IV Admixture

By

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I/V admixtures

- An IV admixture is the preparation of a pharmaceutical mixture of two or more drugs into a large bag or bottle of IV fluid.
- This is always done under the direction of a doctor, controlled/performed by a trained pharmacists.
- This is to be sure that no one is accidentally overdosed, or given the wrong medications.

Major routes of Drug administration

- **Parenteral route** ''para'' & ''enteron'' means outside the intestine & are following.
- I/V
- I/M
- S/C
- Intrathecal
- Oral, sublingual,
- Inhalation route

IV route

- Have many advantages as well as disadvantages.
- Advantages?
- Disadvantages?
- In iv admixtures or in the form of iv infusions it is a suitable method to administer large volume of infusion, total parenteral nutrition, of drug in the form of iv admixtures.

Learning Objectives

- Describe the characteristics of intravenous solutions/admixtures including solubility, osmolality, and pH.
- Identify common vehicles for intravenous solutions.
- Describe the equipment and procedures used in preparing parenterals.
- Identify the components of an intravenous administration set/ drip.
- Calculate the molecular weight and milliequivalents of certain substances used in the pharmacy.
- Calculate intravenous rates and administration.

Intravenous Preparations

- The IV route of administration is used
  - to reach appropriate drug serum levels
  - to guarantee compliance
  - for drugs with unreliable gastrointestinal (GI) absorption
  - for the patient who can have nothing by mouth
  - for the patient who is unconscious or uncooperative, and for rapid correction of fluid or electrolytes
- Most parenterals are introduced directly into the bloodstream
  - must be free of air bubbles or particulate matter
  - have many characteristics including solubility, osmolality, and pH

Characteristics of IV Preparations

- Intravenous (IV) preparations are either:
  - solutions (in which ingredients are dissolved)
  - suspensions (in which ingredients are suspended)
- Most parenteral preparations are made of ingredients in a sterile water medium
- Some parenteral preparations may be oleaginous (oily)

Characteristics of IV Preparations

- Parenteral IV preparations must have chemical properties that will not
  - damage vessels or blood cells
  - alter the chemical properties of the blood serum

- With blood, IVs must be
  - iso-osmotic (having the same number of particles in solution per unit volume)
  - isotonic (have the same ***osmotic pressure***, meaning the pressure produced by or associated with osmosis)

Characteristics of IV Preparations

- The ***osmolality*** is the amount of particulate per unit volume of a liquid preparation
  - measured in milliosmoles (mOsm)
  - osmolality of blood serum = 285 mOsm/L

- An ***isotonic solution*** is a solution in which body cells can be bathed without a net flow of water across a semipermeable membrane
  - 0.9% normal saline (NS)

Characteristics of IV Preparations

- Pharmacists sometimes must adjust tonicity of parenteral preparations to ensure they are near isotonic.
- A ***hypertonic solution*** has a greater number of particles than the blood cells themselves
  - 50% dextrose or 3% sodium chloride
- A solution of less than normal tonicity is hypotonic, which has fewer numbers of particles than blood cells
  - 0.45% NS

Characteristics of IV Preparations

- The ***pH value*** is the degree of acidity or alkalinity of a solution
  - acidic solution: pH of less than 7
  - alkaline solution: pH value more than 7

- Human blood plasma has a pH of 7.4
  - slightly alkaline
  - parenteral IV solutions should have a pH that is neutral (near 7)

Methods of Injection

- The bolus, or injection, is one of the most common routes of IV administration
- The injection is performed using a syringe
  - prepackaged in the form of filled, disposable plastic syringes
  - injectable drug must be taken up into the syringe from a single- or multi-dose glass or plastic vial, or from a glass ampule
- Sometimes the solid drug in the vial has to be reconstituted by addition of a liquid before use

Methods of Injection

- IV infusions deliver:
  - large amounts of liquid into the bloodstream over prolonged periods of time

- IV infusion is used to deliver:
  - blood
  - water
  - other fluids
  - electrolytes
  - drugs
  - nutrients

Characteristics of parenteral preparations that are important to adjust:

- Tonicity,
- Osmolality,
- pH are characteristics of parenteral preparations.
- It is important that they be adjusted to be as close as possible to the values for human blood, to prevent damage to blood cells and organs.

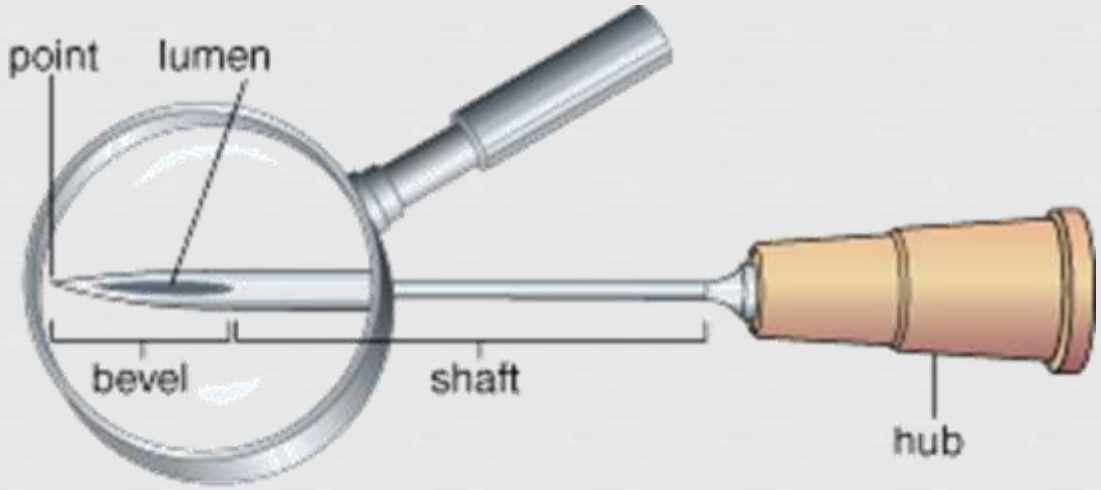
Some commonly used abbreviations

- DS
- NS
- RL
- SW
- Zn
- NaCl
- KCl
- Vit.

Syringes and Needles

- Syringes are used for IV push and in the preparation of infusions, are made of glass or plastic
- Glass syringes are more expensive
  - use limited to medications that are absorbed by plastic
- Plastic syringes
  - are less expensive
  - are disposable
  - Manufactured as sterile

- Needles are made of stainless steel or aluminum
  - needle lengths range from 3/8 of an inch to 6 inches
  - needles come in gauges ranging from 30 to 13 (higher the gauge, smaller the lumen)
- After use, needles must be discarded in a designated sharps container



IV Sets

- An ***IV administration set*** is a sterile, Pyrogen-free disposable device used to deliver IV fluids to patients
- The set may
  - be sterilized before use by means of radiation or ethylene oxide.
  - Come in sterile packaging and a sealed plastic wrap
- Sets do not carry expiration dates

IV Sets

- IV sets are sterile and no pyrogenic
- Each unit is supplied in packaging that ensures the maintenance of sterility
- Flanges and other rigid parts of an IV set are molded from tough plastic
- Most of the length of the tubing is molded from a pliable polyvinyl chloride (PVC)
- PVC sets should not be used for
  - nitroglycerin, which is absorbed by the tubing
  - IV fat emulsions, which may leach out of the tubing

NOTE:

A damaged package cannot ensure sterility. It is best to discard sets that are found in unoriginal, opened, or damaged packages.

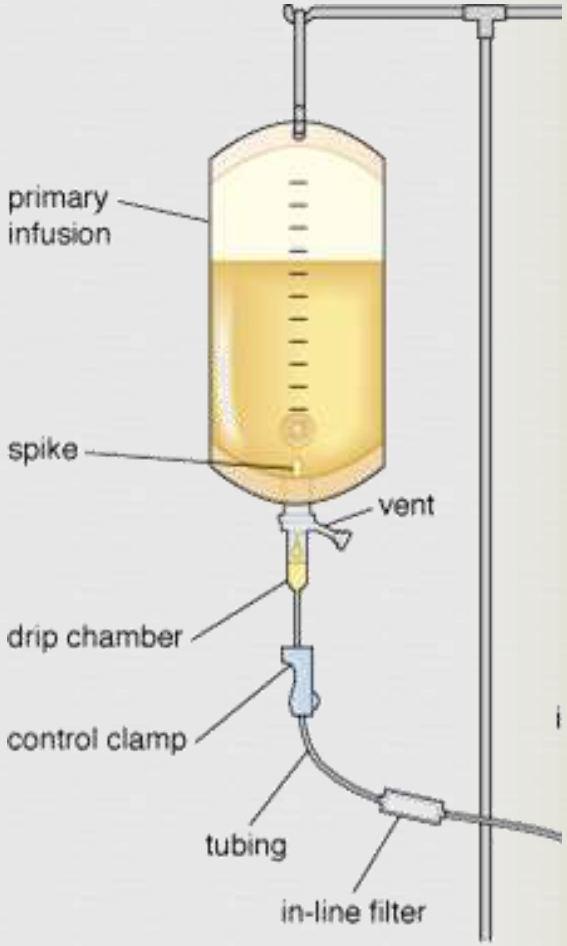
Do not use PVC IV sets for nitroglycerin or fat emulsions. Special types of plastic sets are required for such infusions.

IV Sets

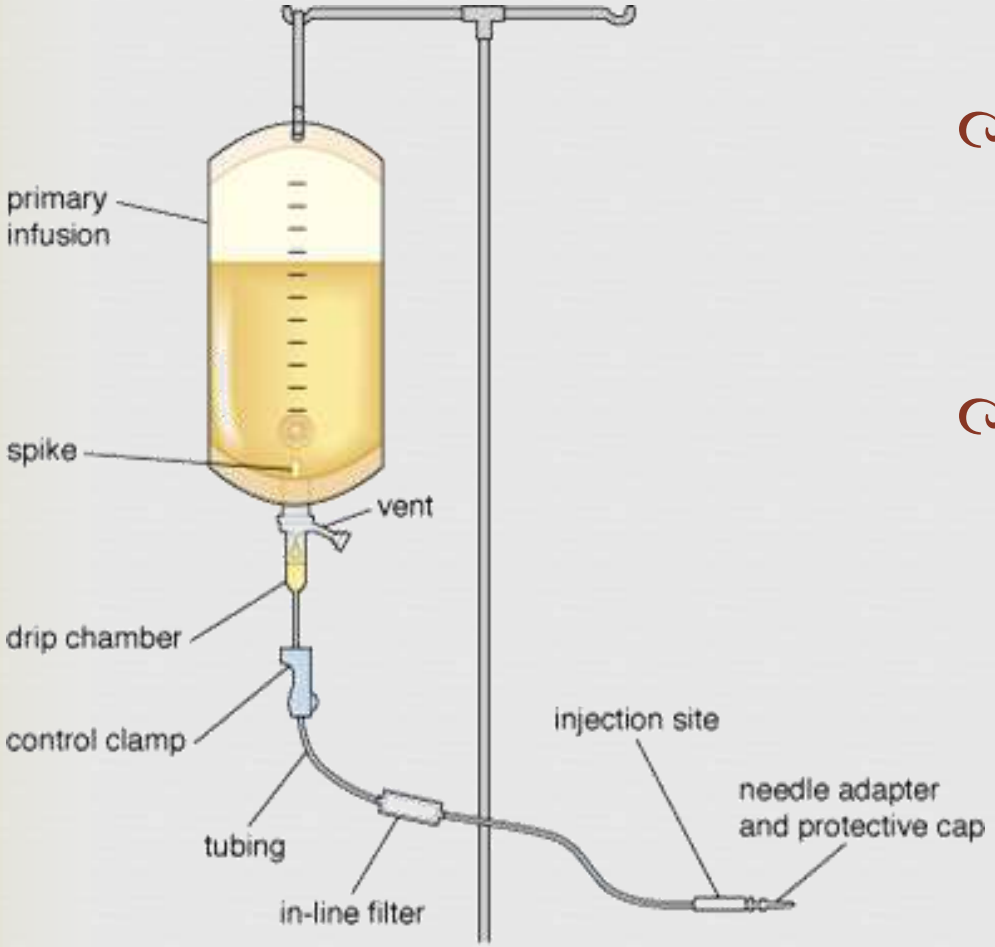
- The length of sets varies from 6-inch extensions up to 110- to 120-inch sets used in surgery
  - the priming (use) of tubing depends on the length of the set
- Standard sets have a lumen diameter of 0.28 cm
  - varying the size of the lumen diameter achieves different flow rates
  - regulation of flow rates is critical in neonates and infants

IV Sets

- A spike to pierce the rubber stopper or port on the IV container
- A drip chamber for trapping air and adjusting flow rate
- A control clamp for adjusting flow rate or shutting down the flow
- Flexible tubing to convey the fluid



IV Sets



- A needle adapter for attaching a needle or a catheter
- A catheter, or tube, may be implanted into the patient and fixed with tape to avoid having to repuncture the patient each time an infusion is given

IV Sets

- The spike is a rigid, sharpened plastic piece used proximal to the IV fluid container
  - covered with a protective unit to maintain sterility
  - generally has a rigid area to grip while it is inserted into the IV container
- If an air vent is present on a set, it is located below the spike
  - the air vent points downward and has a bacterial filter covering
  - the vent allows air to enter the bottle as fluid flows out of it
  - necessary for glass bottles without an air tube

IV Sets

- The drip chamber is a transparent, hollow chamber located below the set's spike
  - drops of fluid fall into the chamber from an opening at the uppermost end, closest to the spike
  - number of drops it takes to make 1 mL identifies an IV set

Preparing IVs

- Pharmacists and technicians prepare drugs and IV solutions in a form ready to be administered to a patient
- IV push (i.e., bolus) and IV infusion dose forms should be prepared in laminar airflow hoods using aseptic techniques
  - products used during the preparation must always be sterile and handled in such a manner as to prevent contamination

- Preparation should always be done under the supervision of a licensed pharmacist medication that is prepared by the technician must be reviewed and approved by the pharmacist.
- Begin any IV preparation by washing your hands thoroughly using a germicidal agent such as chlorhexidine gluconate or povidone-iodine.
- All jewelry should be removed from the hands and wrists before scrubbing and while making a sterile product
- Wear gloves during procedures
- Laminar airflow hoods are normally kept running
- Eating, drinking, talking, or coughing is prohibited in the laminar airflow hood
- Working in the laminar flow hood should be free from interruptions

IV Preparation Guidelines

- Before making the product, thoroughly clean all interior working surfaces
- Gather all the necessary materials for the operation and make sure they are:
  - not expired
  - free from particulate matter such as dust
  - check for leaks by squeezing plastic solution containers
- Only essential objects and materials necessary for product preparation should be placed in the airflow hood

IV Preparation Guidelines

- Work in the center of the work area within the laminar airflow hood
  - at least six inches inside the edge of the hood
  - make sure nothing obstructs the flow of air from the high-efficiency particulate air (HEPA) filter over the preparation area
  - nothing should pass behind a sterile object and the HEPA filter in a horizontal airflow hood or above a sterile object in a vertical airflow hood

IV Preparation Guidelines

- Follow proper procedure for handling sterile devices and medication containers
- Remember that the plunger and tip of the syringe are sterile and must not be touched
- For greatest accuracy, use the smallest syringe that can hold the desired amount of solution
  - syringe should not be larger than twice the volume to be measured
  - syringe is considered accurate to half the smallest measurement mark on its barrel

IV Preparation Guidelines

- The volume of solution drawn into a syringe is measured at the point of contact between the rubber piston and the side of the syringe barrel
- Additives are commonly added to IV solutions
  - medications, electrolytes, vitamins and/or minerals
- Additives may be packaged in vials or ampules
- Proper technique in using vials and ampules is an important skill for the pharmacy technician to learn

Vials

- Powders are reconstituted by introducing a diluent (e.g., sterile water for injection)

- Vials are closed systems
  - the amount of air introduced should be equal to the volume of fluid removed
  - an exception to this guideline is the withdrawal of cytotoxic drugs from vials

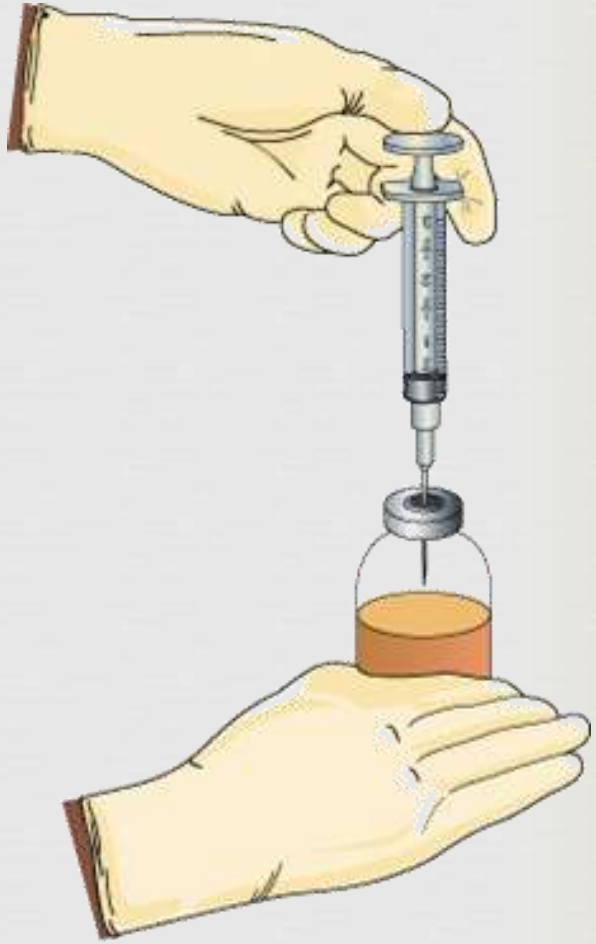
Vials

Use a Syringe to Draw Liquid from a Vial

1. Choose the smallest gauge needle appropriate for the task, and avoid coring the rubber top of the vial and thus introducing particulate into the liquid within it
2. Attach the needle to the syringe.
3. Draw into the syringe an amount of air equal to the amount of drug to be drawn from the vial.

Vials

4. Swab or spray the top of the vial with alcohol before entering the laminar flow hood; allow the alcohol to dry. Puncture the rubber top of the vial with the needle bevel up. Then bring the syringe and needle straight up, penetrate the stopper, and depress the plunger of the syringe, emptying the air into the vial.



Vials

5. Invert the vial with the attached syringe.
6. Draw up from the vial the amount of liquid required.
7. Withdraw the needle from the vial. In the case of a multidose vial, the rubber cap will close, sealing the contents of the vial.
8. Remove and properly dispose of the needle, and cap the syringe. A new needle will be attached at the time of injection into a patient.

Ampules

- An ***ampule*** is a single-dose-only drug container

- The glass ampule offers another challenge because one must first break the top off the ampule before withdrawing the medication

Ampules

Opening an Ampule

1. Gently tap the top of the ampule to bring the medication to the lower portion of the ampule.

Ampules

Opening an Ampule

2. Clean the neck with an alcohol swab; then grasp the ampule between the thumb and index finger at the neck with the swab still in place.

Ampules

Opening an Ampule

3. Forcefully snap the neck away from you.

Ampules

- To withdraw from an ampule, tilt the ampule, place the needle bevel of a filter needle or tip of a filter straw in the corner near the opening, and withdraw the medication

- Use a needle equipped with a filter for filtering out any tiny glass particles, fibers, or paint chips that may have fallen into the ampule

Ampules

- Before injecting the contents of a syringe into an IV, the needle must be changed to avoid introducing glass or particles into the admixture
- A standard needle could be used to withdraw the drug from the ampule; it is then replaced with a filter device before the drug is pushed out of the syringe
- Filter needles are for one directional use only

IV Solutions

- The vehicles most commonly used for IV infusions are:
  - dextrose in water
  - NS solution
  - dextrose in saline solution

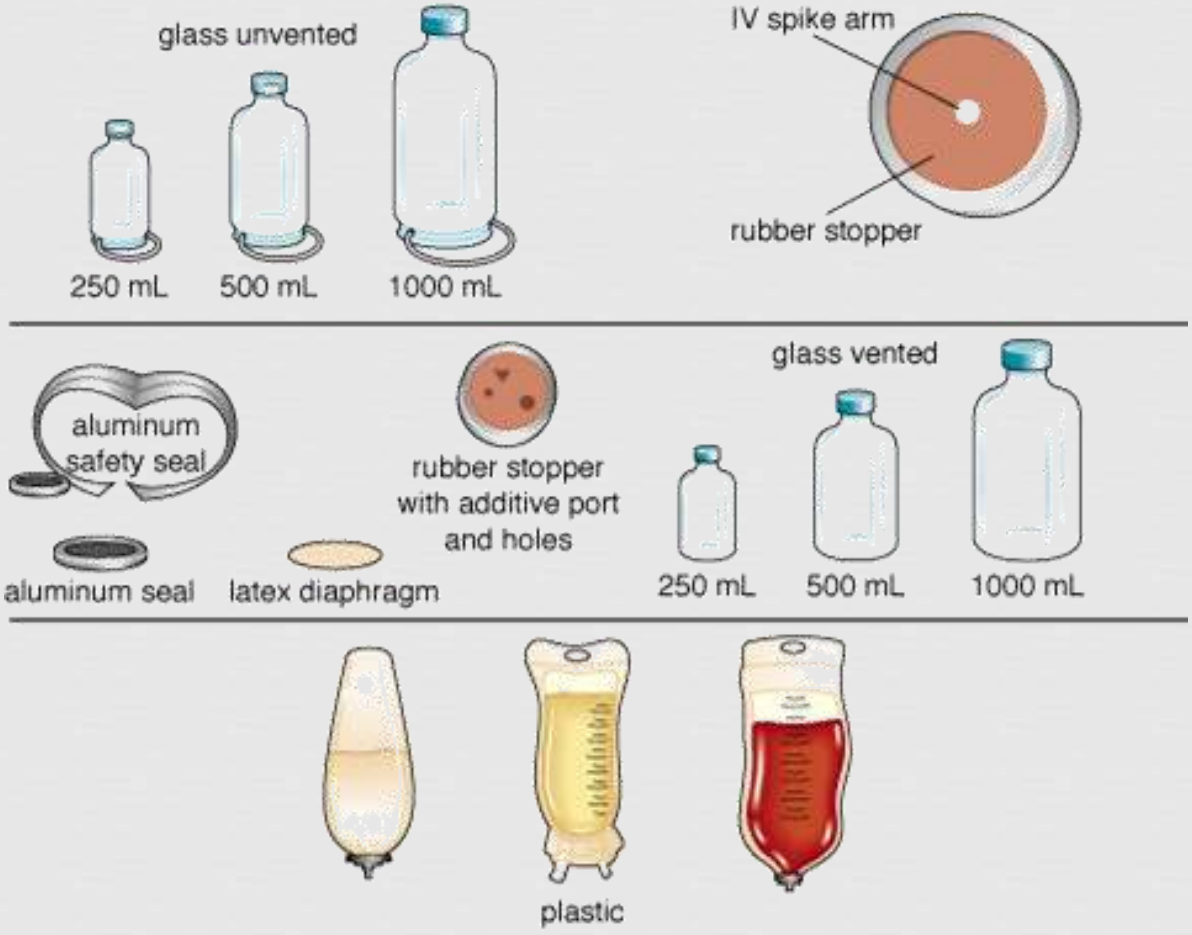
- The two main types of IV solutions are:
  - *small-volume parenterals (SVPs)* of 50 or 100 mL
  - *large-volume parenterals (LVPs)* of more than 100 mL

IV Solutions

- SVPs are typically used for delivering medications at a controlled infusion rate

- Large-volume parenterals (LVPs) are used
  - to replenish fluids
  - to provide electrolytes (i.e., essential minerals)
  - to provide nutrients such as vitamins and glucose
  - LVPs are commonly available in 250 mL, 500 mL, and 1000 mL sizes

Different Types of IV Containers



IV Solutions

- A LVP usually contains one or more electrolytes
  - potassium chloride is the most common additive
  - other salts of potassium, magnesium, or sodium can be added
- Additives to IV solutions can also be multivitamins or trace elements

Preparing a Label for an IV Admixture

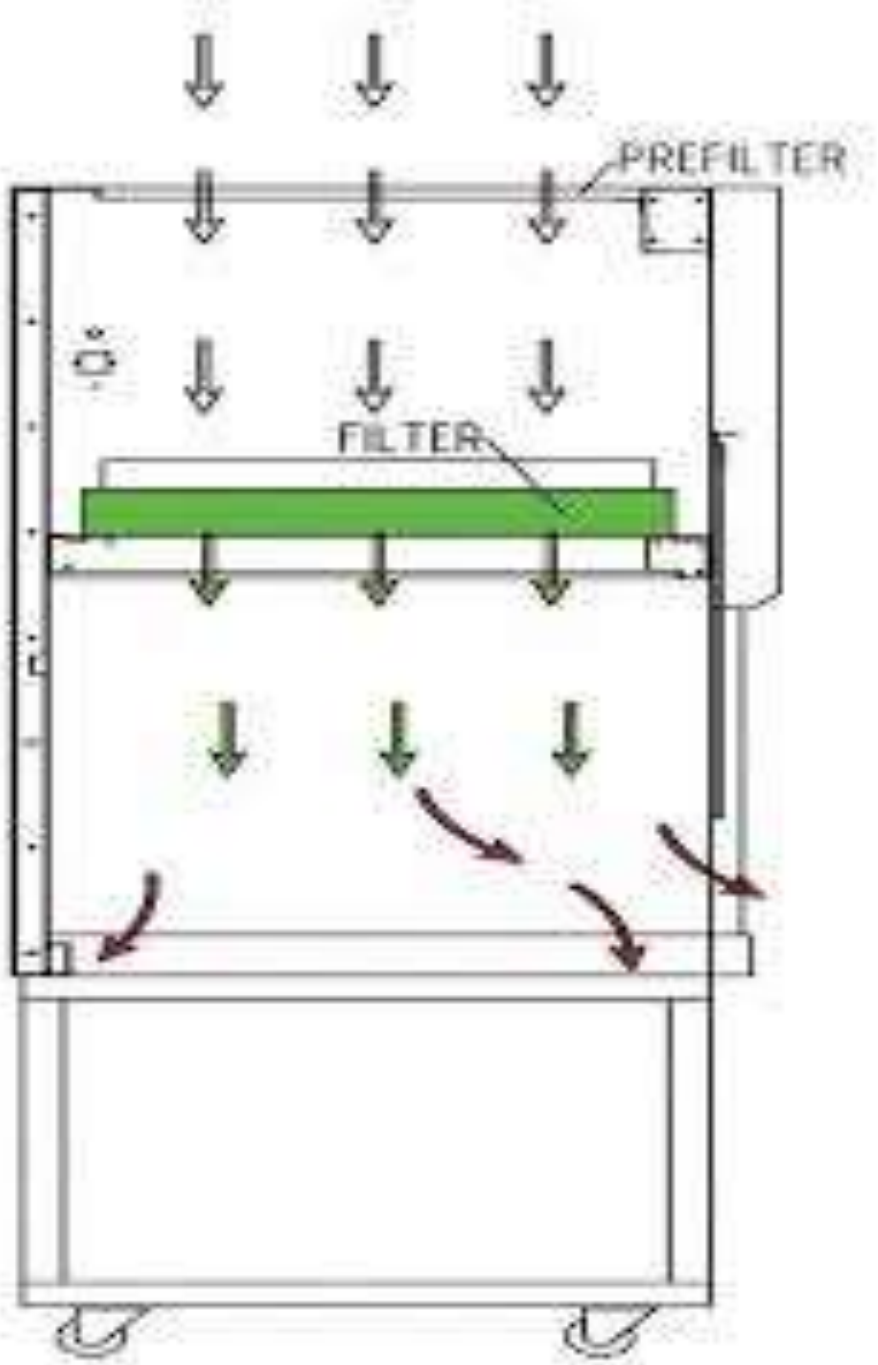
Labels for IV admixtures should bear the following information:

- patient's name and identification number
- room number
- fluid and amount
- drug name and strength (if appropriate)
- infusion period
- flow rate (e.g., 100 mL/hr or infuse over 30 min)
- expiration date and time
- additional information as required by the institution or by state or federal guidelines

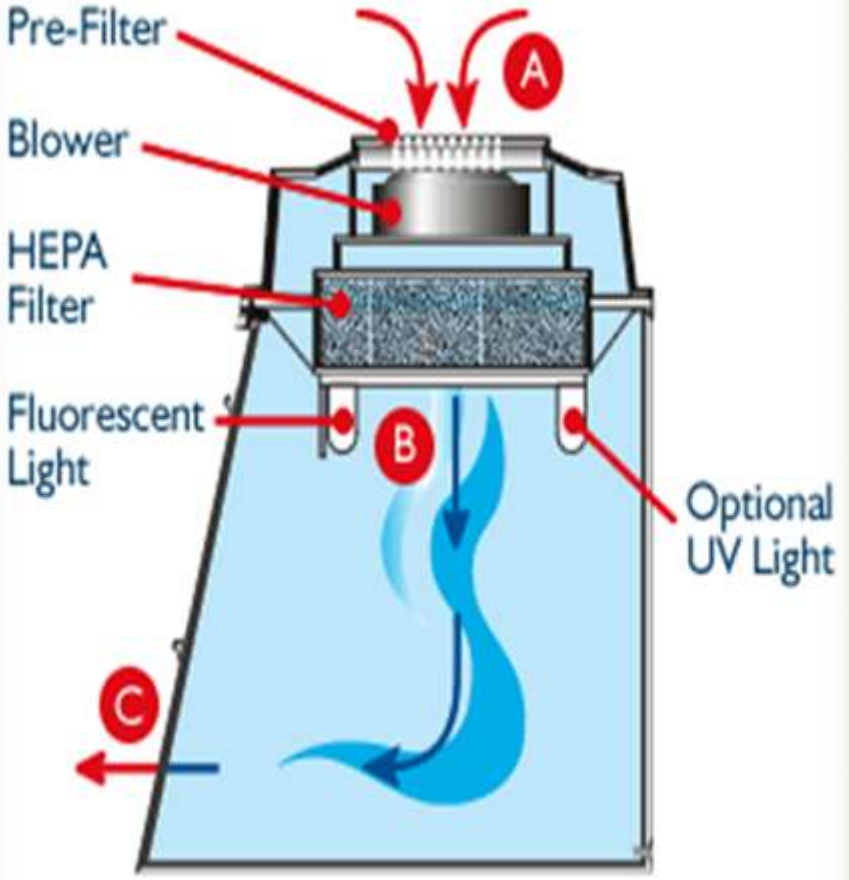
Examples of Pharmacy-prepared Labels

- for a minibag

- for a large-volume parenteral (LVP)



How the AC600 Series Class 100 Vertical Laminar Flow Works:



1. Room air enters at "A".
2. Air forced through HEPA filter creating laminar flow.
3. Clean laminar flow air enters at "B" and exits at "C".

LFH

- . The work area is continuously bathed with positive pressure ISO 5/Class 100 vertical laminar flow air that has passed through a High Efficiency Particulate Air (HEPA) filter. This filter removes organisms and particulates 0.3 micron in size with an efficiency of 99.99%. The laminar flow principle consists of moving individual streams of unidirectional, ultra-clean air along parallel lines with minimal turbulence. The HEPA filter is positioned in the top of the work area and is protected by a removable, perforated metal diffuser.

THANK YOU