

Medication Administration Guidelines**A. FORMS OF MEDICATIONS:**

- **Tablets**
 - Scored/grooved: only scored tablet can be safely broken in half
 - Enteric coated: dissolves in the small intestine, not in the stomach
 - Chewable: better distribution – especially for children
 - Sublingual: under the tongue
 - Buccal: placed in the cheek
- **Capsules**
 - Time Released Spansules: drug is gradually but continuously released
 - Capsule: drug is in soluble gelatin capsule
- **Troches/ lozenges**
 - Given for anesthetic/antiseptic effect in the mouth/throat
- **Suppositories**
 - Given rectal/vaginal/urethral – cone shaped, dissolves after insertion
- **Liquid Solutions**
 - *Elixir* = Solvent mixed with alcohol and water
 - *Syrup* = Drug dissolved in liquid concentrate with dissolved sugar
 - *Emulsions* = Dispersion of oil in water or water in oil
 - *Suspension* =
 - Liquid containing insoluble drug particles dispersed in liquid base
 - Particles separate and settle on the bottom when not in use
 - Must shake very well to disperse medication equivalently prior to administering
- Topical dosage forms:
 - Drugs administered (applied) to the skin
 - Drug passes through skin membranes and into bloodstream
 - Manufactured transdermal patches contain reservoir of drug within the patch

B. PREPARATION GUIDELINES

- Do not use an unlabeled drug – return to pharmacy
- Many meds may be crushed and placed in food such as applesauce or ice cream
- Do not crush enteric coated tablets or sustained released. Check with the pharmacy for an alternative delivery form suitable for patient
- Give effervescent powder and tablets immediately after dissolving
- Mix powders at bedside – e.g. Metamucil
- Do not allow patient to chew or swallow lozenges
- Protect against aspiration – patient should be sitting up, and take one pill at a time
- Observe aseptic technique – don't touch tablets, inside of med cups or bottles
- **NEVER** give meds that someone else has prepared

C. ROUTES OF ADMINISTRATION

- **Oral:** Patient must be able to swallow and be in upright position
- **Buccal:** Place in cheek area of mouth until dissolved – absorbed through mucous membranes

- **Sublingual:** Place under the tongue – must be an FDA approved route; e.g. Nitroglycerine
- **Parenteral:** Subcutaneous (SQ or SC) intramuscular (IM), intravenous (IV), intradermal
- **Topical:** Apply to skin or mucous membranes – action is local, sometimes has systemic effect
 - Continue to always observe the 6 rights
 - Wear gloves to protect self if applying lotions, ointments, etc. – it will absorb through your skin
 - Use sterile technique with open wounds and for all eye meds
 - Always document how skin looks
 - **Ointments** – meds prepared from oily base – prolongs contact with surface; action can be analgesic, anti-inflammatory, moisturize, and soothe
 - **Pastes:** thick, firmer, doesn't melt
 - **Lotions/liniments:** may be rubbed in or patted on – follow direction on container – clean area before applying new dose
 - **Powders:** dusted on lightly (Avoid in patients with pulmonary disorders)
 - **Patches:** (transdermal) drug released over time and absorbed through skin; rotate sites and use non-hairy areas of the body/not over bony areas
 - Write date/ time/ initials on patch
 - Remove the old patch
 - Do not rub or massage the patch after application
 - Document site patch was applied
- **Inhalation:** Rapid absorption into lungs for local or systemic effects, given by inhalers, sprays, and nebulization
 - Have patient in sitting position – allows for better lung expansion/better distribution
 - Patient fully inhales and exhales – then administers the dose on next inhalation holding breath for 10 seconds
 - Remember bronchodilators are given before inhaled steroids
 - Patient always rinses mouth after using inhaled medications
- **Nasal Meds:**
 - *Drops*
 - Lying with head tipped back is best – stay in that position 5 min. after administration
 - Hold dropper outside nares to avoid contamination – also can count drops better
 - *Inhaler*
 - Place dispenser in nostril while holding other one shut
 - Breathe through nose while administering drug
 - Give correct number of sprays
- **Eye Meds:**
 - *Drops*
 - Wear gloves
 - Be sure container states “for ophthalmic use”
 - Patient must be sitting with head back or lying
 - Retract lower eye lid
 - Have patient look up

- Place med in lower conjunctival sac
- Apply gentle pressure to inner canthus to avoid systemic effects
- Avoid letting drop fall on cornea
- *Ointments*
 - Wear gloves
 - Position patient same as for drops
 - Squeeze thin band in lower conjunctival sac
 - Hold eye open few seconds to let drug start to melt
 - Instruct patient to close eye and roll eye ball
- **Ear Drops:**
 - Straighten ear canal
 - **ADULTS – pull upward and toward back of head**
 - **CHILD – (under the age of three) pull down and back**
 - Warm solution to room temperature – to avoid vertigo and/or nausea
 - Place cotton ball lightly in ear – may need to drain
 - Have patient remain on side for few minutes
 - Never occlude ear canal with dropper or irrigation syringe – forcing meds can injure eardrum
- **Vaginal Meds:**
 - Whenever possible allow patient to insert med herself
 - If nurse inserts, procedure similar to rectal suppository

D. ADMINISTRATION DOS & DON'TS

- **Always** verify the patients drug allergies
- Patient must be able to swallow and be in upright position unless contraindicated
- Give with adequate amount of water – caution: if patient on fluid restriction or intake/output, calculate and add to intake for shift
- It may be necessary to assist some patients – putting med in mouth, holding glass, etc.
- Moisten mouth with water prior to putting med in mouth – prevents med from sticking to tongue or roof of mouth
- If patient has trouble swallowing place med toward back of mouth before giving water and be sure to follow any dysphagia management protocol
- Explain special instructions related to the med: e.g. do not chew; place under tongue, etc.
- **NEVER** leave med at bedside for patient to take later – someone else could pick it up and take it. Remember patients have the right to refuse a med. Educate where possible and evaluate rationale of why patient wants to refuse, be sure to notify the physician and document information thoroughly in the patient's medical record. A physician must leave an order for any medication that a patient requests to have at the bedside, as well as for any medication brought from home.
- When a medication receives a "Hold" order follow facility policy. Some facilities require medication be discontinued and re-ordered. If hold orders are allowed, be sure to document that meds were held on the MAR and pass off in hand-off communication
- Always take all special precautions related to administration, such as B/P, apical pulse, etc.
- When medications are discontinued, be sure they are eliminated from the computerized charting system or are highlighted in yellow and the stop date recorded on a paper MAR

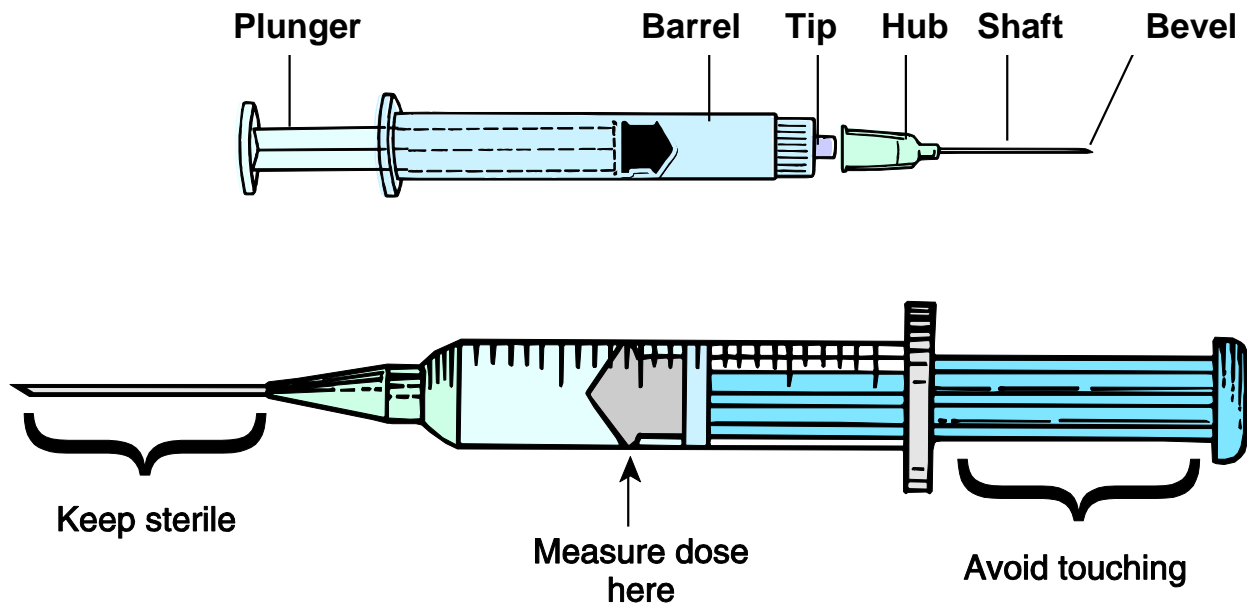
- If a medication is dropped on the floor – throw it away and notify pharmacy for replacement
- Pouring and preparing liquid medications
 - Place the medication on a flat surface at eye level
 - Carefully pour into a medication cup taking caution to not allow the medication to run over the label causing it to become indecipherable
 - If the label is indecipherable, send it back to pharmacy and ask for a replacement.
- *Unit Dose System*
 - Wash Hands
 - Open personal patient medication cabinet with key assigned to you, or access the drawer with correct patient name if using a medication cart
 - Take dose(s) out of drawer – checking each label 3 times. All discrepancies need resolved before administering the medication
 - Do not open medication dose until at bedside and patient ready, able, and willing to take
 - Place all meds in one medication cup except those requiring pulse or B/P checks; **put these meds in a separate cup as a reminder** to check vitals before administering. Must take B/P and Apical Pulse just prior to administration. Do not use the previous vital sign results for your medications (check yourself again)
 - Be sure all **HIGH RISK** Medications have second nurse verification
 - If a medication is dropped or refused, return them to pharmacy or follow facility policy. Pharmacy will replace the dropped medication. You will document all refused medications, notify the physician and state the reason of refusal
 - Don't forget to provide all necessary patient education about the medications you are administering
 - Don't forget all necessary follow up; e.g. patient response to medication
- *Electronic Dispensing System*
 - Wash Hands
 - Retrieve medications from the dispensing system with personal assigned code
 - Check each label 3 times. All discrepancies need resolved before administering the medication
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- Narcotics
 - *Narcotic box*
 - Box is locked and keys retained by licensed nurse (often charge RN)
 - Drugs are listed on a narcotic sheet showing the number on hand, number added from pharmacy, and a running total of each narcotic
 - All drugs used are signed out with an ending count documented on the narcotic sheet each time a narcotic is used
 - Narcotics are counted by two licensed nurses at each shift change
 - Any discrepancy is reported and investigated immediately
 - All wastes must be witnessed by second licensed nurse and documented as such by both nurses involved
 - *Dispensing System*
 - Dispensing system kept behind locked door
 - Pharmacy maintains primary control over stocking and counting
 - Each licensed nurse with access must have individualized entry code/password
 - Many narcotics are dispensed as a single dose, some will still require counting and placing the number on-hand into the computer of the dispensing system
 - Any discrepancy requires an immediate cycle count, investigation, and correction of number in computer of dispensing system
 - All wastes must be witnessed by second licensed nurse and documented as such by both nurses involved

E. PARENTERAL MEDICATION SPECIFICS

- All routes other than gastrointestinal tract (GI)
- Given with a needle and syringe or syringe adapted to needle-less system
- Onset of action is quicker and is most immediate via intravenous injection (IV)
- Intravenous injection (IV) poses increased risk for complications
- Requires sterile technique in handling equipment and medication vials/ampules
- 4 Major Sites
 - Subcutaneous (SQ, SC) = into tissue below dermis
 - Intramuscularly (IM) = into muscle
 - Intradermal = into dermis under epidermis (uppermost layer of skin)
 - Intravenous (IV) = into a vein
- Complications
 - Rapid drug response
 - Allergic reaction
 - Adverse Reaction
 - Fluid volume overload
 - Localized bleeding
 - Nerve injury
 - Extravasation, phlebitis, infection, or abscess at or surrounding injection site
 - Needle-stick injuries
 - Medication errors (drug can't be retrieved)
- Needle Size/Length – (sized by gauge and length)
 - **GAUGE**: Refers to the diameter of the needle

- **Typical range** = 18 gauge to 27 gauge
- The smaller the gauge of the needle the larger the diameter of the shaft
 - 19 gauge needle has a larger shaft than 25 gauge needle
- Selection of gauge is based on viscosity of the liquid to be injected and the route of administration
 - Subcutaneous medications = 25 gauge
 - Intramuscular = 19 – 23 gauge
 - Intradermal = 26 – 27 gauge
- **Length:** Varies from ¼ inch to 5 inch long
 - **IM** injection for adult:
 - Average adult length: 1 inch to 1½ inch long for IM injection of adult
 - **SQ** injection for adult:
 - 3/8 – 5/8 inches long
 - Choice of length based on patient size, weight and where drug needs to be injected
 - Children and slender adults need shorter needles – use nursing judgment
- Syringe Size and Specifics
 - Syringe size varies from 0.5 ml to 60 ml
 - Be sure only insulin syringes are used for insulin
 - Can use a tuberculin syringe for subcutaneous heparin
 - **Tubex/Carpject** = injection systems that hold pre-filled disposable sterile cartridges. You will place the medication cartridge into the holder, lock holder in place, and use the plunger on the holder to deliver the medication
 - Hub of the needle and outside of the barrel are the only areas non-sterile



- Solution Containers
 - **Vial:** glass container with rubber stopper and cap
 - Cap is removed and stopper is considered sterile until touched or used
 - For multi-dose vials you must wipe with alcohol before drawing up medication
 - Date and time all multi-dose vials as multi-dose vials are only good for 24 hours and must be disposed of after this period (exception is insulin)
 - Prior to inserting needle into stopper, draw up air in an amount equal to the amount of drug you plan to withdraw for easier withdrawal; e.g. need 1 mL of medication out – inject 1 mL of air into the vial first.
 - Some vials contain powder and will need to be reconstituted with an acceptable diluent (solution); e.g. normal saline or sterile water. Follow the manufacturer's recommendation for reconstituting. Some powders are slow to dissolve; gently shake or roll in your hands, and let sit for a short period to dissolve completely
 - Double check each medications storage requirements – may need refrigerated
 - **Ampule:** glass container
 - Single dose only
 - Cover neck/stem of Ampule with alcohol wipe to protect fingers and snap top off away from yourself
 - Do not inject air into ampule before withdrawing drug
 - Use filter needle to draw up contents – Avoid glass slivers in solution
 - Change needle before giving injection

All vials/ ampules contain a small amount of extra drug – ONLY administer ordered dosage

- Needle/Syringe Disposal
 - **NEVER** recap a contaminated needle – this technique prevents needle stick injuries
 - Dispose of sharps in sharps container in the room
- Needle-less Systems
 - Manufactured equipment that allow intravenous therapy without use of a needle
- Medication Disposal – Follow facility policy
- Medication Compatibility
 - When two parenteral meds are to be given at same time – you must check the compatibility before giving them into the same IV tubing or mixing in the same syringe. This information is retrieved from your drug reference resource, a drug compatibility chart, the medication information package insert, or a pharmacist
 - **Caution**
 - For IM injections do not go above mL that can be instilled into a muscle
 - If you mix two liquid meds together and they form a gas with bubble or change colors – do not use. Contact and return drug to pharmacy
 - When mixing two drugs from multi-dose vials be sure to change needle between 1st and 2nd vial to avoid contamination of one medication into the vial of another. There is an exception for insulin – cannot change needles on insulin syringes

- Insulin
 - Use insulin vial containing 100 units / mL and a U 100 insulin syringe
 - Okay to mix short acting insulin (Regular, clear solution) with longer acting insulin (NPH, lente, cloudy solutions).
 - Cloudy insulins must be mixed prior to drawing up from vial. To properly mix cloudy insulins, rotate insulin vial between palm of hands – DO NOT SHAKE (bubbles and foams)
 - You are always going to draw up the Regular Insulin first and draw up the long acting insulin second.
 - Be exact when drawing up your dosage
 - Remember insulin requires a second nurse verification (HIGH RISK)
- Nursing Responsibility after Administration
 - Record administration of drug on medication administration record (MAR)
 - Evaluate effectiveness of medication – very important for PRN and new medications
 - When giving PRN and first time medications, also document in the patients record your assessment pre-post, pertinent vitals, education, tolerance, etc.
 - Report all abnormalities to the physician
- Basic Principles/Guidelines
 - Use only STERILE needles/syringes
 - Choose appropriate needle length for drug/size of patient and site utilized
 - Choose site free from inflammation, lesions, scars, excessive hair, and avoid areas of major nerves or blood vessels
 - ROTATE INJECTION SITES
 - Observe SAFETY of patient – get help with confused/combatative clients and ALWAYS with a child
 - Cleanse site prior to injection using alcohol. Start at point of injection and cleanse in outward circular motion
 - Allow area to dry 30 seconds to avoid introducing alcohol into tissue
 - Aspirate prior to injecting drug (see Air-lock technique for exceptions). If aspirate is blood, start over
 - AIR-LOCK
 - Draw up 0.2 ml air into syringe after med dosage is drawn up and measured leaving an air-bubble in the syringe at end of syringe
 - The air-bubble is injected after medication is injected
 - Commonly used for subcutaneous anticoagulants, medications that sting, and medications given via Z track method
 - Prevents bruising, stinging, and disperses medication throughout the tissue avoiding nerve endings
 - Minimize patient's discomfort
 - Use smallest gauge appropriate for viscosity of the medication to be given
 - Insert needle swiftly, but inject medication slowly
 - Hold alcohol wipe against skin as needle is extracted to prevent pulling skin
 - Use a position that is comfortable to the patient
 - Divert the attention where possible, especially for children. Ask patient to squeeze a hand – yours or an assistants, or focus on T.V.

F. PARENTERAL ROUTES OF ADMINISTRATION

- **Subcutaneous (SQ/SC)**
 - SQ tissue hold maximum of 1.0 mL
 - Sites = upper outer arms, abdomen, anterior thighs
 - Angle = 45° OR 90° angle (45° if 1 inch pinched – 90° if 2 inches pinched up)
 - SQ anti-coagulants are given in the abdomen and have air-lock injection technique used
 - Needle size: 25gauge with 5/8 needle length in 3mL syringe
 - Rotation of sites: very important for maximum absorption
- **Intramuscular (IM)**
 - 90° angle
 - Needle size:
 - Adult = 20-23gauge, 1 ½ inch needle
 - Children: 25-27 gauge ½ - 1 inch needle
 - **Sites:**
 - **Adults:**
 - ***Vastus lateralis*** = Use middle 1/3 of muscle for injection; hand breadth above knee and below greater trochanter. Position patient supine with knee slightly flexed. Recommended for infants and toddlers. *Maximum amount for injection is 2 mL*
 - ***Ventrogluteal*** = Heel of hand on greater trochanter – index finger on anterior superior iliac spine – middle finger back toward iliac crest. This makes a “V” with the hand—inject inside of the “V.” Position patient on side opposite of injection with knees flexed. Safest and deepest muscle even when emaciated; with fewer nerves. *Maximum amount for injection is 3 mL*
 - ***Dorsogluteal*** = Upper outer quad of buttocks (gluteus medius). Locate posterior superior iliac spine and greater trochanter. Position patient prone with knees turned in. Be cautious as hitting sciatic nerve or major blood vessels in this area is possible. *Maximum amount for injection is 3 mL.*
 - ***Deltoid*** = Palpate lower edge of acromion process – note triangular shaped area below process. Inject in center of triangle (1-2 inches below process and 3 finger breadths below). Position of patient either sitting or lying flat with lower arm flexed. Caution this is a small muscle and in close proximity to the radial and ulnar nerve. Do not inject medications that are irritating in this site. *Maximum amount for injection is 1 mL.*
 - **Special considerations: Use smaller gauge needle for elderly, emaciated, or atrophied muscles**
- **Intradermal**
 - Just beneath the skin – can see tip of needle through the skin
 - Used for allergy skin testing and Mantoux TB skin testing
 - Skin needs to be free of lesions, pigmentation, hairless
 - Amount of solution is 0.1 – 1.0 mL
 - Inject in inner aspect of forearm and upper back
 - Angle is 10°
 - Needle/syringe size = 25-27 gauge, ¼ - ½ inch needle length, with TB syringe

- Site
 - 3 – 4 fingers below antecubital area and hand width above wrist
 - Stretch skin – insert needle – advance 1/8 inch – inject med
 - Will feel resistance – normal – if not, needle is in sq tissue
 - When completed, reveals a wheal or bleb to know injected just under the dermis
 - DO NOT massage – draw circle around site – date/initial
 - All Mantoux tests are read in 48 – 72 hours and is considered positive if a visible 10 mm induration or hardened area is visualized
- **Z Track Method**
 - Used for irritating substances to minimize irritation by sealing drug in muscle – keeps it from leaking out and irritating sq tissue
 - Give in deeper muscles; e.g. ventrogluteal or gluteus medius
 - Key Points:
 - Change needle after drawing up medication
 - Draw up 0.2 ml of air after med drawn up (air lock)
 - Pull tissue laterally 1 – 1 ½ inches
 - Aspirate - inject medication slowly (5 -10 sec)
 - Keep needle inserted for 10 sec. – allows med to disperse
 - Release skin – creates a zig-zag path – seals in medication
- **Intravenous IV**
 - Drug are administered directly into the bloodstream when immediate drug action is needed
 - Increases risk to patients as side-effects are quick and can be more dramatic
 - Always use an intravenous medication administration reference as a resource

Role of the Iowa LPN:

- Has limited role with IV therapy
- Can hang plain, non-medicated IV solutions
- Regulate flow rate of non-medicated solutions
- Discontinue peripheral IV's
- Can start peripheral IV's by meeting following criteria:
 - Employed in facility for 1 year
 - Successful completion of IV course requirements and competency validation
 - Successfully passed a pre-test for math calculations for medication administration

Types of Intravenous Therapy:

- *Infusion Devices*
 - Saline Locks
 - For patients requiring intermittent or continuous intravenous medication delivery, and for the establishment of prophylactic emergency IV access
 - IV tubing directly connects to a pigtail loop attached to the end of the IV catheter
 - When intermittent, requires intermittent flushing with normal saline to ensure patency
 - Central Line
 - Placed in large vein for patients who are critical, have poor peripheral access, or

- to infuse highly caustic medication
 - Infection risk is great
 - Used for short term therapy
 - Sometimes referred to as a “Hickman” catheter
 - Sometimes placed for hemodialysis
 - Centrally placed dialysis catheters are ONLY accessed by the RN trained to perform hemodialysis
- PICC (peripherally inserted central catheter)
 - A long catheter peripherally placed for patients who have poor peripheral access and need long term therapy
 - RN has be certified to place a PICC line
- Infusa-port
 - An indwelling access for patients requiring long term therapy
- Hemodialysis fistula
 - Surgically placed device that allows arterial/venous access for hemodialysis. The fistula is ONLY accessed by the RN trained to perform hemodialysis
- *Types of infusions*
 - *Continuous Intravenous Infusion*
 - Physician orders a specific fluid, specific rate, and sometimes specific time-frame
 - Can be administered through all types of intravenous catheters (exception: dialysis catheters)
 - *Secondary Intermittent Infusions*
 - Medications given intermittently while the primary IV is infusing. These IV bags are sometimes referred to as “piggyback” or “partial fill”
 - Meds are prepared in small 50-100cc bags and added to the primary infusion for a set infusion rate. Interruption of primary IV may be indicated during secondary infusion
 - Can be administered through all types of intravenous catheters (exception: dialysis catheters)
 - *Bolus*
 - Specified amount of medication given over very short period of time

Basic Nursing Care:

Assessment

- Assess the patency of the infusion system (observe fluid infusing from bag to patient)
- Assessment includes verifying the IV fluid and rate is correct, and is ongoing being performed at beginning of shift, throughout the shift, and at end of shift
- Notify the RN of all abnormal findings
- Assess the condition of the IV site for:
 - **Infiltration**
 - Needle is out of the vein, solution is infusing into surrounding tissue
 - S/S = swelling, pain, decreased skin temp in area, pallor, or redness
 - Treatment = DC IV and apply warm or cool washcloth
 - **Phlebitis**
 - Inflammation of the vein, caused by irritation or trauma to vein

- S/S = redness, puffiness, pain, warmth at site, vein may feel hard or cordlike
- Treatment = DC IV and apply warm moist soaks to the area. Do not rub or massage extremity (may dislodge any clots present)
- **Infection / inflammation**
 - Catheter tip may become contaminated with bacteria
 - S/S = redness, warmth, tenderness, swelling at site; possible purulent drainage
 - Treatment = DC IV. Physician will order treatment and may order site cultured
- **Septicemia**
 - Microorganisms migrate into blood stream. Usually a result of poor aseptic technique or contaminated equipment
 - S/S = fever, chills or profuse sweating, N/V/D, malaise
 - Treatment = DC IV and notify physician; physician most likely will order blood cultures and a culture of the tip of the IV catheter, antibiotics, and increased observation
- **Circulatory Overload:**
 - Infusing excessive amounts of fluids, infusing fluids too rapidly, or infusing a volume of fluid too great for the patient with poor heart pumping function
 - S/S = tachypnea, dyspnea, cough, shortness of breath, inspiratory crackles, tachycardia, arrhythmias, 3rd heart sound, restlessness, change in level of consciousness, decreased oxygen saturation
 - Treatment = Slow IV rate to TKO (To Keep Open) and notify physician immediately, following new physician orders
- **Air Embolism**
 - Rare but lethal – air enters the blood stream through IV
 - S/S = chest pain, shoulder pain, shortness of breath, cyanosis, tachycardia, arrhythmias, restlessness, loss of consciousness, possible cardiopulmonary arrest
 - Treatment = immediately report assessment findings to a physician. In case of cardiopulmonary arrest, initiate basic life support
- **Allergic Reactions**
 - Associated with blood transfusion or medications
 - S/S = same as any allergy - hives, itching, wheezing, possible anaphylaxis
 - Treatment = DC allergen, but keep IV fluids infusing TKO to provide access for emergency medications. Notify physician immediately and follow facility allergic reaction/anaphylaxis protocols if available

Implementation

- Common types of IV Solutions
 - **Isotonic solutions** = Osmolality close to extracellular fluids (275-295)
 - Normal Saline (0.9% NaCl or 0.9%NS)
 - Used as a TKO solution
 - Used to restore volume
 - Only approved solution used with Blood Transfusions (**never** use anything else)
 - Replaces large sodium loss
 - Lactated Ringers Solution (LR)
 - Contains small amounts of sodium, potassium, and calcium

- Used following surgery
 - **Hypotonic Solutions** = Osmolality lower than extracellular fluids (< 275)
 - Causes fluid to move from the extracellular space into the intracellular space
 - Indicated for cellular dehydration
 - 0.45% Normal Saline (½ normal saline)
 - 5% Dextrose and Water (D₅W)
 - *Is isotonic prior to infusion*
 - *A diluent for certain medications*
 - *No nutritional value*
 - **Hypertonic Solutions** = osmolality higher than the extracellular fluid (> 295)
 - Indicated for intravascular dehydration with interstitial or cellular overhydration
 - 5% Dextrose in Lactated Ringers (D5LR)
 - 5% Dextrose in 0.45% Normal Saline (D5 ½ NS)
 - 5% Dextrose in 0.9% Normal Saline (D5 0.9NS)
- Hanging IV solutions:
 - Check bag for leaks or cracks
 - Check for cloudiness of solution
 - Check for correct solution and flow rate
 - Check Dr. order and compare to MAR
 - All bags are labeled with name of client, name of solution, flow rate, and expiration date
 - Check tubing for presence of air bubbles
 - Calculating IV Flow Rate
 - The flow of IV fluids from the bag/bottle through the tubing and into the vein is by drops
 - The size of the drop varies according to the drip chamber opening on the tubing used
 - Regular IV drip chambers release 15 drops (gtts) for each mL (primarily used for adults)
 - Drip chambers for blood products release 10 gtts/mL (considered a macrodrop)
 - Micro-drip chambers release 60 gtts/mL (primarily used in pediatrics)
 - Pump infusions
 - Most widely used
 - Tubing chamber placed into electronic pump
 - Pump rate is set for mL per hour (can also be set for a specific volume)
 - Gravity infusions are used when:
 - Pumps are not available
 - Small amount of fluid is infused; e.g. antibiotic
 - Large amount of fluid is infused rapidly; e.g. treatment during shock
 - Formulas for calculating IV flow rates depend on delivery system
 - Gravity IV infusion

$$\frac{\text{VOLUME}}{\text{TIME (must be in minutes)}} \times (\text{DROP FACTOR}) = \text{GTT/MIN}$$
 - Pump IV infusion

$$\frac{\text{TOTAL VOLUME IN ML}}{\text{TOTAL TIME IN HOURS}} = \text{ML / H}$$