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Administration of Medications:

- ❑ Preventing medication errors.
- ❑ Medication systems.
- ❑ Medication orders.
- ❑ Drug preparations and dosage forms.
- ❑ Routes of drug administration

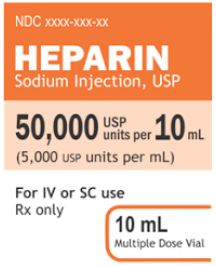
Medication Administration and the Nursing Process of Drug Therapy

Medication errors continue to receive increasing attention from numerous health care organizations and agencies.

- **Medication errors** commonly reported include giving an **incorrect dose**, **not giving an ordered drug**, and giving an unordered drug. Specific drugs often associated with errors and Adverse Drug Events, include insulin, heparin, and warfarin. The risk of ADEs increases with the number of drugs a patient uses.

  Many years ago, the labels of heparin were very similar. This similarity resulted in an over dosage of heparin, leading to patient death.

  Medication errors may occur at any step in the drug distribution process , from the manufacturer to the patient, including **prescribing**, **transcribing ,dispensing , and administering**



Sources of Errors	Recommendation to Prevent Errors
Drug Manufacturers	
• Drugs may have similar names that can lead to erroneous prescribing, dispensing, or administration. • For example, the antiseizure drug lamotrigine (Lamictal) has been confused with Lamisil, an antifungal drug; lamivudine, an antiviral drug; and others. • The FDA estimates that 10% of all reported medication errors result from drug name confusion. • In addition to similar names, many drugs, especially those produced by the same manufacturer, have similar packaging. This can lead to errors if container labels are not read carefully, especially if the products are shelved or stored next to each other. • Long-acting oral dosage forms with various, sometimes unclear indicators (e.g., LA, XL, XR), may be crushed, chewed, or otherwise broken so that the long-acting feature is destroyed. This can cause an overdose.	• FDA evaluation of proposed trade names in manufacturers' new drug applications in seeking FDA approval for marketing. • When choosing a trade name for a new drug, avoid names that are similar to drugs already on the market. • Design packaging so that all drugs from an individual manufacturer do not look alike in terms of color, appearance, etc. • Clearly designate long-acting drug formulations. • Use "Tall Man" lettering on drug labels to distinguish between generic drug with similar names (e.g., NICARdipine, NIFEdipine; vinBLAstine, VinCristine).

Sources of Errors	Recommendation to Prevent Errors
Health Care Agencies	
• Prescribers, pharmacists, and nurses have a heavy workload, with resultant rushing of prescribing, dispensing, and administering medications. • They may also experience distractions by interruptions, noise, and other events in the work environment that make it difficult to pay needed attention to the medication-related task.	• Provide prescribers with CPOE technology and standardized drug order sheets; discourage handwritten drug orders; minimize verbal orders and state procedures to follow when verbal orders are necessary. • Provide computerized technology (e.g., bar coding for patients; handheld scanning devices for nursing staff) to verify the drug, the dose, and the patient identity before administration of a dose and to record administration after a dose. • Provide sufficient pharmacy staff to dispense medications. • Provide sufficient nursing staff to administer medications. • Try to provide a quiet and orderly work environment, with limited traffic, telephones, and other distractions. • Provide adequate equipment for the required medication-related tasks. For pharmacies, this includes an adequate computer system for accessing databases of drug information and for detecting risks of adverse drug effects and drug–drug interactions. • Standardize drug administration materials and equipment (e.g., infusion pumps) throughout the agency. • Be sure that all professional staff members know and follow safety standards and medication reconciliation processes mandated by The Joint Commission.

Prescribers

- May write orders illegibly
- Order a drug that is not indicated by the patient's condition
- Fail to order a drug that is indicated
- Fail to consider the patient's age, size, kidney function, liver function, and disease process when selecting a drug or dosage
- Fail to consider other medications the patient is taking, including prescription, over-the-counter, and herbal drugs
- Lack sufficient knowledge about the drug
- Fail to monitor for, or instruct others to monitor for, effects of administered drugs
- Fail to discontinue drugs appropriately

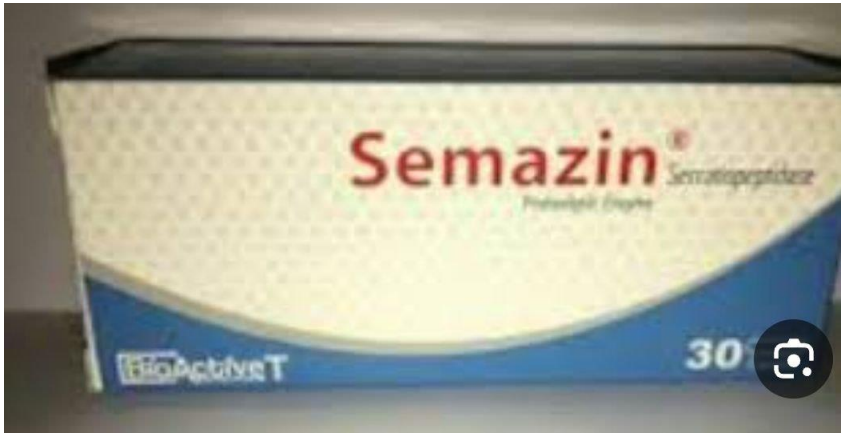
- Use CPOE when available.
- Be sure that any handwritten drug order is legible (e.g., printed in block letters if necessary), clear, and unambiguous.
- Avoid or minimize the use of abbreviations. Consult The Joint Commission's "Do Not Use" List.
- Use generic names of medications rather than brand names, and include the purpose of the drug.
- Avoid verbal orders when possible. If a verbal order is necessary, have the person taking the order write the order and read it back, spelling drug names, dosages, routes, and so forth when indicated.
- Review the patient's health status and other drugs being taken before ordering any new drug. Also, discontinue drugs appropriately when no longer needed.
- Maintain a current knowledge base about new drugs and changes in uses of drugs for the relevant area of clinical practice.

Nurses

- May have inadequate knowledge about a drug or about the patient receiving the drug
- Not follow the rights to medication administration
- Fail to question the medication order when indicated

- Be aware of agency policies and procedures about medicatio use, storage, administration, and recording.
- Maintain an up-to-date knowledge base about drugs and the administration.
- Make a diligent effort to learn about patients' health status a the drugs they are receiving.
- Question or clarify any unclear drug orders.
- Verify medication calculations with another nurse or a pharm cist, especially for children.
- Recheck a single dose any time the amount seems unusually large or small.
- Verify settings on drug infusion pumps with another nurse, when indicated.
- Follow the rights of medication administration consistently.
- Recheck the original drug order when a patient questions whether a particular drug dose should be taken.

Sources of Errors	Recommendation to Prevent Errors
Nurses (*Continued*)	
	• Report errors, so that preventive efforts can be designed. • Discuss patients' medications during change-of-shift reports, including new and discontinued drugs, patients' responses to their medications, patient teaching about medications, and medications given 1–2 hours before or after shift report.
Patients and Consumers	
• Outpatients may take drugs from several prescribers • Fail to inform one prescriber about drugs prescribed by another health care provider • Get prescriptions filled at more than one pharmacy • Fail to get prescriptions filled or refilled • Underuse or overuse an appropriately prescribed drug • Take drugs left over from a previous illness or prescribed for someone else • Fail to follow instructions for drug administration or storage • Fail to keep appointments for follow-up care • Fail to ask for information when needed	• Inform all health care providers about health status, any drug allergies, and all medications being taken (e.g., prescription, over-the-counter, herbal, and dietary supplements). • Ask prescribers to include the purpose of a drug on the label of all prescription medications. • If able, know names, strengths, doses, and the reason for use of all medications. • Follow instructions about when and how to take medications; do not increase amount or frequency of any medication without checking with a health care provider. Ask questions or request written instructions if needed. • If unable to take medications or if problems occur, discuss with a health care provider. Do not stop taking prescribed medications. • Maintain a current list of all medications being taken. Take the list or the medications to each visit to a health care provider. • Keep all medications in their original containers. • Read labels of medication containers every time a dose is taken. • Do not chew, crush, or break any tablets or capsules unless a health care provider says it is okay to do so.



relief from pain and swelling

nerve protecting medicine

treat a wide range of health problems including allergies, blood disorders, skin diseases, inflammation, infections

used to lower high blood pressure, also called hypertension.

Metformin XR lasts longer than regular metformin and has less side effects.

❑ Medication Systems

Each health care facility has a system for distributing drugs. The **unit-dose system**, in which most drugs are dispensed in single-dose containers for individual patients, is widely used. The pharmacist or pharmacy technician checks drug orders and stocks the medication in the patient's medication drawer. When a dose is due to be taken, the nurse removes the medication and gives it to the patient. Unit-dose wrappings of oral drugs should be left in place until the nurse is in the presence of the patient and ready to give the medication. It is essential that each dose of a drug be **recorded** on the patient's **medication administration record** as soon as possible after administration.

Increasingly, institutions are using automated, computerized, locked cabinets for which each nurse on a unit has a password or code for accessing the cabinet and obtaining a drug dose. The pharmacy maintains the medications and replaces the drug when needed. **Controlled drugs**, such as **opioid analgesics**, are usually kept as a stock supply in a locked drawer or automated cabinet and replaced as needed. The nurse must sign for each dose and record it on the patient's **medication administration record**. He or she must comply with legal regulations and institutional policies for dispensing and recording controlled drugs.

❑ Medication Orders

Medication Substance administered for the diagnosis, treatment, or relief of a symptom or for the prevention of diseases used interchangeably with the word **drug** .Drug also has the meaning of an illegally obtained Substance

Prescription

Written directions for the preparation and administration of a drug

- **Parts of a Medication Order**
- Full name of the customer
- Date and time the order written
- Name of drug to be administered
- Dosage Frequency of administration
- Route of administration
- Signature of person writing the order

Orders in a health care facility may be typed into a **computer** (the preferred method) or **handwritten** on an order sheet in the patient's medical record. Occasionally, **verbal** or **telephone orders** are acceptable. When taken, they should be written on the patient's **order sheet**, **signed** by the person taking the order, and later **countersigned** by the prescriber. After the order is written, **a copy** is sent to the pharmacy, where the order is **recorded** and the drug is **dispensed** to the appropriate patient care unit. In many facilities, pharmacy staff prepares a computer-generated **medication administration record** for each 24-hour period.

For patients in **ambulatory care settings**, the procedure is essentially the same for drugs to be given immediately. For drugs to be taken **at home**, written prescriptions are given. In addition to the previous information, a prescription should include **instructions** for taking the drug (e.g., **dose**, **frequency**) and whether the prescription can be **refilled**.

To interpret medication orders accurately, the nurse must know commonly used abbreviations for **routes**, **dosage**s, and **times of drug administration**

As a result of **medication errors** that occurred because of **incorrect or misinterpreted abbreviations**, many abbreviations that were formerly commonly used are now banned or are no longer recommended by the organizations concerned with increasing patient safety,

Thus, it is safer to write out such words as "**daily**" or "**three times daily**"; "**at bedtime**," "**ounce**," "**teaspoon**," or "**tablespoon**"; or "**right**," "**left**," or "**both eyes**" rather than using abbreviations, in both medication orders and in transcribing orders to the patient's **medication administration record**. If the nurse cannot read the physician's order or if the order seems erroneous, he or she must question the order before giving the drug.

Routes of Drug Administration	
IM	intramuscular
IV	intravenous
PO	by mouth, oral
SL	sublingual
Sub-Q	subcutaneous
Drug Dosages	
cc	cubic centimeter
g	gram
mg	milligram
mcg	microgram
mL	milliliter
oz	ounce
tbsp	tablespoon
tsp	teaspoon
Times of Drug Administration	
ad lib	as desired
PRN	as needed
q4h	every 4 h
stat	immediately

❑ Drug Preparations and Dosage Forms

Drug preparations and dosage forms vary according to the drug's chemical characteristics, reason for use, and route of administration. Some drugs are available in only **one dosage form**, and others are available in **several forms**.

Dosage Forms and Their Routes of Administration	Characteristics	Considerations/Precautions
Tablets		
Regular: PO, gastrointestinal (GI) tube (crushed and mixed with water)	• Contain active drug plus binders, dyes, preservatives • Dissolve in gastric fluids	8 oz of water recommended, to promote dissolution and absorption
Chewable: PO	Colored and flavored, mainly for young children	Children may think tablets are candy; keep out of reach to avoid accidental overdose
Enteric coated: PO	Dissolve in the small intestine; mainly used for medications that cause gastric irritation	Do not crush; instruct patients not to chew or crush
Extended release (XL) (also called sustained release [SR], long acting [LA], and other names): PO	Slowly absorbed; effects prolonged, usually 12–24 hours Contain relatively large amounts of active drug	**Warning:** Crushing to give orally or through a GI tube administers an overdose, with potentially serious adverse effects or death! *Never crush*; instruct patients not to chew or crush
Sublingual: Under the tongue	Dissolve quickly	
Buccal: Held in cheek	Medication absorbed directly into the bloodstream and exerts rapid systemic effects	Few medications formulated for administration by SL or buccal routes
Capsules		
Regular: PO	Contain active drug, fillers, and preservatives	8 oz of fluid recommended to promote dissolution and absorption
	Gelatin capsules dissolve in gastric fluid and release medication	
Extended release (XL); sustained release (SR); long-acting (LA): PO	Slowly absorbed; effects prolonged, usually 12–24 hours Contain relatively large amounts of active drug	**Warning:** Emptying a capsule to give the medication orally or through a GI tube administers an overdose, with potentially serious adverse effects or death! Instruct patients not to bite, chew, or empty these capsules
Solutions		
Oral: PO, GI tube	Absorbed rapidly because they do not need to be dissolved	Use of appropriate measuring devices and accurate measurement is extremely important
Parenteral: IV, IM, Sub-Q, intradermal	Medications and all administration devices must be sterile IV produces rapid effects; Sub-Q is used mainly for insulin and heparin; IM is used for only a few drugs; intradermal is used mainly to inject skin-test material	Use of appropriate equipment and accurate measurement is extremely important. Insulin syringes should always be used for insulin, and tuberculin syringes are recommended for measuring small amounts of other drugs
Suspensions		
PO, Sub-Q (e.g., NPH, Lente insulins)	Particles of active drug are suspended in a liquid; the liquid must be rotated or shaken before measuring a dose	Drug particles settle to the bottom on standing. If not remixed, the liquid vehicle is given rather than the drug dose
Dermatologic Creams, Lotions, Ointments Topically to skin	Most are minimally absorbed through skin and exert local effects at the site of application; some (e.g., skin patches) are absorbed and exert systemic effects	*Formulations vary with intended uses and are not interchangeable.* When removed from the patient, skin patches must be disposed of properly to prevent someone else from being exposed to the active drug remaining in the patch

Dosage forms of systemic drugs include **liquids**, **tablets**, **capsules**, **suppositories**, and **transdermal** and **pump delivery systems**. **Systemic liquids** are given **orally**, or **PO** (Latin per os, "by mouth"), or by **injection**. Those given by injection must be sterile .Administration of tablets and capsules is PO. **Tablets** contain **active drug plus binders**, **colorants**, **preservatives**, and **other substances**. **Capsules** contain active drug enclosed in a gelatin capsule. Most tablets and capsules **dissolve** in the acidic fluids of the stomach and are **absorbed** in the alkaline fluids of the upper small intestine. **Enteric-coated** tablets and capsules are coated with a substance that is **insoluble** in stomach acid. This delays dissolution until the medication reaches the intestine, usually to **avoid gastric irritation** or to **keep the drug from being destroyed** by gastric acid. **Tablets for sublingual** (under the tongue) or buccal (held in cheek) administration must be specifically formulated for such use.

Several **controlled-release dosage forms** and drug **delivery systems** are available, and more continue to be developed. These formulations maintain more consistent serum drug levels and allow **less frequent** administration, which is more convenient for patients. Controlled-release oral tablets and capsules are called by a variety of names (e.g., **timed release**, **sustained release**, **extended release**), and their names usually include **CR, SR**, **XL**, or other indications that they are long-acting formulations. Most of these formulations are given **once or twice** daily. Some drugs (e.g., alendronate for osteoporosis, fluoxetine for major depression) are available in formulations that deliver a **full week's dosage** in one oral tablet. Because controlled-release tablets and capsules contain high amounts of drug intended to be absorbed slowly and act over a prolonged period of time, they should never be broken, opened, crushed, or chewed .Such an action allows the full dose to be absorbed immediately and constitutes an overdose, with potential organ damage or death.

Transdermal (skin patch) formulations include systemically absorbed clonidine, estrogen, fentanyl, and nitroglycerin. These medications are **slowly absorbed** from the skin patches over varying periods of time (e.g., 1 week for clonidine and estrogen). Pump delivery systems may be external or implanted under the skin and refillable or long acting without refills. Pumps are used to administer insulin, opioid analgesics, antineoplastics, and other drugs.

Solutions, **ointments**, **creams**, and **suppositories** are applied topically to the skin or mucous membranes. They are formulated for the intended route of administration. For example, several drugs are available in solutions for nasal or oral inhalation; they are usually self-administered as a spray into the nose or mouth.

Many combination products containing fixed doses of two or more drugs are also available. Commonly used combinations include analgesics, antihypertensive drugs, and cold remedies. Most are oral tablets, capsules, or solution

❑ Routes of Administration

Routes of administration depend on drug characteristics, patient characteristics , and desired responses. The major routes are **oral** (by mouth), **parenteral** (injected), and **topical** (applied to skin or mucous membrane). Each has **advantages**, **disadvantages**, **indications for use**, and **specific techniques of administration** .Common parenteral routes are **subcutaneous** (Sub- Q), **IM**, and **IV** injections. Injections require special drug preparations, equipment, and techniques.

Route and Description	Advantages	Disadvantages	Comments
Oral	Simple and can be used by most people Convenient; does not require complex equipment Relatively inexpensive	Dosage is unknown because some drug is not absorbed and some is metabolized in the liver before reaching the bloodstream. Slow drug action Irritation of gastrointestinal (GI) mucosa by some drugs	The oral route should generally be used when possible, considering the patient's condition and ability to take or tolerate oral drugs.
GI tubes (e.g., nasogastric, gastrostomy)	Allows use of GI tract in patients who cannot take oral drugs Can be used over long periods of time, if necessary May avoid or decrease injections	With nasogastric tubes, medications may be aspirated into the lungs. Small-bore tubes often become clogged. Requires special precautions to give correctly and avoid complications	Liquid preparations are preferred over crushed tablets and emptied capsules, when available. Tube should be rinsed before and after instilling medication.
Subcutaneous (Sub-Q) injection—injection of drugs under the skin, into the underlying fatty tissue	Relatively painless Very small needles can be used. Insulin and heparin, commonly used medications, can be given Sub-Q.	Only a small amount of drug (up to 1 mL) can be given. Drug absorption is relatively slow. Only a few drugs can be given Sub-Q.	Sub-Q route is commonly used for only a few drugs because many drugs are irritating to Sub-Q tissues. Such drugs may cause pain, necrosis, and abscess formation if injected Sub-Q.
Intramuscular (IM) injection—injection of drugs into selected muscles	May be used for several drugs Drug absorption is rapid because muscle tissue has an abundant blood supply.	A relatively small amount of drug (up to 3 mL) can be given. Risks of damage to blood vessels or nerves if needle is not positioned correctly.	It is very important to use anatomic landmarks when selecting IM injection sites.

Route and Description	Advantages	Disadvantages	Comments
Intravenous (IV) injection—injection of a drug into the bloodstream	Allows medications to be given to a patient who cannot take fluids or drugs by GI tract Bypasses barriers to drug absorption that occur with other routes Rapid drug action Larger amounts can be given than by Sub-Q and IM routes Allows slow administration when indicated	Time and skill required for venipuncture and maintaining an IV line After it is injected, drug cannot be retrieved if adverse effects or overdoses occur. High potential for adverse reactions due to rapid drug action and possible complications of IV therapy (i.e., bleeding, infection, fluid overload, extravasation) Phlebitis and thrombosis may occur and cause discomfort or pain, take days or weeks to subside, and limit the veins available for future therapy.	The nurse should wear latex gloves to start IV infusions, for protection against exposure to blood-borne pathogens. Phlebitis and thrombosis result from injury to the endothelial cells that form the inner lining (intima) of veins and may be caused by repeated venipunctures, the IV catheter, hypertonic IV fluid, or irritating drugs.
Topical administration—application to skin or mucous membranes. Application to mucous membranes includes drugs given by nasal or oral inhalation; by instillation into the lungs, eyes, or nose; and by insertion under the tongue (sublingual), into the cheek (buccal), and into the vagina or rectum.	With application to intact skin, most medications act at the site of application, with little systemic absorption or systemic adverse effects. Some drugs are given topically for systemic effects (e.g., medicated skin patches). Effects may last several days, and the patches are usually convenient for patients. With application to mucous membranes, most drugs are well and rapidly absorbed.	Some drugs irritate the skin or mucous membranes and cause itching, rash, or discomfort. With inflamed, abraded, or damaged skin, drug absorption is increased, and systemic adverse effects may occur. Application to mucous membranes may cause systemic adverse effects (e.g., beta-blocker eye drops, used to treat glaucoma, can cause bradycardia just as oral beta-adrenergic blockers can). Specific drug preparations must be used for application to skin, eyes, and sublingual, buccal, vaginal, and rectal sites.	When available and effective, topical drugs are often preferred over oral or injected drugs, because of fewer and/or less severe systemic adverse effects.


thank you!