LPNs administer medications by several routes that do not invade the skin. Medications can be administered by mouth (orally), topically, inhaled, or instilled. The easiest and most frequently ordered route of medication administration is by mouth (PO) or orally. In this module, you will learn how to safely and effectively administer oral and topical medications.
1. Describe medication distribution systems.
2. Discuss preparations required before administering oral or topical medications.
3. Administer medications via the following routes:
   a. Oral
   b. Mucosal
   c. Sublingual
   d. Buccal
   e. Inhalant/Nebulizer
   f. Topical
   g. Nasogastric or gastric tube
   h. Ophthalmic
   i. Otic
4. Apply the six rights of medication administration.
5. Document effects to medications or parenteral therapy.
6. Recognize or question prescriptions that may increase risk of accident or error.
7. Discuss guidelines and precautions for administering medications in special circumstances.
8. Reinforce teaching on possible adverse effects of medications.
9. Evaluate the effectiveness of medication administration.
10. Follow procedures to counteract adverse effects of medications.
11. Identify symptoms or evidence of adverse effects of medications.
12. Identify and document response to actions taken to counteract adverse effects of medications.
13. Identify procedures to clarify illegible prescription, and then obtain correction.
14. Determine responses to prescription and over-the-counter medications and home remedies.
15. Determine interactions among prescriptions, over-the-counter and home remedies medications.
**LEARNING OBJECTIVES**

**Objective** Describe medication distribution systems.

**MEDICATION DISTRIBUTION SYSTEMS**

There may be many ways to distribute medications however, facility policies, procedures, and standards must be followed to promote patient safety. Every facility has policies and procedures for the distribution of medications with policies and procedures for use of the specific system utilized within the institution. In an effort to promote patient safety, medication distribution practices use unit dose systems, computerized or automated systems, and bar coding. Occasionally, the traditional methods of distribution such as the multiple dose systems or floor stock are used. Safety issues are of concern and strict adherence to procedures must be followed to ensure each patient’s medications are administered correctly.

**Unit dose systems**

This system of medication distribution is the most widely used today. With this system, a single dose of medication is prepackaged and labeled by the manufacturer. In acute care, the pharmacy delivers the ordered medications to the nursing units every 24 hours. The ordered dose is taken to the patient at the appropriate time.

The medication cart system is used in some long-term care facilities. A medication cart contains a drawer for each patient on the unit. A 24-hour supply of medicines for that patient is placed in the cart drawer by the pharmacy. The medication drawer is accessed by the nurse each time medicines are given.

The cart is kept locked when no drawers are being accessed. Controlled medications are kept in a separate narcotics drawer under double lock.

**Computerized or automated systems**

With this type of system, the pharmacy loads an automated dispensing system (such as the PYXIS, Sure-Med, or Med-Serve) as medication orders are sent to the pharmacy and then delivers the stocked drawer or cart to the nursing unit where the patient is housed. At distribution time, the LPN enters the patient’s name and drug needed into the system and the drug is dispensed from the system and automatically entered on the computerized drug administration record and on the patient’s billing account. The cart or drawers are returned to the pharmacy for refill according to policy. Although these types of medication distribution systems are very costly, they do reduce nursing time for administration of medication and, more importantly, they allow for tighter control of medications— and therefore have the potential to reduce the chances of medication errors.

Some computerized systems today also use bar coding. These systems require verification of the medication and the patient by scanning the bar code on the medication and/or the bar code on the patient identification band.

**Multiple dose systems or floor stock**

In this type of system, large containers of various medications are kept in the medicine room. The LPN locates the ordered medication from the floor stock and pours the ordered dose into the medication cup for distribution to the patient. This type of system not only makes inventory control difficult, but makes tracking of medication errors a challenge.
CONTROLLED SUBSTANCE MEDICATION DISTRIBUTION

Regardless of the distribution system utilized within a facility, accounting for controlled substance medications is mandated by both state and federal laws due to potential action of the drugs. The primary goal of these laws is to account for all controlled substances. Controlled substance medications are inventoried and distributed in single-dose units or pre-filled syringes kept under lock and key or regulated in a computerized system. RNs or LPNs preparing to administer a controlled substance must demonstrate accountability for the dose of medication given. Follow the policy of the facility to ensure accountability. Procedures must be followed to prevent misuse and abuse of these types of medications.

Two licensed staff members must count the medications: one person counts the medicines in the drawer, the other checks the total on the inventory documentation. Both people must sign that the count was done and is correct. The number of each medication in the drawer must match the number of remaining medicines in the inventory documentation.

If the count is not correct, staff cannot leave work until the discrepancy is corrected. Some facilities require staff to give urine specimens for drug analysis in these situations. It is very important that nurses do not accidentally take the keys to the medication cart home.

Documentation includes:

- Reasons the medication was not administered to a patient
- When inventory records and actual medication counts do not match
- Administration of medication
NAME

Introduction
There are five categories of narcotic controlled substance medications. Utilize a drug book or pharmacology text of your choice to complete the chart below. Fill in the blank boxes with the names of drugs that are assigned to each category or schedule.

Activity
Complete the table below as you review information about schedule drugs.

<table>
<thead>
<tr>
<th>CATEGORY OR SCHEDULE OF DRUG</th>
<th>EXPLANATION OF CATEGORY</th>
<th>EXAMPLE OF TYPE OF DRUG FOUND IN THIS CATEGORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule 1</td>
<td></td>
<td></td>
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<tr>
<td>Schedule 2</td>
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<td>Schedule 3</td>
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<td>Schedule 4</td>
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<tr>
<td>Schedule 5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Application
Compare with another student or present to your instructor for feedback.
LEARNING OBJECTIVES

Objective
Discuss preparations required before administering medications.

PREPARING TO ADMINISTER MEDICATIONS

When preparing to administer medications, the LPN must follow the facility policies and procedures, basic medication administration guidelines, and the six rights of medication administration. Any questions regarding the medication ordered, the route of administration, the dosage, or the time the medication is to be administered must be clarified prior to administration of the medication.

Medications come in many different forms. The LPN cannot correctly prepare a medication if its form is unknown.

Types of Oral Medications:
- Tablets
- Capsules
- Powders
- Liquids, syrups, *elixirs*
- Coated tablets
- *Enteric-coated tablets*
- *Sustained release*
- *Suspension solutions*

Types of Mucosal Medications:
- Eye, ear, and nose drops
- Eye ointment
- Vaginal douches, creams, and suppositories
- Rectal suppositories and enema solutions
- *Sublingual* tablets (absorbed through mucous membrane in the oral cavity)
- *Buccal* tablets and films (absorbed through mucous membrane in the oral cavity)
- Inhaled sprays, mists, and gas

Types of Topical Medications:
- *Transdermal patches*
- Ointments
- Liniment
- Solutions
- Foams
- Gels
- Creams, paste, lotion
- Aerosols

Steps in preparing to administer medications are shown on the following page.
Preparing to Administer Medications

Safety Precautions
- Identify patient, explain procedure, and assess ability to swallow liquid medication.
- Determine if patient needs any PRN medications.
- Check the original physician’s order according to facility policy.
- Check vital signs and lab results as appropriate.
- Check patient’s allergies.
- Research medicines that are unfamiliar to you, ensuring that you are aware of the correct drug:
  - classification
  - indications for use
  - recommended dosage
  - expected action
  - side effects for that dose
  - contraindications and nursing actions
- Calculate correct dose, if necessary.

Prepare Medication
- Wash hands and follow standard precautions.
- Gather MAR or software, medication cup, medications, pen, clean glove for sublingual and buccal meds, and medication tray (optional).
- Read order on MAR.
- Check label on pre-packaged medication as it is removed from drawer.
- Check label again and compare to MAR.
- Detach correct pre-packaged dose from card or supply and place in medicine cup.
- Check label a third time after remaining prepackaged medication is returned to the drawer. The LPN must never utilize a medication which is in a package or bottle that is not labeled or if the label is illegible. The medication is checked systematically by comparing the label on the drug to the medication administration record (MAR) three times:
  - First: as the drug is removed from the storage area
  - Second: immediately before removing the medication from the unit dose packet (which will occur at the patient bedside) or multiple dose bottle
  - Third: before returning the medication either back to the storage place or upon discarding the unit dose package
- Place medication cup on tray or cart.

NOTE: If medication is not pre-packaged, obtain from a stock supply by pouring the correct number of tablets or capsules from the bottle into the bottle cap, then transferring them to the medicine cup.

The LPN must never administer a medication which someone else has prepared. The LPN must also remember the steps of the nursing process when preparing to administer medication.
LEARNING OBJECTIVES

Objective Administer medications via the following routes:
   a. Oral
   b. Mucosal
   c. Sublingual
   d. Buccal
   e. Inhalant/Nebulizing
   f. Topical
   g. Nasogastric or gastric tube
   h. Ophthalmic
   i. Otic

MEDICATION ROUTES

Oral
The oral route of administration is the most frequent. Of primary importance when administering oral medications is the patient’s ability to swallow. This route of medication administration rarely causes any physical discomfort for the patient. Some oral medications are sustained-release and dissolve over a period of time.

The LPN must also consider the patient’s ability to sit partially upright as it is dangerous to expect a patient to ingest anything liquid in a supine position. If the patient is experiencing nausea or vomiting, the oral route of administration may not be optimal.

Very few oral medications are permissible for the patient to self-administer. These include nitroglycerin and occasionally antacids. The LPN should monitor the patient taking the medication prior to documenting the procedure.

Necessary equipment includes a glass of water. The patient should be encouraged to take a few sips of water prior to placing the oral medication in the mouth. The tablet or capsule is placed on the back of the patient’s tongue to assist in swallowing the medication. The patient is encouraged to take sips of water to swallow the medication and then drink the remaining water to allow the medication to enter into the stomach. Tipping the head forward allows the medication to float to the back of the throat for ease of swallowing.

Administering Oral Medications
- Identify patient by reading armband and comparing it with the MAR.
- Confirm identification by asking or verbalizing patient’s name and birthdate.
- Assist patient to sitting position.
- Pour glass of water.
- Explain purpose of medication.
- Allow patient time to ask questions.
- Open pre-packaged medicine, allowing it to drop into medicine cup.
- Do not touch medicine with your hands.
- Hand medicine cup and glass of water to patient.
- Assist patient with holding cup if needed.
- Observe patient swallow medication.

Mucosal
The mucous membranes of the body line the body cavities. This route allows for easy absorption of the medication resulting in quicker therapeutic response. All mucous membranes have different blood supplies, making some more sensitive to medication. Creams, ointments, liquids, aerosols, tablets and suppositories are utilized for the mucosal route of medication administration.

Additionally, there are several areas of the body where mucosal medications may be administered. These include under the tongue (sublingual), buccal (between the cheek and gums), ophthalmic (in the eye), in the nose, otic (in the ear), vaginal, rectally and inhaled into the lungs through an aerosol.

Sublingual
With this route, the tablet is placed under the tongue and allowed to dissolve there. No water is allowed for this route of administration. Patients should be taught not to eat, drink or smoke while the medication is being taken—this allows for quick absorption through the mucous membrane and into the circulatory system.
Administering Sublingual Medications

- Identify patient by reading armband and comparing it with the MAR.
- Confirm identification by asking or verbalizing patient’s name and birthdate.
- Wash hands and put on a clean glove.
- Explain purpose and placement of medication to patient.
- Open pre-packaged medicine, allowing it to drop into medicine cup.
- Do not touch medicine with bare hands.
- Place sublingual tablet under patient’s tongue with gloved hand or observe patient place the medication.
- Instruct patient to allow the tablet to dissolve and not to swallow it.
- Remain with patient until medication is dissolved.
- Do not give water.

Administering Buccal Medications

- Identify patient by reading armband and comparing it with the MAR.
- Confirm identification by asking or verbalizing patient’s name and birthdate.
- Wash hands and put on a clean glove.
- Explain purpose and placement of medication to patient.
- Open pre-packaged medicine, allowing it to drop into medicine cup.
- Do not touch medicine with bare hands.
- Place buccal medication between the patient’s cheek and gum with gloved hand or observe patient place the medication.
- Instruct patient to allow tablet to dissolve and not to swallow it.
- Remain with patient until medication is dissolved.
- Do not give water.

Buccal

The buccal route of medication administration involves placing the medication between the cheek and either upper or lower gum to dissolve slowly. Generally, this type of medication is utilized for a local rather than systemic effect, such as throat lozenges.

Ophthalmic

The ophthalmic route requires sterile medication. The LPN should wear gloves during this procedure. Any drainage from the eye should be cleaned with sterile water prior to administration of ophthalmic medications. A dropper is utilized for this procedure. Some ophthalmic ointments have applicator tips for distribution of the medication.

The LPN instructs the patient to look up while pulling the lower lid out to expose the conjunctival sac. The medication is dropped or squeezed into the conjunctival sac. DO NOT touch the dropper or tip of the ointment applicator to the eye or conjunctival sac. This can contaminate the tip with infectious agents that can be reintroduced into the eye. Once the medication is in the sac, ask the patient to close the eye and with a cotton ball, hold gentle pressure on the inner corner of the eyelid for a few minutes to keep the medication from draining into the nose. As the pressure is held, instruct the patient to move the eye around to distribute the medication.

Otic

Otic (ear) medications are administered primarily for outer ear inflammation or infection. These medications are sterile solutions. DO NOT touch the tip of the dropper to the patient’s skin. The patient is instructed to lie on the unaffected side. The outer earlobe is pulled down and back for children under 3 years of age or up and out for adults. The otic medication is dropped into the external ear canal. The patient should remain in this position for several minutes until the medication has had time to saturate the external ear canal. A cotton ball may be loosely placed in the canal if desired to prevent medication from draining from the canal.
**Inhalant/Nebulizing**

Medications administered by this route are carried into the respiratory tract either through the mouth or through the nose. This technique requires special equipment. **Nebulizers** and **meter-dose inhalers** are just a few of the common tools utilized to carry these medications into the respiratory tract for absorption.

The LPN’s primary role in this type of medication administration is to make sure that the patient utilizes proper technique. When using aerosols, oxygen is utilized to assist in delivery of the medication (or room air when a machine is used). A nebulizer mouthpiece is placed into the patient’s mouth or, if the patient is less cooperative, a mask may be used and placed over the patient’s nose and mouth. The patient is encouraged to breathe deeply and slowly as the oxygen or air is directed into the nebulizer. Air combines with the medication to create a mist. This is done until all of the medication is gone. It is important to teach the patient proper care of the equipment by cleaning and drying the equipment after each use.

Metered-dose inhalers are used to deliver predetermined amounts of medication to the nasal or lung tissue. Inhalers are small gas pressured canisters. The inhaler opening is held in the mouth with the lips forming a tight seal. As the canister is pumped, the medication is dispensed. The patient is instructed to take a deep breath and hold it for as long as possible. This allows the medication to be carried into the lungs, producing a very rapid effect. The inhaler opening should be cleaned after each use.

**Administering Inhalant/Nebulizing Medications**

Prepare to administer medication.

- Identify patient by reading armband and comparing it with the MAR. Confirm identification by asking or verbalizing patient’s name and birthdate.
- Explain purpose of medication and allow patient time to manipulate inhaler, canister, and spacer device. Explain the metered dose delivered by the inhaler. Allow patient time to ask questions.
- Provide privacy.
- Wash your hands and follow standard precautions.
- Remove mouthpiece cover and shake inhaler well.

Administer medication.

*For inhaler only:*
- Instruct patient to open lips and place inhaler mouthpiece one-half to one inch into the mouth making a tight seal around the mouthpiece. Lips should not touch the canister.
- Instruct patient to inhale slowly and deeply through the mouth while pressing down on the inhaler.
- Instruct patient to inhale slowly through their mouth with lips tightly sealed around the mouthpiece for two to three seconds, exhaling through nose.
- Wait one minute between administering puffs.

*For inhaler with spacer (aerochamber):*
- Instruct patient to exhale fully, then place mouthpiece of spacer into mouth with lips closed around it.
- If two puffs are prescribed, the spacer collects and holds medication, allowing the patient to inhale all medication in multiple breaths.
- If more than one type of inhaler is prescribed, wait 5 to 10 minutes between administration of the inhalers. If a steroid inhaler is used, the patient should rinse his or her mouth with water after using the inhaler.

Complete procedure.

- Leave patient safe and comfortable.
- Document the name of medication, dose, route, location, time, and date of administration according to facility policy.

Nasal inhalers are administered in the same manner as nasal sprays. A metered dose is delivered by the nasal inhaler.
Applying Mucosal Medications

Prepare to administer medication.

- Identify patient by reading arm band and comparing it with MAR. Confirm identification by asking or verbalizing patient’s name.
- Explain purpose of medication and location of application. Allow patient time to ask questions.
- Provide privacy.
- Wash hands.

For eye medications:

- Position patient’s head so it is tilted back and supported by a pillow.
- Instruct the patient to look upward.
- Cleanse exudate from eye with saline-moistened cotton ball, wiping from inner canthus (corner) outward. Use a separate cotton ball for each wipe.
- Apply gentle traction to the lower eyelid to form a pouch in the lower conjunctival sac.

Eye drops:

- Carefully drop prescribed number of eye drops into the pouch, not on the eyeball.
- Apply gentle pressure to the inner canthus using a cotton ball or tissue for one to two minutes. (This prevents the medication from going into the lacrimal duct.)

Eye ointment:

- Carefully apply thin line of ointment along the pouch of the lower eyelid. Be careful not to touch the tip to the mucous membrane.
- Instruct patient to close the eye and move it around in a circular motion to spread the ointment.

For ear medications:

- Position patient with affected ear up.
- Draw prescribed amount of medication into dropper.
- For patients age three and up, pull ear lobe upward and back. Instill drops in ear canal without touching dropper to ear. For patients under three years old, pull earlobe downward and back before instilling ear drops.
- Instruct patient to remain in this position for several minutes.
- Insert cotton ball loosely in ear if needed.

For nasal medications:

Eye ointment:

- Carefully apply thin line of ointment along the pouch of the lower eyelid. Be careful not to touch the tip to the mucous membrane.
- Instruct patient to close the eye and move it around in a circular motion to spread the ointment.

For ear medications:

- Position patient with affected ear up.
- Draw prescribed amount of medication into dropper.
- For patients age three and up, pull ear lobe upward and back. Instill drops in ear canal without touching dropper to ear. For patients under three years old, pull earlobe downward and back before instilling ear drops.
- Instruct patient to remain in this position for several minutes.
- Insert cotton ball loosely in ear if needed.

For nasal medications:

Nose Drops:

- Position patient with neck hyper extended, if possible.
- Draw medication into dropper.
- Instill prescribed number of drops while holding dropper at nostril(s).

- Instruct patient to remain in this position for two to three minutes.
- Wipe nasal area with tissues, but instruct patient not to blow nose immediately after instillation of nose drops.

Nose Spray

- Position patient sitting upright with head erect.
- Instruct patient to blow nose gently to remove mucus.
- Shake nose spray bottle and hold it upright.
- Compress one nostril, and instruct patient to breathe slowly through open nostril.
- Squeeze bottle as patient inhales.
- Repeat for other nostril, if ordered.
- Wipe nasal area with tissues, but instruct patient not to blow nose immediately after instillation of nose drops.

Complete the procedure.

- Leave patient safe and comfortable.
- Document the name of medication, dose, route, location, time, and date of administration according to facility policy.
Topical Medications
This route of administration involves application of medication directly to the skin. Topical medications may be creams, ointments, lotions or pastes. Prior to application, the skin where the medication is to be applied should be cleaned and dried. Gloves should be worn. If the medication being applied comes in contact with the LPN, the same therapeutic effect may result with the LPN as is intended for the patient. As a result the patient doesn’t receive the correct dose.

When a patient has areas of skin that have infectious exudates, tongue depressors or cotton-tipped applicators may be used to assist with application of medication. Some topical medications require rubbing the medication into the skin until absorbed. Other types are squeezed onto marked measuring applicator paper. This paper is then placed on a cleaned area of the skin, covered with plastic and allowed to absorb slowly. Topical administration maintains a relatively constant blood concentration of the medication which results in a lower risk of adverse reactions. The LPN must remove the old patch and clean that site prior to applying a new patch. Pre-dosed patches such as nitroglycerin or estrogen are included in this type of medication route.

**Administering Topical Medications**

Prepare to apply topical medication.
- Check the original physician’s order according to facility policy.
- Identify patient, explain procedure, and locate area for topical application.
- Determine if patient needs any PRN medications.
- Check patient’s allergies.
- Research medicines that are unfamiliar to you, ensuring that you are aware of the correct dose, proper placement of medicine, indications, actions, side effects, and nursing actions.

Prepare the medication and patient.
- Wash hands and follow standard precautions.
- Gather MAR, topical medicine or transdermal medication, applicator patch if needed, dressing if needed, gloves, tongue depressor for wound medication, and pen.
- Read order on MAR.
- Check label on topical medication as it is removed from drawer or storage area.
- Check label again and compare to MAR.
- Check label a third time before applying to patient.
- Identify patient by reading armband and comparing it with MAR.
- Confirm identification by asking or verbalizing patient’s name and birthdate.
- Explain purpose of medication and location of application.
- Allow patient time to ask questions.
- Provide privacy.
  
  For wound medication:
  - Put on a clean glove.
  - Remove old dressing (if necessary) and old medication by cleansing site as ordered.
  - Remove glove and wash hands.
  - Put clean gloves on both hands.
  - Apply medication as ordered using a tongue depressor to remove medication from container.
  - If medication is in a tube, squeeze it onto the tongue depressor and use your gloved finger to smooth it in place.
  - Avoid touching the medication tube or container to the wound area.
  - Apply dressing if ordered.
  - Remove gloves and wash hands.

  For transdermal patch:
  - Remove old patch and cleanse site with an alcohol swab.
  - Remove new patch from packaging and write date, time, and your initials on the patch.
  - Remove patch backing from one side.
  - Place patch in a new location on the patient’s body, and remove the remaining backing.
  - Press gently on patch to ensure that it adheres to skin.

  For transdermal cream:
  - Remove old patch and cleanse site with alcohol swab.
  - Measure the ordered length of cream on the application patch. For example, if one inch of Nitropaste is ordered, squeeze a line of Nitropaste one inch in length as marked on the patch.
  - Apply the patch to a new area of the body, spread gently by moving the applicator patch, and tape in place.
  - Write the date, time, and your initials on the tape.

Complete the procedure.
- Leave patient safe and comfortable.
- Document the name of medication, dose, route, location, time, and date of administration according to facility policy.
Gastric / Nasogastric

Patients with gastric or nasogastric tubes can be given oral medications through these tubes. Prior to administration via this route, the nurse must determine patency of the tube. Once patency is verified, the tube is flushed with water prior to administration of any medication. Liquid medication should be diluted with water and the tube should be flushed after all medication has been administered. The nurse must research all medications to determine if it is safe to crush or open for administration. Tablets should be crushed and diluted prior to administration. Capsules safe to open and dilute may not mix well with water. Request that medications be provided in liquid form. To maintain the patency of the tube, flush the tube completely after medication administration.

Administering Medication via Gastric/Nasogastric Tube

Prepare to administer medications through a feeding tube.
- Identify the patient and explain procedure.
- Gather stethoscope, medication (liquid or crushed), bulb or piston syringe, gloves, and a glass of water at room temperature.
- Determine if patient needs any PRN medications.
- Check the original physician’s order according to facility policy.
- Check vital signs and lab results as appropriate.
- Check patient’s allergies.
- Research medicines that are unfamiliar to you, ensuring that you are aware of the correct dose, indications, actions, side effects, and nursing actions.
- Calculate dose, if necessary.

Administer medication through a feeding tube.
- Assist the patient to Fowler’s position unless contraindicated.
- Check placement of nasogastric feeding tube.
- Measure a small amount of water into cup.
- Remove plunger from the syringe and insert the tip of the barrel into the nasogastric or gastrostomy tube.
- Slowly pour the water into the syringe and allow it to flow by gravity into the nasogastric or gastrostomy tube.
  **NOTE:** If the feeding tube is blocked, the water will not flow. You can then correct the blockage without having lost any of your medication dosage.
- Clamp tube after water flows into the tube. Do not let air enter the gastrostomy or nasogastric tube when refilling the syringe, as this may cause gas and discomfort for the patient.
- Mix crushed medicines with a small amount of water.
- Unclamp the feeding tube and pour the crushed medicine and water mixture into the syringe.
- Allow the crushed medicines and water to flow into the tube via gravity.
- Pour any liquid medicines into the syringe and allow them to flow into the tube via gravity.
- Pour the prescribed amount of water into the syringe and allow it to flow by gravity into the tube.
- Reclamp the feeding tube or reconnect it to continuous feeding via pump.
- If the tube is a nasogastric tube to suction, rather than a feeding tube, clamp the tube for 20 to 30 minutes, then reconnect it to suction.

Complete the procedure.
- Leave patient comfortable and safe, with the head of the bed elevated 45°.
- Document the name of medication, dose, route, location, time, and date of administration according to facility policy.
NAME

Introduction
As an LPN it is necessary to administer different types of medication. Frequently the patient may not tolerate one form of the medication and a different form may be required.

Activity
In the following activity, you will summarize the differences between forms of medication.

1. What is the difference between a tablet and a capsule?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

2. What is the benefit of an enteric-coated tablet?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

3. How does a sustained release capsule help a patient tolerate the medication?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

4. Compare and contrast sublingual and buccal medications.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Application
Present your answers to your instructor for feedback.
**LEARNING OBJECTIVES**

**Objective**  
Apply the six rights of medication administration.

**SIX RIGHTS**

Safety and accuracy of administration of medications is of paramount importance. There is no room for carelessness in the process of medication administration. The LPN must remain vigilant when preparing medications for administration by utilizing a systematic process to prevent medication errors. Verifying the six rights of medication administration provides this process.

1. **Right Drug** — Prepare the drug by checking three times prior to administration. First, the drug name on the medication as it is in the multidose container, if used, unit dose packet or other storage place is compared with the medication administration record. Second, put the medication in the medication cup without opening the drug and compare the medication to the medication administration record or software printout. Third, prior to preparing the dose for administration to the patient at the bedside, compare the medication to the medication administration record.

2. **Right Dose** — Ensure the patient receives the right dose by checking the MAR or software printout with the physician’s order. Calculation of the correct amount to give is needed when the amount of medication available differs from the medication ordered. The LPN must review the facility policies to determine if this is standard practice within the facility. Additionally, some medications require a double check of the dose with another licensed person. Some of the medications that often require this validation of the right dose include insulin and heparin.

3. **Right Patient** — Identify the patient prior to administration of any medication. It is a requirement that you identify the patient by two different methods. The types of identification which the LPN could utilize for this purpose might include the patient’s name, the patient’s date of birth, or the patient’s medical record number. Never identify a patient by a room number. The LPN could ask the patient to state this information or find it on the patient’s identification bracelet.

4. **Right Route** — Verify the route by checking the original physician order for the medication. Anytime the route is not specified in the physician order, the LPN must clarify this information. The LPN must contact the physician to clarify the medication order if an improper route order could cause harm to the patient.

5. **Right Time** — Verify the time by checking the original physician order for the medication. Medications are administered at scheduled times for various reasons. Some medications are metabolized faster than other medications. Some medications may require specific times between doses to maintain a therapeutic blood level for optimal effectiveness of the medication. Most facilities have policies for specified times of administration. The LPN must review these policies prior to administering medications. Some medications may be ordered on an as needed basis, abbreviated as PRN. This type of order requires that the LPN obtain additional information prior to administration of the medication. PRN ordered medications specify a period between doses such as every 4 hours or every 12 hours. The LPN must determine when the last administration of the medication took place to determine if it is safe and appropriate to administer the medication again. A PRN medication is also often ordered for a specific symptom or problem. It cannot be given for other reasons. For example: Aspirin 325 mg is ordered 2 tablets by mouth (PO) for fever above 101 F. You cannot give this to the patient if the patient complains of pain without checking with the physician first. The table below lists some of the abbreviations for frequency of administration.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Frequency</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>BID</td>
<td>Twice a day</td>
<td>0900 and 1700</td>
</tr>
<tr>
<td>TID</td>
<td>Three times a day</td>
<td>0800, 1200, 1600</td>
</tr>
<tr>
<td>PRN</td>
<td>as needed</td>
<td>0900, 1300, 1700, 2100</td>
</tr>
</tbody>
</table>

Caution should be taken when caring for a cognitive impaired patient. Be sure to follow the policy of the facility in which you work.
6. Right Documentation — Document the medication administration on the MAR or software program as well as in the patient’s medical record. Each medication administered should be documented immediately after administration, not before. This documentation includes:

- medication administered
- time the medication was administered
- LPN administering the medication according to facility policy and depending on the route of administration
- site of administration (if required)
- pain assessment

In facilities utilizing computerized medication distribution systems, all of this documentation may be done automatically when the LPN signs onto the system. Occasionally, medications ordered as scheduled doses are not administered. It is very important to document the reason for not administering medications as scheduled. This offers valuable information to the physician as well as to other members of the healthcare team. Possible reasons for not administering scheduled medication might include the patient is vomiting, the patient refused the medication or the patient has tests ordered which require no food or drink 24 hours prior to testing.

Again, the LPN must be aware of the facility policies regarding these types of situations. When a medication is ordered PRN, the LPN must document in the patient medical record as well as on the MAR.

NURSING PROCESS FOR MEDICATION ADMINISTRATION

Assessment & Research
The prudent LPN has obtained information about the patient to safely administer the ordered medication. This includes the patient’s diagnosis, symptoms, allergies, health history and why the medication is indicated for the patient.

The LPN must also have knowledge about the medication to safely administer it to the patient. This information includes the normal dosage range, the acceptable routes of administration, the expected response of the medication, adverse reactions, side effects and interactions with other drugs as well as contraindications.

Planning
Plan on how to give the medication. After assessing the patient, determine the best nursing interventions to give the medication to the patient safely. For example, if the patient needs to sit up in order to swallow a tablet, determine the action needed to ensure that the patient can swallow the tablet.

Implementation & Documentation
During the actual administration, the LPN utilizes only those acceptable procedures which allow for patient safety. Once the medication has been administered, the LPN must document the medication administration.

This varies greatly from facility to facility. However, the following guidelines about administration and documentation of medicines will apply in most situations:

- ALWAYS document medications you give.
- ALWAYS report a medication error to your supervisor immediately.
- ALWAYS watch the patient swallow all oral medications.
- ALWAYS document the reason a medication was not given.
- ALWAYS return to assess the patient’s response to administered medications.
- NEVER document medications for someone else or ask another to document for you.
- NEVER administer medications you did not prepare.
- NEVER leave prepared medications unattended.
- NEVER leave the medicine cart unlocked.
- NEVER leave medicines with a patient or family member to be given later

The medication administration process offers many patient teaching opportunities which the LPN can utilize to teach the patient and the family for the continued safe use of any medication.

Evaluation
The LPN must also monitor the patient for a response to the medication. Any unexpected responses to medications must be reported immediately and documented appropriately.
NAME

Introduction
All medication should be administered with safety in mind. This activity will familiarize you with the six rights of medication administration.

Activity
Answer the questions related to the medication administration scenarios.

1. The LPN is preparing to administer medications. The LPN has been assigned to Ms. Smith in Room 2256 and Mrs. Smith in Room 2266. To assure safe and accurate administration of medications to each of these patients, the LPN must utilize a double check for identification of each patient. Each patient has an identification bracelet on; however, the bracelet of the patient in Room 2266 has been wet and is now smudged. What must the LPN do to properly identify this patient prior to administering the medication prescribed?

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

2. Your patient has scheduled medication for 0700 which includes insulin sub q. The patient has a test ordered for 0900, which requires the patient to be NPO for 24 hours prior to testing. Would you administer the medication which is not ordered orally? Discuss your actions.

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

3. You are preparing your medications for administration for a patient in Room 560. In the PYXIS drawer that is labeled to contain Paxil, you withdraw a tablet labeled Plavix. Is there any action that the LPN should take at this point?

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

Application
Create your own scenario where one or more of the six rights were not followed properly. What would have been the consequences of these actions? Discuss with the class, your partner or instructor.
**Learning Objectives**

**Objective**  
Document effects to medications or parenteral therapy.

**Objective**  
Recognize or question prescriptions that may increase risk of accident or error.

**Objective**  
Discuss guidelines and precautions for administering medications in special circumstances.

**Documentation of Medication Effects**

There are national standards of care that outline the processes for evaluation of medication responses. These standards should be used when determining patient response to the drug. The therapeutic effect of the medications administered should be monitored by evaluating all changes in symptoms that the patient exhibits. Adverse effects observed should be recorded and reported promptly. Medication responses (observed) should be part of the scheduled routine nursing evaluation process. Documentation in the patient medical record includes patient observations as well as nursing actions.

**Risk of Accident or Error**

Multiple safety checks are essential for patient safety during the medication administration process.

- All medication orders should be reviewed for completeness.
- All medication calculations should be double checked for accuracy.
- If a patient questions a medication, the LPN should listen intently and investigate the patient’s concerns prior to administration of the medication.

The Institute for Safe Medication Practices (ISMP) has developed a list of many medications and abbreviations, symbols and dose designations which are known to have the potential to cause medication errors. The ISMP lists are known as the Look Alike Sound Alike and the High Alert Medications. These lists, as well as the list of Error Prone Abbreviations, Symbols and Dose Designations should be readily available to every healthcare provider who is working with medication administration. Healthcare providers are human and can make errors innocently. It is everyone’s responsibility to check and double check processes to ensure patient safety. This double check system often involves calling the physician to verify correct orders.
**SPECIAL CIRCUMSTANCES**

Administering medications is not simply a matter of handing pills to a patient and watching them swallow. Patients may:

- be uncooperative
- refuse to take the medication
- be unable to swallow the medication
- not understand how the medication is to be taken

**NOTE:** The patient has the right to refuse to take a medication.

The patient must not be forced to take a medication. Patient teaching regarding the need for the treatment may assist the patient in understanding the need for the medication. If the patient continues to refuse to take the medication, this information should be charted on the MAR and in the patient’s medical record. It may also be necessary to notify the physician of the patient’s refusal to take the medication.

Sometimes the patient may be unable to swallow tablets or capsules. In this situation, if the medication can be crushed, the LPN should crush the medication and mix it with a suitable soft food such as pudding or applesauce to assist the patient in swallowing the medication. This should only be done after consultation with the Drug Guide to determine that the medication can be safely crushed. Some medications may be available in liquid form that would be preferable to crushing a tablet or opening a capsule. The LPN could consult with the pharmacy to determine if this is an option.

Some patients with feeding tubes may have oral medications ordered. In these situations, the LPN should research medication to determine if it is acceptable to crush a tablet or open a capsule. Once it is determined that it is safe to do this, the medication is crushed to a fine powder and diluted to avoid blocking the feeding tube. Determine if a liquid form of the medication is available and seek permission to use this form instead of crushing the tablet. The medication is then administered through the feeding tube just as the nourishment is administered. The feeding tube should be flushed with water after administration of medications through the tube to maintain patency of the feeding tube.
NAME

Introduction
Medications can obstruct a gastric tube. This activity will demonstrate the reaction between medication and the solution in which they are dissolved, as well as the potential for medications to obstruct the tube.

Activity
Complete the activity and chart your results.

1. Gather a variety of solid candies such as Smarties, Sweet Tarts, wafer candies or M & M’s.
2. In separate small dishes crush each candy as small as possible.
3. Mix the crushed substance with ¼ cup of water.
4. Pour the substance through a drinking straw.
5. Repeat the process using a carbonated beverage.

<table>
<thead>
<tr>
<th>Candy #1</th>
<th>Candy #2</th>
<th>Candy #3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water</strong></td>
<td><strong>Carbonation</strong></td>
<td><strong>Water</strong></td>
</tr>
<tr>
<td>How easily does the substance clear the straw?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How fine does the powder need to be dissolved?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How much water/carbonated beverage does it take to dissolve the crushed powder?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How easily does the straw clog?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Application
Discuss your results as a class or with your instructor. Determine if carbonation makes a difference in the solvency of the candy.
LEARNING OBJECTIVES

Objective Reinforce teaching on possible adverse effects of medications.
Objective Evaluate the effectiveness of medication administration.

PATIENT TEACHING

Medication administration provides an optimal teaching opportunity for the LPN. The patient and the family should be provided information about all aspects of the medication regime.

Key areas of patient education include expectations of the medication regime as well as possible side effects that may be experienced. The patient should be taught to monitor any vital signs or laboratory findings recommended when taking specific medications. Some medications require a log of recordings for the provider to evaluate and properly monitor the medication effectiveness. The LPN should encourage the patient and family to contact their healthcare provider for advice if any abnormal symptoms occur rather than to stop taking the medication.

The LPN should evaluate the patient’s ability and skill level to monitor any parameters set for safe medication therapy, such as the patient’s ability to palpate their pulse or take a blood pressure, understand normal findings and finally the ability to record those readings or report them to their healthcare provider if the findings are abnormal.

EVALUATE MEDICATION EFFECTIVENESS

The effectiveness of medications is determined by the body's rates of absorption, metabolism, distribution, and excretion.

It is vital that the LPN have knowledge of why a specific medication is prescribed. Many drugs are prescribed for a variety of reasons or indications. The LPN is expected to evaluate the therapeutic response to medications administered. The best way to determine the therapeutic effectiveness of a medication is by monitoring changes in the patient’s condition.

For instance, a patient is receiving an antibiotic for a urinary tract infection. When evaluating the patient, the urinalysis continues to indicate an infection and the patient continues to experience an elevated temperature and burning when urinating. These symptoms indicate that the antibiotic may not be effective in reducing patient symptoms. The LPN would need to relay this information to the medical provider for possible changes in the antibiotic treatment.
Before administering any medication, the LPN must have basic knowledge regarding specific information indicated for safe and effective use of the medication.

**NOTE:** When a patient has a medication reaction which is unexpected and undesirable, immediate care is needed. This type of adverse effect is known as an *idiosyncratic* response.

**LEARNING OBJECTIVES**

**Objective** Follow procedures to counteract adverse effects of medications.

**Objective** Identify symptoms or evidence of adverse effects of medications.

**Objective** Identify and document response to actions taken to counteract adverse effects of medications.

**Objective** Identify procedures to clarify illegible prescription, and obtain correction.

**ADVERSE EFFECTS**

LPNs play a very important role in monitoring for adverse reactions to medications. Virtually every medication has the potential to cause an adverse reaction. Adverse effects from medications are those actions which are unintended, unpredictable and non-therapeutic. These adverse reactions range from bothersome to life-threatening. Every person is as different as the reaction a medication can cause. The LPN must be knowledgeable of adverse reactions that are commonly caused by the medication. An adverse reaction can occur at any time.

Adverse effects to medications may be referred to as an allergic reaction. This type of adverse effect typically manifests the first symptoms of the allergy with the first dose of the medication. These symptoms may be minor such as patient complaints of itching or a skin rash. Severe allergic reaction to a medication may be evidenced as breathing difficulties, wheezing, cyanosis, sudden loss of consciousness and swelling of the lips, tongue and eyes. Medication reactions may appear as other conditions such as the flu or a cold. A new medication that has been added to the medication regime recently can cause an unusual reaction.

Allergic reactions can occur at any point during treatment and administration. Treat every drug administration as a drug that could have unexpected effects.

If the patient is in a non-life threatening state, nursing actions include monitoring:

- Blood pressure
- Heart rate
- Lab results
- Toxic effects
- Indicators of drug effectiveness
- Teaching needs

Additionally, the LPN must always assess for patient allergies to drugs and foods. Routinely ask the patient right before administering the medications if they have any allergies. It is better to have the patient answer that question repeatedly than to have a reaction to medications. The prudent LPN practices careful and thoughtful preparation prior to administration of all medications.

Minor adverse effects from medications may be treated with antihistamines (to alleviate itching) or corticosteroids (to decrease swelling) to counteract the inflammatory response of the body.

Life-threatening adverse effects must be identified quickly and require more aggressive treatment. Treatment may involve:

- medications or actions to maintain the patient’s blood pressure
- improve the patient’s airway and respiratory function
- maintain or restore the cardiac function of the patient
Documentation of the patient’s response to medications can prevent future adverse reactions that a patient might experience.

The LPN should stay with the patient until other healthcare providers arrive. Turn on call light to notify other healthcare providers and RN about the situation.

Adverse reactions provide critical information for the patient’s health promotion and health maintenance. The LPN relies on documented patient allergies for safe and effective treatment administered to the patient.

**LEGIBLE PRESCRIPTIONS**

The first step in the medication administration process requires a legible order that contains all the essential information for safe medication administration.

All medication orders must be complete and written following a specific format. This includes:

- Patient name
- Name of the drug
- Dose
- Route of administration
- Reason for administration
- Time frequency for the medication to be given
- Signature of the healthcare provider writing the medication prescription

This information is reviewed as transcription of the order is done. If any of this information is missing, the LPN must obtain the information prior to administration. If at any time, anyone on the healthcare team questions any issues regarding the patient’s need for the ordered medication, or the safety of the patient if the medication is administered as ordered, the physician should be consulted. The LPN must never administer medications from an order that is illegible or not complete and clear. Double check for sound or look alike medications before acknowledging the medication prescription is accurate.
Learning Activity 5

Name

Introduction
It is vital that medication orders are clear with all information needed. This activity will test your knowledge on what is missing from medication orders.

Activity
Determine what is missing from the following example medication orders.

1. Capoten 25 mg BID
   ____________________________________________
   ____________________________________________
   ____________________________________________

2. Tylenol PRN for headache or temperature
   ____________________________________________
   ____________________________________________
   ____________________________________________

3. Insulin 15 units for blood sugar over 250 dl/mg
   ____________________________________________
   ____________________________________________
   ____________________________________________

Application
Present to your instructor or compare with another student to determine if all missing information has been noted.
Herbal medicines and dietary supplements may be beneficial for some individuals. However; these same medications can lead to very dangerous effects in other persons. Herbal medicines and dietary supplements are not standardized or regulated by the U.S. Food and Drug Administration.

There are hundreds of herbal medications and dietary supplements available to the public. This could lead to possibly thousands of interactions and effects from these products. These medications and supplements have the potential for interactions with not only other herbal and dietary products but also with prescribed medications.

**Learning Objectives**

**Objective** Determine responses to prescription and over-the-counter medications and home remedies.

**Objective** Determine interactions among prescriptions, over-the-counter and home remedies medications.

**Non-Prescription Drugs**

Nonprescription medications are also known as over-the-counter medications (OTC). Home remedies are also known as herbs and dietary supplements. Both of these types of drugs can cause therapeutic as well as adverse effects on the body.

Nonprescription medications include those used for colds, cough, headaches, constipation, diarrhea, or upset stomach. Dietary supplements include vitamins, minerals, herbs and weight control supplements. Herbs come in a variety of forms and are used for a variety of effects from boosting the immune system to treating depression or as a laxative. All of these products are easily available at supermarkets, drug stores, pharmacies and health food stores.

One very common nonprescription medication, aspirin, can cause potentially life-threatening gastrointestinal bleeding. Many herbs have very strong pharmacological activity causing the same effects as many prescription medications do.

Any substance introduced into the body can cause adverse reactions as well as therapeutic responses. Some herbs may interact with prescription medications or could be toxic to the body, causing major organ damage. These products may be referred to as “natural remedies”. Although these products do not require a prescription, they are not without risk.

Information

In 2009, the U.S. Food and Drug Administration was given regulatory rights over tobacco products.
Many patients consider nonprescription medications and herbs as safe and therefore do not include them when discussing their routine medication regime. Patients who choose to use these medications and supplements must be open with their healthcare provider. The patient must be encouraged to consult with their physician for any signs or symptoms experienced while taking these products.

LPNs must inquire about the use of herbs and dietary supplements, as well as prescribed medications, when taking the patient health history. When the LPN is gathering data about the patient’s medication regime, it is important to question the patient and report any herbs, teas, vitamins and other dietary supplements.

<table>
<thead>
<tr>
<th>HERBAL MEDICATIONS</th>
<th>POSITIVE EFFECTS</th>
<th>POTENTIAL ADVERSE EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Echinacea</td>
<td>Used to stimulate the immune system</td>
<td>May actually be harmful to patients taking immunosuppressive medications</td>
</tr>
<tr>
<td>Ephedra</td>
<td>Widely used as a dietary suppressant</td>
<td>May be harmful to persons with hypertension and can even inhibit antihypertensive agents’ effectiveness</td>
</tr>
<tr>
<td>Ginkgo</td>
<td>A herbal medication known to prevent blood clotting</td>
<td>Can be dangerous for patients on therapeutic aspirin regimens</td>
</tr>
<tr>
<td>Green tea</td>
<td>Antioxidant potential of this herb</td>
<td>May antagonize the therapeutic effect of anticoagulant medications</td>
</tr>
</tbody>
</table>
NAME

Introduction
The nursing process is the foundation for all nursing actions. This exercise takes you through the steps of the nursing process.

Activity
A. For each step of the nursing process, fill in the expected action of the LPN when administering pain medications.

ASSESSMENT ____________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

NURSING DIAGNOSIS ____________________________________________________
_______________________________________________________________________
_______________________________________________________________________

PLANNING _____________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

IMPLEMENTATION ______________________________________________________
_______________________________________________________________________
_______________________________________________________________________

EVALUATION ___________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

B. Develop a concept map on a natural remedy or home remedy explaining the advantages and disadvantages of this treatment.

Application
Present to your instructor or compare with other students.
Medications may be administered by a variety of routes. The route of administration can affect the onset and duration of the therapeutic effect of the medication.

The six rights of medication administration are essential to ensure safe and accurate administration of medication to the patient and include:

- Right Drug
- Right Dose
- Right Patient
- Right Route
- Right Time
- Right Documentation

Accuracy and safety of medication administration is a critical task of the LPN requiring vigilance and precision.

Safety Precautions:
1. Identify patient, explain procedure, and assess ability to swallow liquid medication.
2. Determine if patient needs any PRN medications.
3. Check the original physician’s order according to facility policy.
4. Check vital signs and lab results as appropriate.
5. Check patient’s allergies.
6. Research medicines that are unfamiliar to you, ensuring that you are aware of the correct drug:
   - Classification
   - Indications for use
   - Recommended dosage
   - Expected action
   - Side effects of dose, contraindications and nursing actions.
   - Basic teaching that must be provided for the patient
7. Calculate correct dose, if necessary.

Medications can elicit various responses. Every medication has a therapeutic effect and can cause an adverse effect.

All of the steps of the nursing process are utilized when administering medications.

If a medication error occurs, the LPN must report the error immediately as part of the LPN’s legal and ethically responsibilities for the patient.

All medication orders must be complete and written following a specific format. This includes:
- Patient name
- Name of the drug
- Dose
- Route of administration
- Reason for administration
- Time frequency for the medication to be given
- Signature of the health care provider writing the medication prescription

Administer medications following standard steps as practiced in the lab. Make these steps a standard each and every time you give medications and avoid shortcuts.
Glossary

Absorption: The passage of a substance through some surface of the body into body fluids or tissues.

Adverse reactions / effects: A medication side effect that is potentially harmful for the patient.

Buccal: The areas of the cheek or mouth.

Distribution: The dividing and spreading of anything.

Elixir: A sweetened liquid used in the compounding of oral medications.

Enteric-coated: Tablets or capsules coated with a compound that does not dissolve until it is exposed to fluid in the small intestine.

Excretion: The elimination of waste products from the body.

Exudate: Material that escapes from blood vessels and is deposited in tissues or on tissue surfaces.

Idiosyncratic: A characteristic, habit or mannerism that is peculiar to an individual.

Medication Cart System: A cart with wheels that contains medications in small drawers for each patient as well as supplies needed to administer drugs.

Metabolism: Energy and material transformations that occur within living cells.

Meter-dose inhaler: A device used for self-administration of aerosolized drugs.

Nebulizer: An apparatus for producing a fine spray or mist.

Side effects: Drug-induced effect other than the desired therapeutic effect.

Sublingual: The area beneath the tongue.

Suspension solutions: The state of a solid when its particles are mixed with, but not dissolved in, a fluid or another solid.

Sustained release: A delivery of a drug from a tablet over many hours.

Therapeutic response / effect: Intended effect or action of a drug.

Transdermal patches: A method of delivering medication by applying a patch to the skin.
**Publications:**


**Online:**

- F.A. Davis Company
  - [www.druguide.com](http://www.druguide.com)

- Institute for Safe Medication Practices
  - [www.ismp.org/lsas](http://www.ismp.org/lsas)