Intravenous Access

Intravenous (IV) access/cannulation- surgical puncture of a vein to deliver medication/withdraw blood.

Situations indicating IV Access:

1. Fluid and blood replacement
2. Drug administration
3. Obtaining venous blood specimens (lab)

Types of IV Access:

1. Peripheral (most often performed as a paramedic)
2. Central (rarely, if ever performed in prehospital setting)

Peripheral venous access- surgical puncture of a vein in the arm, leg, or neck (start at the distal end of the extremity and work proximal)

Central venous access- surgical puncture of the internal jugular, subclavian, or femoral vein (veins located deep within the body/central veins are larger) (ex. PICC)

Equipment and Supplies for Venous Access:

Intravenous fluids- chemically prepared solutions tailored to the body's specific needs.

Types of solutions:

- **Colloids-** contain large proteins that cannot pass through the capillary membrane, remain in the circulatory system for a long time.
- Also contain osmotic properties that *attract water* into the circulatory system
- Small quantity con significantly increase intravascular volume (Volume of blood and fluid contained within the blood vessels)

Examples of Colloids:

- **Plasma protein fraction (plasmanate)-** protein-containing colloid. (Albumin is the principle protein)
- **Salt poor albumin-** contains only human albumin (1g/retains approx.18mill. of water in the blood stream)
- **Dextran-** is *not* a protein, but a large sugar molecule with osmotic properties.
- **Hetastarch (Hespan)-** sugar molecule with osmotic properties similar to a protein's. (different side effects than Dextran's)
    i. **Colloids help maintain vascular volume, using them in the field in NOT practical**

- **Crystalloids**- contain electrolytes and water, but lack colloid's larger proteins and larger molecules (primary out-of-hospital IV solution)
    i. Classified by their tonicity (number of particles per unit volume) relative to that of the body plasma

Crystalloid Classes:

1. **Isotonic**- solutions tonicity level is equal to blood plasma's
2. **Hypertonic**- solutions have a higher solute concentration than do the cells
3. **Hypotonic**- solutions have a lower solute concentration than do the cells

Three most commonly used IV fluids:

- **Lactated Ringer's**- solution in an isotonic electrolyte solution. (contains sodium chloride, potassium chloride, calcium chloride, and sodium lactate in water)
- **Normal saline solution-** is an isotonic electrolyte solution containing 0.90% sodium chloride in water
- **5% Dextrose in water (D5W)-** is a hypotonic glucose solution used to keep a vein patent and to supply calories needed for cellular metabolism (increases circulatory volume, glucose molecules rapidly diffuse across the vascular membrane and increase the free water)
    i. both lactated Ringer's and normal saline are used for fluid replacement, because of their immediate ability to expand the circulating volume (2/3 of either electrolytes/water solution will be lost to the extravasular space within 1 hour)

Items to check on IV bag:

- **Label (fluid type, expiration date, color and clarity)**
- **Medication Administration port**
- **Administration set port**

IV drip sets-

- Mini drip- 60 gtts = 1mL
- Maxi drip- 10/15/20 gtts = 1mL

IV bags-

50mL - 3000mL (however most rescue trucks carry only up to 1000mL)

IV drip sets-

- Mini drip- 60 gtts = 1mL
- Maxi drip- 10/15/20 gtts = 1mL

IV Cannulas-

- **Over-the-needle catheter**
- **Hollow-needle catheter**
- **Plastic catheter inserted through a hollow needle (intracatheter)**

Over-the-needle catheter (angiocatheter)

- *Catheter*- encloses the metal stylet (needle)
- *Metal stylet*- punctures the skin and blood vessel
- *Flashback chamber*- clear plastic chamber confirms placement of the stylet in the vein
- *Teflon catheter*- slides over the metal stylet and into a punctured vein
- *Hub*- located in the back of the Teflon catheter, receives the needle adapter of the administration tubing once removed from metal stylet

Hollow-needle catheter- stylet that does not have a Teflon tube, but is itself inserted into the vein and secured there (pediatrics/other patients with tiny, delicate veins)

Catheter inserted through the needle- Teflon catheter inserted through a large metal stylet (intracatheter)

- Used in hospital setting to implement central lines

IV Gauges:

- **22-gauge** Small gauges are used for *fragile* veins (children/elderly)
- **20-gauge** Moderate gauges are used for average adults who does not need fluid replacement
- **18-gauge, 16-gauge, or 14-gauge** Larger gauge used to increase volume or to administer viscous medications
    - **Hypodermic needle 1"-1 ½" long**

IV Prep kit:

- Venn guard
- 4X4 dressing
- Alcohol pad
- Lock set up and saline flush (10-20 mL)
- 18 and 20 gauge needle
- Tourniquet
    - IV prep kit's are pre-made and are found on the back of rescues (quick and easy access for IV set up's)

Factors Affecting IV Flow Rates:

- Tourniquet (has not been removed)
- Edema at the puncture site (swelling at the IV site indicates fluid collection caused by infiltration)
- Cannula abutting the vein wall/valve (carefully reposition cannula)
- Administration set control valves (ensure that the flow regulator is open)
- IV bag height (bag must me higher than IV site)
- Completely filled drip chamber
- Catheter patency (blood clot at the end of the Teflon catheter/needle may obstruct the flow of solution from the IV solution bag into the body)
    - **Never flush an IV that has stopped running b/c of a clot**

Complications of Peripheral IV Access

- **Pain-** minimize pain, use a smaller gauge catheter
- **Local infection-** occurs if you do not properly cleanse site and thus introduce pathogens through the puncture
- **Pyrogenic Reaction-** in the administration tubing/IV solution (produces a fever)
- **Allergic Reaction**
- **Catheter shear-** can occur if you pull the Teflon catheter through/over the needle after you have advanced it into the vein (embolus)
- **Inadvertent arterial puncture**
- **Circulatory overload-** occurs if you administer too much fluid for the patient's condition
- **Thrombophlebitis-** inflammation of the vein, is particularly common in long-term intravenous therapy
- **Thrombus formation-** blood clot, can form if IV access injuries the vessel wall
- **Air embolism-** when air enters the vein.
- **Necrosis-** sloughing off of dead tissue, occurs later in IV therapy as medication has extravasated into the interstitial space
- **Anticoagulants-** drugs such as aspirin, Coumadin, or heparin increase the chance of bleeding and impede hemorrhage control during IV establishment