium - triamterene - K+ sparing diuretic
HCTZ, Esidrix, HydroDiuril - hydrochlorothiazide – thiazide diuretic, antihypertensive
isosorbide - osmotic diuretic
Lasix - furosemide - loop diuretic
mannitol - osmotic diuretic
metolazone - thiazide diuretic
torsemide - loop diuretic

Diuretics remove from the body: sodium, K+,calcium, magnesium, chloride, phosphorus, uric acid
Side effects of K+ loss: tiredness, weakness, numbness, tingling, muscle cramps, constipation, vomiting, fast heartbeat
Side effects: dry mouth, increased thirst, arrhythmia (irregular heartbeat), confusion, mental changes or moodiness, weak pulse, heaviness or weakness of the legs, dizziness or lightheadedness - especially after getting up from a sitting or lying position
Less common side effects: allergic reaction, fainting, sun sensitivity, blurred vision, confusion or nervousness, diarrhea, stomach cramps or pain, muscle twitches or spasms, joint pain, fever or chills, erectile dysfunction, headache or ringing in the ears, unusual bleeding or bruising, jaundice, mood changes, weight changes

Respiratory
Advair Diskus - fluticasone/salmeterol - anti-asthmatic
Brethine - terbutaline
codeine (Narcotic - Schedule II) - antitussive
Elixophyllin - theophylline - bronchodilator
Flovent - fluticasone
Mediquell, Benylin DM - dextromethorphan
Mucinex - guaifenisin - mucolytic
Mucomyst - acetylcysteine - expectorants
Nasonex - mometasone
Neo-Synephrine - phenylephrine - decongestant
Phenergan - promethazine - antihistamine
Primatene Mist - epinephrine – bronchodilator
Proventil - albuterol - bronchodilator
Proventil, Ventolin - albuterol - anti-asthmatic
Pulmocort; Rhinocort
Spiriva - tiotropium

Nervous
amantadine - antiparkinson

Ambien - zolpidem - sleep aid
Apo-Amitriptyline hydrochloride - antidepressant
Aricept - donepezil - anti-alzheimers
Ativan - lorazepam - antianxiety, sedative/hypnotic
Benedryl - diphenhydramine - anti-histamine
Buspar - - antidepressant, antianxiety
Cogentin - donepezil - antiparkinson
Darvocet-N 50, Darvocet-N 100 - propoxyphene with acetaminophen - analgesic
Demerol - meperidine - narcotic analgesic
Desyrel - trazodone - antidepressant
Dilantin - phenytoin sodium - anticonvulsant
Exelon patch - rivastigmine- anti-alzheimers
Fentanyl Patch - opiod analgesic
Haldol - haloperidol - antipsychotic
Imitrex - sumatriptan succinate – antimigraine
Klonopin - clonazepam - anticonvulsant
levodopa - antiparkinson
Lexapro - escitalopram oxalate - antidepressant
Melatonin - herbal - sleep aid
Mellaril - antipsychotic
Namenda - memantine hydrochloride - anti-alzheimers
Neurontin - gabapentin - anticonvulsant, anti-epileptic, mood stabilizer, neuropathy, analgesic
Oxycontin – oxycodone long acting
Percocet - oxycodone and acetaminophen
Percodan - oxycodone and aspirin - analgesic
Prozac - fluoxetine - antidepressant
Restoril - temazepam - sleep aid
Risperdol - risperidone - antipsychotic
Ritalin - methyphenidate - stimulant
Sinemet - carbidopa/levodopa - antiparkinson
St. Johns Wort - herbal - antidepressant
Talwin - pentazocine - analgesic
Tegretol - carbamazepine - anticonvulsant
Tylenol with Codeine - acetaminophen with codeine - narcotic analgesic
Vicodin - hydrocodone with acetaminophen - narcotic analgesic
Xanax - alprazolam - antianxiety
Zoloft - sertraline hydrochloride - antidepressant

Gastrointestinal
Aciphex - rabeprazole
Antivert - meclizine - antiemetic
Axid - nizatidine - anti-ulcer - histamine H2-receptor antagonist
Benefiber - fiber
cascara sagrada - laxative
Colace - docusate sodium - stool softener, laxative
Compazine - prochlorperazine - antiemetic

Dramamine - dimenhydrinate - antiemetic
Dulcolax - bisacodyl - laxative histamine H2-receptor antagonists
Lactulose - - laxative
Lomotil - diphenoxylate HCl and atropine sulfate - antidiarrheal
Metamucil - psyllium - fiber laxative
Mira-Lax - stool softener, laxative
Mylicon - simethicone - antiflatulent
Nexium - esomeprazole - anti-ulcer - proton pump inhibitor
Pepcid - famotidine - anti-ulcer - histamine H2-receptor antagonist
Peri-Colace - stool softener, laxative
Prevacid - lansoprazole - anti-ulcer - proton pump inhibitor
Prilosec - omeprazole - anti-ulcer - proton pump inhibitor
Protonix - pantoprazole - GERD - proton pump inhibitor
prunes, prune juice - fruit/fiber laxative
Riopan - magaldrate - antacid
Senna - laxative
Tagamet - cimetidine - histamine H2-receptor antagonist
Zantac - ranitidine hydorchloride - anti-ulcer
Zofran - ondansetron hydrochloride - antiemetic
Side effects: cramping, gas, bloating, nausea, diarrhea, abdominal discomfort, faintness, cramps

Urinary
Detrol LA
Ditropan
Flomax - tamsulosin - male urinary
Vesi-Care

Musculoskeletal
Actonel - risedronate sodium - bone resorption inhibitor
Side effects: back and joint pain, upset stomach and stomach pain, short-lasting, mild flu-like symptoms

Fosamax - alendronate - bone resorption inhibitor
side effects: jawbone problems, stomach pain, indigestion/heartburn, or nausea

Boniva - ibandronate sodium - bone resorption inhibitor
side effects: pain in extremities, diarrhea, dyspepsia

Reclast - zoledronic acid - bone resorption inhibitor
side effects: fever, myalgia, flu-like symptoms, headache and arthralgia

Evista - raloxifene HCl - tx of osteoporosis
side effects: stroke, leg cramps, peripheral edema, flu syndrome, arthralgia, sweating

Miacalcin - calcitonin-salmon - bone resorption inhibitor
side effects: rhinitis, back pain, arthralgia, epistaxis, headache, other symptoms of the nose

Skelaxin - metaxalone - muscle relaxant
side effects: nausea, vomiting, GI upset, drowsiness, dizziness, headache, nervousness or irritability

Flexeril - cyclobenzaprene HCl - muscle relaxant
side effects: drowsiness, dry mouth, fatigue, headache, abdominal pain, acid regurgitation, constipation, diarrhea, nausea

colchicine - antihyperuricemic
Enbrel - etanercept - (SubQ) - tumor necrosis factor - alpha drug
Humira - adalimumab - (SubQ) - tumor necrosis factor - alpha drug
Lioresal - baclofen - muscle relaxant
methotrexate – antineoplastic
Robaxin - methocarbamol - muscle relaxant
Soma - carisoprodol - muscle relaxant
Zyloprim - allopurinol - antihyperuricemic

Endocrine
Avandia - rosiglitazone maleate - antidiabetic
Decadron - dexamethasone – corticosteroid
Deltasone - prednisone - corticosteroid, anti-asthmatic
Estradiol - estrogen - female hormone
glucagon (SubQ, IM, IV) - severe insulin reaction, hypoglycemia
Glucophage - metformin - antidiabetic - oral hypoglycemic
Glucotrol - glipizide - antidiabetic
Humatrope - somatropin - growth hormone
Insulin (Sub Q)
Medrol Dose Pak – methylprednisolone
Micronase, DiaBeta - glyburide - antidiabetic - Type 2 Diabetes Mellitus (NIDDM)
Pitressin - vasopressin tannate - diabetes insipidus
Progesterone - female hormone
Synthroid - levothyroxine sodium - thyroid hormone
Synthroid, Levothroid, Cytomel, Thyrolar - levothyroxine sodium - thyroid hormone
Testosterone - male hormone

Analgesics
Advil, Motrin - ibuprofen - NSAID, analgesic
Aspirin - acetylsalicylic acid - antipyretic, non-opiod analgesic, anti-inflammatory
Celebrex - celecoxib - NSAID
Darvocet N - propoxyphene/acetaminophen - opiod analgesic
Fentanyl patch - opiod analgesic
Indocin - indomethacin – NSAID
Lortab 5/500 - hydrocodone/acetaminophen - opiod analgesic
Mobic – meloxicam - NSAID
Naprosyn - naproxen sodium - NSAID

OxyContin – oxycodone – opioid analgesic
Roxanol - opiod analgesic
Tylenol, MAPAP, APAP - acetaminophen - antipyretic, non-opiod analgesic
Ultram - tramadol hydrochloride - analgesic, antipyretic – opioid - synthetic

Anti-Infectives
Amoxil, Polymox - amoxicillin trihydrate
Augmentin - amoxicillin and clavulanate
Bactrim, Septra - sufamethoxazole/trimethoprim
Cipro - ciprofloxacin hydrochloride
Garamycin - gentamicin
Keftab - cephalexin
Levaquin - levofloxacin
Zithromax – azithromycin

Antivirals

Flumadine – rimantadine
Relenza - zanamivir
Symmetrel - amantadine
TamiFlu - oseltamivir
Voltrex – valacyclovir
Zovirax - acyclovir

Supplements
Calcium
FeSol, Imferon, SlowFe - Iron
K+, K-lor, KCL, K-Lyte, Klor-Con - potassium chloride
Magnesium oxide
Na+, Sodium - sodium
Vitamin A
Vitamin B1 - thiamine hydrochloride
Vitamin B2 - riboflavin
Vitamin B3 - niacin
Vitamin B5 - pantothenic acid
Vitamin B6 - pyridoxine
Vitamin B7 - biotin
Vitamin B9 - folic acid
Vitamin B12 - cyanocobalamin
Vitamin C - ascorbic acid
Vitamin D - ergocalciferol
Vitamin E
Vitamin K - aqua mephyton

Eyes
Antibiotic gtts - Polymyxin B, bacitracin, neomycin; Ciloxan – ciprofloxacin; Ocuflox –

ofloxacin
Antibiotic ointment –cortisporin, erythromycin
Betoptic – betaxolol
Isopto Carpine - pilocarpine HCl
Lumigan – bimatoprost
Polytrim – trimethoprim and polymycin
Systane
Tears
Timoptic - timolol maleate
Tobrex - tobramycin
Travatan – travoprost
Trusopt – dorzolamide
Xalatan – latanoprost

Ears
Antibiotic gtts – ciprofloxacin, cortisporin
Cerumenex - te-condensatethanolamine polypeptide oleatrie
Debrox – carbamide peroxide
Swimmer's ear gtts

Reproductive
AZT, ZDV, Retrovir - zidovudine - antiretroviral
Cialis - tadalafil
Flagyl - metronidazole - antibacterial
Levitra - vardenafil - erectile dysfunction drug
Metandren - methyltestosterone - hormone
Monistat 7 - miconazole - antibacterial
Pitocin, Syntocinon - oxytocin - hormone
Premarin - conjugated estrogens - hormone
Provera - medroxyprogesterone acetate - hormone
Viagra - sildenafil citrate - erectile dysfunction drug

Allergy
Allegra - fexofenadine - antihistamine
Benedryl - diphenhydramine - antihistamine
Claritin – loratadine - antihistamine
Flonase - fluticasone - corticosteroid
Nasacort AQ - triamcinolone
Nasonex - mometasone
Rhinocort Aqua - budesonide
Singulair - montelukast - bronchodilator/anti-asthmatic
Zyrtec - cetirizine - antihistamine

Herbal
Echinacea - boosts immune system, reduces duration of colds, heals wounds
Garlic - lowers lipids, lowers blood pressure, reduces blood clotting, antioxidant

Gingko Biloba - memory loss, confusion, heart disease, depression, dizziness, ringing in the ears, improve visual field in glaucoma & diabetic retinopathy
Ginseng - improve cognitive function, enhance athletic performance, improve mood
Melatonin - sleep aid, jet lag, cancer, primary HTN, ringing in the ears, headaches
St. Johns Wort - antidepressant, treat OCD, used for wounds (inflammation), muscle aches, first-degree burns

Integumentary
antifungalsalicylic acid - Keratolytics
Caladryl - calamine and diphenhydramine - Astringents
hydrocortisone
Temaril - trimeprazine tartrate - Antipruritics
Valisone - betamethasone valerate - Anti-inflammatory (topical corticosteroids)

Psychotropics
Abilify - aripiprazole
Ambien - zolpidem - sedative/hypnotic
Ativan - lorazepam - antianxiety, sedative/hypnotic
Dalmane - flurazepam - antianxiety, sedative/hypnotic, insomnia
Desyrel - trazodone - antidepressant
Effexor - venlafaxine - antidepressant
Elavil - amitriptyline - tricyclic antidepressant
Eskalith, Lithane - lithium carbonate – antimanic
Geodon - ziprasidone
Halcion - triazolam - antianxiety, sedative/hypnotic, insomnia
Haldol - haloperidol - antipsychotic
Invega - paliperidone
Lexapro - escitalopram - SSRI
Librium - chlordiazepoxide - antianxiety, sedative/hypnotic
Parnate - tranylcypromine - MAO inhibitor
Pristiq - desvenlafaxine
Prozac - fluoxetine - SSRI
Remeron - mirtazapine
Risperdal - risperidone
Seroquel - quetiapine
Thorazine - chlorpromazine - antipsychotic
Tofranil - imipramine - tricyclic antidepressant
Valium - diazepam - antianxiety, sedative/hypnotic
Wellbutrin - bupropion - antidepressant
Xanax - alprazolam - antianxiety, sedative/hypnotic
Zoloft - sertraline - SSRI
Zyprexa - olanzapine

MEDICATIONS AND THE ELDERLY
(Retained from 2003 curriculum, updated 2010)

Age, in and of itself, creates changes in cellular metabolism, cellular health, and often times a variety of disease processes. As we age, normal changes occur which impact the absorption and bioavailability and elimination of drugs. Some of the "normal" changes include:

- decrease in small bowel surface area
- increase in gastric pH
- total body water and lean body mass are reduced
- body fat is increased
- decrease in serum albumin, hepatic (liver) mass and blood flow
- decrease in renal (kidney) mass and blood flow (mainly in the renal cortex) is significant
- decrease in creatinine clearance begins after age 30 (about 1/3 of the elderly do not experience this decrease)
- serum creatinine levels remain within normal limits because older persons have less lean body mass, and produce less creatinine
- decreases in tubular function (kidney) are parallel to decreases in glomerular function
- changes occur in drug-receptor interaction, postreceptor events or in adaptive homeostatic responses
- increased organ pathology (disease)

Because of these changes, especially as renal functions continue to decline, dose of drugs given long-term should be periodically reviewed. For drugs which have very serious side effects, such as warfarin, morphine, ACE inhibitors, diazepam, and levodopa, use in the elderly must be approached with caution. Toxicities can occur in some drugs because of reduced effectiveness in the elderly, with cumulative "side effects" even though the intended effect is reduced. Signs of toxicity may be quite delayed.

Nearly one-third of drug-related hospitalizations and one-half of drug-related deaths occur in persons over the age of 60.[1] There is a demonstrated risk of toxicities with certain drugs:

- long-acting benzodiazepines
- NSAIDs (non-steroidal anti-inflammatory drugs)
- warfarin
- heparin
- aminoglycosides
- isoniazid
- high doses of thiazides
- antineoplastic drugs
- most antiarrhythmic drugs

[1]The Merck Manual, Seventeenth Edition, page 2603.

The risk of adverse drug-drug or drug-disease interaction occurs with aging for a number of reasons. In aging, more diseases occur which may lead to more use of different types of drugs. Some of the drugs may actually interfere with each other, or, worsen a disease. With the complexity of diseases and drugs, determining the subtle adverse reactions may be difficult. Some drugs aggravate existing conditions:

- anticholinergic drugs may increase prostatism
- diuretics may increase risk of postural hypotension
- concurrent use of anticholinergics such as antiparkinsonian drugs (benztropine), tricyclic antidepressants (amitriptyline), antipsychotics (thioridazine), and OTC antihistamines (diphenhydramine) may cause or aggravate dry mouth, gum disease, urinary retention, constipation, blurred vision and delirium
- polypharmacy is a problem in the adult care home population

Dose requirements for elderly people usually can be reduced. In general, this reduction may be as much as ½ the usual adult dose. Typically, elderly are most likely to under-dose themselves when self-administering medications.

Drug Classes of Concern - The following are drug classes that pose particular risk for older people.

Diuretics. Risk of hypokalemia and hyperglycemia is greater in elderly. Lower doses may help prevent these conditions and reduce the need for potassium supplements.

Antihypertensives. Cardiovascular complications occur with some drug therapies. Complications such as COPD (chronic obstructive pulmonary disease) and PVD (peripheral vascular disease) may contraindicate beta-blockers. In general safe use of diuretics and beta-blockers is preferable.

Antiarrhythmics. Generally these are similar in effectiveness as in younger people. However, because of the altered pharmacokinetics, the dose of some should be reduced in the elderly. Risk of significant adverse reactions should be anticipated with increase in age. Digoxin clearance decreases average of 50% in elderly persons with normal serum creatinine levels, therefore maintenance doses may be started at a lower (0.125 mg/day) level.

Antiparkinsonian drugs. Clearance of levodopa is reduced in older persons, who are also typically more susceptible to postural hypotension and confusion. Careful monitoring and lower starting doses are usually indicated.

Anticoagulants. The effect of warfarin products may be increased because of greater sensitivity, even though the actual pharmacokinetics is not different for the elderly. Also, when withdrawn, such as for surgical procedures, the return to normal clotting status may be slower for older patients.

Psychoactive drugs. Antipsychotics only marginally control agitation in the elderly, non-psychotic person. They may worsen confusion even though they may reduce expressed paranoia. Tardive dyskinesia is an especially big concern, for women more so than men, because it can be irreversible. Side effects such as sedation, hypotension, akathisia (inability to sit down because the thought of doing so causes severe anxiety; feeling of restlessness and an urgent need of movement; may feel muscular quivering) can occur in 20% of those taking antipsychotic drugs. Drug-induced Parkinsonism can persist for 6-9 months after stopping the drug.

Anxiolytic and hypnotics. Other causes and treatments for insomnia should be investigated before using hypnotics. Limited time use of these drugs is advisable because of issues of toxicity, tolerance, dependence and possible rebound insomnia and anxiety when they are withdrawn.

Antidepressants. Selective serotonin reuptake inhibitors (SSRI) are generally useful and relatively safe. They seem to produce less toxicity even in overdose. Long-elimination half-life of some of these drugs may make some problematic because of active metabolites. Paroxetine is more sedating and can inhibit liver enzyme activities, creating a risk of impaired metabolism of other drugs. Tricyclic antidepressants are effective, but may have anticholinergic adverse effects. Overdose of norepinephrine reuptake inhibitors produces cardiac and neurologic toxicity, and should not be used with those at risk of suicide.

Hypoglycemics. Aging can reduce insulin clearance, but dose requirements are based upon the level of insulin resistance, which varies considerably in type II diabetes. Hypoglycemic reactions may increase with age in those using sulfonylurea. Some newer agents, such as metformin, have demonstrated effectiveness but long-term safety has not yet been established for elderly persons. Renal insufficiencies may increase the risk of lactic acidosis. Must check glucose levels as a monitoring tool.

Analgesics. Decreased clearance of salicylates, oxaprozin, and naproxen may be a contraindication for using these drugs. Peptic ulcer disease and upper GI bleeding are serious side effects which should be considered in selecting analgesics. Risk of upper GI hemorrhage increases more than 10 times when NSAIDs are combined with warfarin. Gastric acid changes in aging may contribute to the intolerance or potential for adverse reactions. Risk for NSAID-induced renal impairment may be increased for elderly. Monitoring of the serum creatinine may help especially if the person has other diseases such as heart failure, renal impairment, cirrhosis with ascites, diuretic use. Watch for total daily intake of acetaminophen not to exceed 4 gm. Acetaminophen may be indicated by APAP.

Medication Classification		
Treatment for… Class of Medication	Generic Name	Brand Name
Infection		
Antibiotic, aminoglycoside	kanamycin sulfate neomycin sulfate	Kantrex, Kanamycin Mycifradin
Antibiotic, cephalosporin	cefaclor cefixime cefuroxime cefadroxil monohydrate cephalexin ceftriaxone cefdinir cefpodoxime	Ceclor Suprax Ceftin Duricef Keftab, Keflex Rocephin Omnicef Vantin
Antibiotic, fluoroquinolone	ciprofloxacin enoxacin norfloxacin ofloxacin levofloxacin	Cipro Penetrex Noroxin Floxin Avelox
Antibiotic, macrolide	azithromycin clarithromycin erythromycin base erythromycin ethylsuccinate erythromycin lactobionate erythromycin stearate	Zithromax Biaxin E-Mycin, PCE EES Erythrocin Erythrocin Stearate Filmtab
Antibiotic, oxalodinone	linezolid	Zyvox
Antibiotic, penicillin, aminopenicillin	ampicillin ampicillin & sulbactam amoxicillin trihydrate amoxicillin & clavulanate potassium carbenicillin indanyl sodium dicloxacillin sodium nafcillin sodium	Omnipen Unasyn Amoxil, Polymox Augmentin, Clavulin Geocillin Dynapen Unipen, Nafcil
Antibiotic, sulfonamide	sulfamethoxazole & trimethoprim	Bactrim
Antibiotics, tetracycline	doxycycline	Vibramycin

	minocycline hydrochloride	Minocin
Skin disorders		
Antifungal	amphotericin B clotrimazole fluconazole flucytosine griseofulvin itraconazole ketoconazole miconazole nystatin oxiconazole selenium tolnaftate undecylenic acid naftifine terbinafine	Amphotec, Fungizone Lotrimin Diflucan Anocobon Gris-PEG, Grifulvin Sporanox Nizoral Micatin, Monistat-Derm Nystex Oxistat Selsun, Head & Shoulders Tinactin Desenex, Cruex Naftin Lamisil
Antiviral	acyclovir sodium amantadine delavirdine famciclovir foscarnet ganciclovir nelfinavir rimantadine valacyclovir zidovudine	Zovirax Symmetrel Rescriptor Famvir Foscavir Cytovene, Vitrasert Viracept Flumadine Valtrex AZT, Retrovir
Antiinfective	bacitracin bacitracin & polymyxin B gentamicin sulfate mupirocin polymyxin B sulfate polymyxin B sulfate & bacitracin & neomycin silver sulfadiazine oseltamivir cidofovir penciclovir ribavirin rimantadine	Baciguent Polysporin Garamycin Bactroban Poly-RX Neosporin Silvadene Tamiflu Vistide Denavir Rebetol Flumadine
Antiinflammatory,	betamethasone desoximetasone	Diprosone, Valisone Topicort

glucocorticoid	flurandrenolide hydrocortisone triamcinolone	Cordran Bactine, Cortaid Aristocort, Kenalog
Anti-inflammatory, antifungal combination	betamethasone & clotrimazole triamcinolone acetonide & nystatin	Lotrisone Mycolog
Antineoplastic, antimetabolite (many new ones)	fluorouracil Lenalidomide Bendamustine	Efudex, 5-FU Revlimid Treanda
Anesthetic, topical	benzocaine dibucaine lidocaine pramoxine	Anbesol, OraJel Nupercainal Solarcaine, Xylocaine ProctoFoam
Antiseptic, disinfectant	alcohol chlorhexidine gluconate hexachloraphene povidone iodine	 Hibiclens, Hibistat pHisoHex Betadine
Astringent	aluminum acetate witch hazel	Domeboro Powder Tucks
Debriding	collagenase trypsin & balsam peru & castor oil	santyl Granulex
Emollients, protectant	tincture of benzoin - compound hydrophilic polymer & rubber polymers & karaya gum powder	Benzoin Sween-a-Peel
Endogenous growth factor	becaplermin	Regranex
Keratolytic	cantharidin collodion salicylic acid & podophyllin & cantharidin podophyllum resin & tincture of benzoin salicylic acid	Cantharone Cantharone Plus Pod-Ben-25 Compound D
Antiparasitic	lindane pyrethrin	Kwell RID

Cardiovascular system disorders		
Antiarrhythmic	disopyramide phosphate procainamide hydrochloride propranolol hydrochloride quinidine polygalacturonate quinidine sulfate quinidine gluconate verapamil hydrochloride amiodarone flecanide propafenone	Norpace Pronestyl, Procanbid Inderal Cardioquin Quinidex Quinaglute Calan, Isoptin Pacerone Tambocor Rythmol
Anticoagulant	aspirin heparin sodium warfarin sodium	ASA, Ascriptin, Bufferin, Ecotrin, Empirin Heparin Coumadin
Antilipidemic, hypolipidemic, fibric acid derivatives	clofibrate gemfibrozil fenofibrate	Atromid S Lopid TriCor
Antilipidemic, hypolipidemic, HMG-CoA Reductase inhibitors	atorvastatin cerivastatin lovastatin pravastatin fluvastatin rosuvastatin simvastatin	Lipitor Baycol Mevacor Pravachol Lescol Crestor Zocor
Antihypertensives, alpha/beta adrenergic blockers	acebutolol labetalol metoprolol nadolol prozosin hydrochloride sotalol	Sectral, Monitan Normodyne, Trandate Lopressor, Toprol XL Corgard, Syn-Nadolol Minipress Betapace
Antihypertensive, Angiotensin Converting Enzyme (ACE) inhibitors	benazepril hydrochloride captopril enalapril maleate fosinopril sodium lisinopril quinapril hydrochloride ramipril	Lotensin Capoten, Novo-Captoril Vasotec Monopril Prinivil, Zestril Accupril Altace

	moexipril trandolapril	Univasc Mavik
Antihypertensive, central-acting adrenergic inhibitors	clonidine hydrochloride methyldopa	Catapres Aldomet
Antihypertensive, angiotensin II receptor antagonist	candesartan telmisartan valsartan irbesartan olmesartan losartan	Atacand Micardis Diovan Avapro Benicar Cozaar
Antihypertensive, calcium channel blockers	amlodipine besylate isradipine nisoldipine diltiazem verapamil	Norvasc DynaCirc Sular Tiazac Calan
Antihypertensive, combination (many available)	hydrochlorothiazide reserpine	Serpasil, Apresoline/
Antidysrhythmic, inotropic, cardiac glycoside	digoxin	Lanoxin
Hemostatic	aminocaproic acid desmopressin acetate phytonadione	Amicar DDAVP Mephyton
Hematinic	ferrous fumarate ferrous gluconate ferrous sulfate iron polysaccharide	Femiron, Feostat Fergon, Fertinic Feosol, Slow Fe, Feratab, Fer-gen-sol, Mol Iron Niferex, Nu-Iron, Hytinic
Thrombolytic	thrombin	Thrombostat
Vasoconstrictor	norepinephrine	Levophed
Vasodilator, coronary, nitrates	nitroglycerine nitroglycerine - transdermal isosorbide dinitrate isosorbide mononitrate	Nitrostat, Nitrobid NitroDur, Deponit Isordil, Iso-Bid, Sorbitrate Imdur
Vasodilator, coronary,	atenolol	Tenormin

adrenergic blocker	nadolol propranolol hydrochloride betaxolol Nebivolol	Corgard Inderal Kerlone Bystolic
Vasodilator, coronary, calcium channel blocker	amlodipine bepridil hydrochloride diltiazem hydrochloride nifedipine verapamil felodipine nisoldipine	Norvasc Vascor Cardizem, Dilacor Procardia, Adalat Calan, Isoptin Plendil Sular
Vasodilator, coronary, non-nitrate	dipyridamole	Persantine
Vasodilator, peripheral, phthalazine	hydralazine hydrochloride	Apresoline
Respiratory system disorders		
Antiasthmatic, mast cell stabilizer	cromolyn sodium nedocromil sodium lodoxamide	Intal Tilade Alomide
Antiasthmatic, bronchodilator leukotriene modifier	montelukast sodium zafirlukast zileuton	Singulair Accolate Zyflo CR
Antihistamine	astemizole brompheniramine budesonide cetirizine chlorpheniramine clemastine desloratadine diphenhydramine fexofenadine loratadine promethazine hydroxyzine cyproheptadine	Hismanal Dimetapp Pulmicort Zyrtec Comhist LA, Comtrex Tavist Clarinex Benadryl Allegra Claritin Phenergan Atarax Periactin
Antitussive	codeine dextromethorphan hydrocodone w/chlorpheniramine	Paveral Benylin DM, Delsym, Hold, Vicks Formula 44 Tussionex

Bronchodilator	albuterol epinephrine isoproterenol theophylline	Proventil, Ventolin Bronkaid Mist, Primatene Mist Isuprel Theo-Dur, Theolair
Decongestant	naphazoline phenylephrine pseudoephedrine	Privine Neo-Synephrine Sudafed, Triaminic AM Decongestant Formula
Demulcent	licorice hard candy	
Expectorants	benzonatate guaifenesin	Tessalon Perles Robitussin, Humibid, Naldecon Mucinex
Inhalant Corticosteroid	beclomethasone triamcinolone budesonide fluticasone mometasone dexamethasone	Qvar Nasacort Pulmacort Flovent Nasonex
Nervous/ Sensory systems		
Autonomic Nervous system		
Cholinergic, anticholinesterase	neostigmine pyridostigmine dicyclomine	Prostigmin Mestinon Bentyl
Cholinergic blocker, tertiary amine, tricyclic amine	amantadine benztropine trihexyphenidyl	Symmetrel Cogentin Artane
Adrenergic	ephedrine sulfate epinephrine isoproterenol	 Adrenalin Isuprel, Bronkosol
Adrenergic blocker	ergoloid mesylate propranolol timolol maleate	Hydergine Inderal Timoptic
Central Nervous system		
Psychomotor stimulant, central	amphetamine sulfate	

acting	dextroamphetamine methylphenidate hydrochloride modafinil	Dexedrine Ritalin Provigil
Anticonvulsant	carbamazepine clonazepam divalproex phenytoin primidone fosphenytoin levetiracetam lamotrigine pregabalin gabapentin topiramate	Tegretol Klonopin Depakote Dilantin Mysoline Cerebex Keppra Lamictal Lyrica Neurontin Topamax
Antiparkinsonian	amantadine hydrochloride benztropine mesylate levodopa levodopa & carbidopa selegiline trihexyphenidyl – hydrochloride entacapone tolcapone pramipexole ropinirole	Symmetrel Cogentin L-Dopa, Dopar Sinemet, Stalevo Carbex, Eldepryl Artane Comtan Tasmar Mirapex Requip
Antipyretics, nonnarcotic analgesics, aspirin	aspirin aspirin & caffeine aspirin with magnesium hydroxide, aluminum hydroxide & calcium carbonate	Bayer, Ecotrin, Empirin Anacin Ascriptin
Antipyretics, nonnarcotic analgesics, acetaminophen	acetaminophen acetaminophen & diphenhydramine citrate tramadol	Datril, Tylenol, Liquiprin, Panadol Excedrin PM Ultram
Antipyretics, nonnarcotic analgesics, aspirin & acetaminophen combinations	aspirin with acetaminophen & caffeine aspirin with acetaminophen & caffeine	Excedrin Migraine Vanquish
Narcotic analgesic	codeine sulfate hydrocodone	codeine Hycodan, Robidone

	hydromorphone meperidine oxycodone pentazocine propoxyphene fentanyl	Dilaudid Demerol Roxicodone, OxiContin Talwin Darvon Actiq-oral, Duragesic - topical
Narcotic analgesics, aspirin based	aspirin with propoxyphene napsylate & caffeine aspirin with codeine aspirin with butalbital & caffeine & codeine 30 mg aspirin & oxycodone aspirin with oxycodone HCl & oxycodone terephthalate aspirin with hydrocodone	Darvon Compound 65 Empirin #3 (30 mg) Empirin #4 (60 mg) Fiorinal with Codeine Percodan Percodan Demi Lortab ASA
Narcotic analgesic, acetaminophen based	acetaminophen with propoxyphene HCl acetaminophen with butalbital & caffeine acetaminophen with butalbital & caffeine & codeine 30 mg acetaminophen 500 mg with hydrocodone 2.5 mg acetaminophen 500 mg with hydrocodone 5 mg acetaminophen 750 mg with hydrocodone 7.5 mg acetaminophen 650 mg with hydrocodone 10 mg acetaminophen 650 mg with hydrocodone 7.5 mg acetaminophen 650 mg with hydrocodone 10 mg acetaminophen & oxycodone acetaminophen & codeine	Darvocet N Fioricet Fioricet w/Codeine Lortab Lorcet HD, Vicodin Vicodin ES Vicodin HP Lorcet Plus Lorcet 10/650 Percocet 2.5, 5., 7.5, 10 mg Tylenol #2 (15 mg) Tylenol #3 (30 mg) Tylenol #4 (60 mg)
Reversible cholinesterase inhibitor, Alzheimer Agents	donepezil galantamine tacrine	Aricept Razadyne Cognex

	rivastigmine	Exelon
Psychotropic		
Antianxiety, sedative/hypnotic (Minor Tranquilizers)	alprazolam hydroxyzine meprobamate	Xanax Atarax, Vistaril Equanil
Antidepressant: alpha 2 antagonists	mirtazapine	Remeron
Antidepressant, Monoamine Oxidase Inhibitor (MAOI)	isocarboxazid phenelzine tranylcypromine	Marplan Nardil Parnate
Antidepressant, Serotonin Selective Reuptake Inhibitor (SSRI)	bupropion fluoxetine sertraline trazodone venlafaxine citalopram fluvoxamine escitalopram paroxetine	Wellbutrin Prozac Zoloft Desyrel, Trazon, Trialodine Effexor Celexa Luvox Lexapro Paxil
Antidepressant, tricyclic	clomipramine amitriptyline desipramine doxepin imipramine nortriptyline protriptyliine	Anafranil Elavil, Endep Norpramin, Pertofrane Adepin, Sinequan Tofranil Aventyl, Pamelor Vivactil
Sedative/hypnotic, barbiturate	amobarbital butabarbital pentobarbital phenobarbital secobarbital	Amytal Butisol Nembutal Luminal Seconal
Sedative/hypnotic, benzodiazepine	estazolam flurazepam halazepam quazepam triazolam zolpidem ramelteon zaleplon	Prosom Dalmane Paxipam Doral Halcion Ambien Rozerem Sonata
Antianxiety/sedative/hypnotics	chlordiazepoxide	Librium, Libritabs

	clorazepate diazepam lorazepam oxazepam prazepam eszopiclone	Tranxene Valium Ativan Serax Centrax Lunesta
Antipsychotic (Major Tranquilizer)	chlorpromazine clozapine haloperidol lithium carbonate prochlorperazine thioridazine loxapine	Thorazine Clozaril Haldol Lithane, Eskalith Compazine Mellaril Loxitane
Atypical Antipsychotic Agents	aripiprazole risperidone paliperidone olanzapine ziprasidone quetiapine desvenlafaxine	Abilify Risperdal Invega Zyprexa Geodon Seroquel Pristiq
Sensory system		
Ophthalmic		
Antiglaucoma agent, adrenergic blockers	apraclonidine betaxolol metipranolol timolol levobunolol latanoprost dorzolamide bimatoprost travoprost	Iopidine Betoptic Optipranolol Timoptic Betagan Xalatan Trusopt Lumigan Travatan
Antiglaucoma, carbonic anhydrase inhibitor	acetazolamide brinzolamide methazolamide	Diamox Azopt Neptazine
Antiglaucoma, cholinergic blocker	carbachol pilocarpine	Isopto Carbachol, Miostat Isopto Carpine, Pilopine
Antiinflammatory, NSAID (Non-Steroidal Anti- Inflammatory Drug)	flurbiprofen diclofenac	Ocufen Voltaren
Antiinflammatory,	neomycin &	Maxitrol

antiinfective	dexamethasone & polymyxin B	
Antiinflammatory - Steroid	dexamethasone fluorometholone prednisolone	Decadron Phosphate, Maxidex FML, Fluor-Op, Flarex Pred-Forte
Artificial Tears		Hypotears Isopto Tears
Otic		
Antiinfective	ciprofloxacin	Cipro
Antiinflammatory, antiinfective combination	polymyxin & neomycin & hydro-cortisone colistin & neomycin & thonzonium & hydrocortisone acetic acid & Burow's solution dexamethasone desonide & acetic acid acetic acid & hydrocortisone ciprofloxacin & dexamethasone ciprofloxacin & hydrocortisone	Cortisporin, LazerSporin-C Coly-Mycin S Domeboro Decadron Tridesilon VoSol (HC) Ciprodex Cipro HC
Antiinflammatory	hydrocortisone fluocinolone	Cortamed, Otall Capex, DermOtic
Anesthetic, decongestant	benzocaine & antipyrine	Auralgan
Ceruminolytic (earwax emulsifiers)	carbamide peroxide triethanolamine polypeptide oleate	Debrox Cerumenex
Gastrointestinal system disorders		
Antacids	aluminum hydroxide aluminum & magnesium calcium carbonate	AlternaGEL, Amphojel Maalox Advanced Caltrate, Maalox Antacid Caplets, Mylanta Lozenges,

	magaldrate & simethicon aluminum hydroxide & magnesium trisilicate	Rolaids, Tums Riopan Plus Gaviscon
Antidiarrheal	bismuth subsalicylate carbonate diphenoxylate/atropine loperamide opium tincture/camphorated opium tincture	Pepto-Bismol, Maalox Advanced Lomotil, Lonox Imodium paregoric
Antiemetics	dimenhydrinate meclizine metoclopramide prochlorperazine trimethobenzamide	Dramamine, Dramanate Antivert, Bonine Reglan Compazine Tigan
Antiflatulents	simethicone	Gas-X, Phazyme, Mylicon
Antiflatulent, antacid combination	aluminum & magnesium hydroxide & simethicone	Di-Gel Liquid
Histamine (H_2) receptor antagonist	cimetidine famotidine nizatidine ranitidine	Tagamet Pepcid Axid Zantac
Antiulcer, proton pump inhibitor	lansoprazole omeprazole rabeprazole pantoprazole esomeprazole	Prevacid Prilosec Aciphex Protonix Nexium
Antiulcer - miscellaneous	sucralfate	Carafate
GERD (Gastroesophageal Reflux Disease)	cisapride	Propulsid
Laxatives, bulk	calcium polycarbophil glycerin lactulose magnesium hydroxide methylcellulose psyllium polyethylene glycol 3350	FiberCon, Fiberall, Mitrolan Osmoglyn Chronulac Milk of Magnesia (MOM) Citrucel Fiberall, Konsyl, Metamucil, Perdiem Miralax
Laxatives, saline	sodium phosphate	Fleet Enema, Phospho-Soda

Laxatives, lubricant	mineral oil	Agoral, Milkinol
Laxatives, stimulants	bisacodyl cascara sagrada senna	Dulcolax, Fleets Bisacodyl, Carter's Little Pills, Doxidan Cascara Perdiem, Senokot, ex-lax
Stool Softeners	docusate sodium docusate calcium docusate & senna	Colace, Dialose Surfak Senna S, Peri-Colace
Urinary system disorders		
Analgesic	phenazopyridine pentosan polysulfate sodium	Pyridium Elmiron
Antiinfective	methenamine nitrofurantoin norfloxacin sulfonamides	Hiprex Macrodantin Noroxin Gantrisin, Bactrim, Septra
Antispasmodic	oxybutynin tolterodine	Ditropan Detrol
Cholinergic	bethanechol cevimeline	Urecholine Evoxac
Diuretic, carbonic anhydrase inhibitor	acetazolamide	Diamox
Diuretic, loop	bumetanide furosemide ethacrynic acid torsemide	Bumex Lasix Edecrin Demadex
Diuretic, potassium-sparing	spironolactone triamterene amiloride	Aldactone Dyrenium Midamor
Diuretic, thiazide and thiazide-like	chlorothiazide hydrochlorothiazide metolazone chlorthalidone	Diuril Hydrodiuril Zaroxolyn Thalitone
Diuretic, thiazide, potassium sparing	spironolactone & hydrochloro-thiazide triamterene & hydrochloro-thiazide	Aldactazide Dyazide
Electrolyte	calcium	Caltrate, Oscal

	magnesium magnesium sulfate potassium bicarbonate potassium bicarbonate & potassium chloride potassium gluconate	Slo-Mag,Chloro-mag epsom salts K-Lyte K-Lyte/Cl, Neo-K, Klorvess K-Dur, Klor-Con, K-Lor, Slow K Kaon
Endocrine system disorders		
Hypoglycemic, alpha-glucosidase inhibitor	acarbose miglitol	Precose Glyset
Antidiabetic, hypoglycemic, meglitinide	repaglinide	Prandin
Hypoglycemic, sulfonylurea	glimepiride glipizide glyburide tolazamide tolbutamide	Amaryl Glucotrol DiaBeta, Glynase, Micronase Tolinase Orinase
Antidiabetic, thiazolidinedione	pioglitazone rosiglitazone	Actos Avandia
Corticosteroids	adrenocorticotropic hormone dexamethasone hydrocortisone methylprednisolone prednisone	ACTH Decadron, Dexasone Cortef, Solu-Cortef, Hydrocortone Depo-Medrol Deltasone
Estrogen	estradiol estrogens, conjugated raloxifene estrogens (esterified)	Estrace, Estraderm, Estrafem C.E.S., Cenestin, Premarin Evista Menest
Insulins	insulin detemir insulin NPH glargine insulin insulin aspart insulin lispro insulin regular	Levemir Lantus NovoLog Humalog
Progesterone	progesterone derivative medroxyprogesterone	Prometrium Provera, Depo-Provera
Thyroid	levothyroxin liotrix liothyronine	Levothroid, Synthroid Thyrolar Cytomel, Triostat

	thyroid (desiccated)	Cholazin, Thyrar, Thyroid Strong
Musculoskeletal system disorders		
Antihyperuricemics (Gout treatment)	allopurinol colchicine colchicine & probenecid probenecid	Zyloprim Colchicine Col-Probenecid, ColBenemid Benemid
Antiinflammatory, NSAIDs	celecoxib diflunisal fenoprofen ibuprofen indomethacin ketorolac naproxen piroxicam sulindac diclofenac meloxicam	Celebrex Dolobid Nalfon Motrin, Advil Indocin Acular, Toradol Naprosyn, Anaprox Feldene, Nu-Pirox Clinoril Voltaren Mobic
Antiinflammatory, steroid	dexamethasone phenylbutazone	Decadron Azolid, Butazolidin
Muscle relaxants	baclofen chlorzoxazone cyclobenzaprine dantrolene carisoprodol orphenadrine methocarbamol metaxalone	Lioresal Paraflex, Parafon Forte, Remular Flexeril Dantrium Soprodal Norflex Robaxin Skelaxin