OFFICE OF THE DIVISION SURGEON
EDUCATION AND TRAININING
SECOND MARINE DIVISION, FMF
CAMP LEJEUNE, NORTH CAROLINA 28542-5500

STUDENT HANDOUT

INTRAVENOUS THERAPY

References:

(1) Coco, Charlene and Diane, "Intravenous Therapy; A Handbook for Practice"; St. Louis: C.V. Mosby Co.

(2) Kurdi, William J. "Modern Intravenous Therapy", Los Angeles; Medical Educations Consultants.

(3) "Hospital Corpsman 3 & 2 manual; 1981

(4) Nursing Procedures Manual NAMVED P-5066

Topics:

I. Purpose

II. I. V. Equipment

III. Selecting a Site

IV. Venipuncture Techniques

V. Complications

VI. Calculating The Flow Rate

VII. Heparin Locks

VIII. Administration of I. V. Piggy Back Medications

REVISED: SEPT 1986

I. PURPOSE:

A. To provide a lifeline for the administration of drugs.

B. To provide a route for the replacement of fluids, electrolytes or nutrients.

C. To restore acid-blance

II. INTRAVENOUS THERAPY EQUIPMENT

A. Types of Fluids

1. Crystalloids

D5 LR NS

a. Water with salts or crystalizing substances dissolved in it.
   1) D5W, D5NS, D5½NS
   2) Normal Saline (NS)
   3) Ringers Lactate (RL), D5RL

b. Used for replacement of water and electrolytes.

c. Most common type of I.V. fluid.

d. Should always be crystal clear, if not, do NOT use that particular bag/bottle of fluid.

Heater lost Replace ≥ 3 liters of CRYS.

2. Colloids

a. By difinition: A state of matter composed of single large molecules or aggregations of smaller. Example: Too large to dissolve in water or will not dissolve at all.

b. Used primarily as a blood volume expander. Draws water from extra vascular areas into blood stream via oncotic pressure, acts much like a sponge holding water.

c. Cellular products (whole blood, packed cells, WBC,s and platelets) are given to replace lost blood components.

d. Examples:

   1) Whole blood, packed red blood cells
   2) Fresh frozen plasma (FFP)
   3) Plasmanate (synthetic albumen)
   4) Albumen (very expensive, rarely used)
   5) Dextran (New and popular macromolecular colloidal fluid)

B. I.V. Administration Sets.

1. Standard Administration Set (Macro-drip) 20 p mL

   a. Flow rate: 20 gtts/ml

   b. Indications for use: When large quantities of fluids must be infused at a fast rate.

2. Minidrip Administration Set (Micro-drip) 60 p mL

   a. Flow rate: 60 gtts/ml

   b. Indications for use: When small quantities of fluids must be infused at a KVO rate. This type should be used when a medication is added to the IV bag

3. Volumtrol Administration set (Soluset)

   a. Indications for used: Used when you want to deliver small doses of medications or fluids over an extended period of time.

C. Needles and Catheters

1. Straight Needle (Butterfly)

   a. Used in short term therapy and for infants and children.

   b. Sizes:

      ✓1) 19-21 gauge, used for older children and adults.
      ✓2) 21-23 gauge, used for smaller children or elderly with fragile veins.
      ✓3) 25-27 gauge, for administration into scalp veins.

   c. Advantages:

      1) Inexpensive
      2) Good for short term use or single use drug administration.
      3) Less likely to cause thrombophlebitis even after long term usage.
      4) Recommended for use in diabetics since steel is less likely to be irritating than plastic.

2. Over the Needle (Angiocath)

   a. Usually used for long term therapy

   b. Provides less vein damage

   c. Gives patient more mobility

   d. Sizes:

1) 14-16 gauge, Blood or blood products Immediate Fluid Bolus
2) 16-20 gauge, Crystalloids or medication infusion (18ga. most popular)

e. Advantages:

1) Well tolerated since it is so flexable
2) Infiltration is highly unlikely (no needle to cause phlebitis)

3. Inside the needle catheter (Intracath)

a. Used for long term therapy

b. Sizes:

1) 14-16 gauge, CVP monitoring via central line or blood administration.
2) 18-20 gauge, Crystalloid solutions or medications.

c. Advantages:

Central line

1) Choice for CVP monitoring.
2) Excellent for long term therapy or when large volumes are to be infused.
3) Infiltrations is unlikely.

D. Other Equipment

1. Tourniquet: Used to dilate the patients veins, and is placed 6-8 inches above the selected venipuncture site.

a. Types:

1) Soft rubber tubing.
2) BP Cuff.
3) Commercially made touniquet.

2. Arm board: used for support.

3. Tape: to secure IV needle and line.

4. Antiseptic cleaning solution: to prevent infection.

5. Bandaid

6. Scissors

7. Ointment

8. Stop-cock

III. SELECTING AN IV SITE:

A. Location of patients injury (what is the patients conditions)

1. Cannot start an IV on an affected extremity.

2. Consider where a central line may be placed.

B. Dexterity of the patient: If the patient is right handed try to use the left hand if at all possible.

C. Anticipate the duration of therapy: Will the IV remain in place for any length of time?

D. Consider the purpose of therapy

1. For diagnostics, the site choice may not be important

2. Hyperalimentation, the line should run through a central vein.

3. Viscous fluid, requires a large vein.

4. For administration of medications, would require a large vein to help dilute medication and decrease burning and sting.

E. Age of the patient

1. Fragile veins.

2. Older people have tortuous veins (they zig-zag).

F. Comfort and Safety

1. Do not use veins running over a joint or flexation area.

2. The inner aspect of the arm is more sensititve than the outer aspect.

G. Condition of the vein

1. If phlebotic, don't use (Ropey).

2. If tortuous, don't use (zig-zag).

3. Is the vein large enough to handle the catheter selected.

H. Vein selection sites

1. Upper extremities

a. Metacarpal region: the back of the hand, primary location.

b. Cephaltic veins: Dorsal and anticubital spaces; the underside of the arm; is more tender/sensitive.

c. Basilic veins

d. Median cubital

e. External jugular: This is considered to be part of the upper extremity.

2. Lower extremities

a. Saphenous

b. Metatarsals

IV. VENIPUNCTURE TECHNIQUES:

A. Prepare the patient.

B. Prepare the equipment.

1. Select the appropriate type of fluid and check for:

a. Leakage or breaks in the seal.

b. cloudiness in the solution.

c. expiration dates.

d. proper amount of fluid.

2. Select the appropriate infusion set and inspect for damage.

3. Select and assemble all other needed materials which will be needed. (Tape, armboard, tourniquet, etc.)

4. Place the tourniquet on the patient and select a suitable vein by palpating and observing for:

a. A good straight large vein.

b. a site as far distal on the extremity as possible.

c. Bifurcations are good sites: Encourage vein distention by dangling the arm, pumping the fist or gently tapping.

5. Prepare the arm.

6. Make the puncture using appropriate sterile technique.

a. Hold the needle at approximately 25-30 degree angle to the skin, then a more shallow angle (10-15 degrees) to pierce the vein.

b. Make sure the bevel is up.

c. Use a slight jabbing motion.

d. Continue to watch the flash chamber for the flashback.

1) If unsuccessful, do not probe around, this could cause damage to the vein and underlying tissue.
2) If successful, hold the stylet fast and slip the catheter off into the vein. Draw back slightly prior to advancing the catheter, this helps to prevent the stylet from blowing the vein while advancing the catheter.

7. Remove the tourniquet

8. Connect the IV tubing

   a. Make sure all air is out of the tubing

   b. Allow the fluid to run into the patient and watch for infiltration.

9. Adjust flow rate.

10. Tape and secure IV.

11. Write the following information on the dressing (tape):

    a. Size of catheter

    b. Date and time initiated

    c. Your initials

V. COMPLICATIONS OF IV THERAPY:

A. Infection

1. Types:

   a. Localized

   b. Systemic

2. Purpose(Prevention of)

   a. To maintain a pathogen free continous route for administering blood, fluids, and medication.

3. Procedure

   a. Change dressing and IV administration set at least every 24 hours.

   b. Verify doctor orders.

   c. Wash hands.

   d. Explain procdure to patient.

   e. Order or prepare proper solution

   f. Identfy patient

g. Close requlator clamp on IV administration set and remove empty bottle or bag.

h. Insert new IV administration into new I.V. solution (quickly)

i. Open closed regulator clamp.

j. Ensure drip chamber is half full.

k. Adjust flow rate as ordered.

l. Apply antibacterial ointment and dressing.

B. Localized infiltration.

C. Circulatory overload.

1. Pulmonary edema.

2. Speed shock.

D. Thrombophlebitis.

E. Pyrogenic reaction.

F. IV malfunction:

1. Tubing is kinked or pinched.

2. Needle not patent.

3. Height of IV (may be to low).

4. Flow clamp closed.

5. No blood return when IV is held below site.

G. Air embolism

H. Catheter emboli.

I. Arterial puncture.

VI. CALCULATING THE FLOW RATE

A. The Medical Officers orders will always include the following.

1. Type of fluid.

2. Rate of infusion.

3. Size of reservoir

4. Medications to be added.

1. Hourly infusion rate (IR) stated in IV orders.

2. Drip chamber rate (DCR) of the infusion set being used.

   a. Most common crystalloid administration set (regular) is 20 gtts/cc.

   b. Blood administration set 12 gtts/cc.

   c. Microdrip or pediatric administration set 60 gtts/cc.

C. Formula

$$\frac{DCR}{60} \text{ X IR} = \text{gtts/mins}$$

1. Note: IR (infusion rates) is always given in hours or per hour.

   EXAMPLE #1: 1000cc RL at 150cc/hr using a regular set

$$\frac{20}{60} \text{ X } 150 = 50 \text{ gtts/min}$$

   EXAMPLE #2: One unit of whole blood at 200cc/hr using a blood administration set.

$$\frac{12}{60} \text{ X } 200 = 40 \text{ gtts/min}$$

VII. HEPARIN LOCKS:

A. Purpose:

1. Provide a small-gauge intravenous line for administration line for administration of intermittent drug therapy.

B. Supplies and equipment needed

1. Antibacterial ointment

2. Antiseptic wipes

3. Band-Aids

4. Heparin lock

5. Heparin 1:1000

6. Injectable normal saline

7. Needles; 23 and 25 gauge

8. Syringes 2 1/2 ml TB.

9. Tourniquet

10. Water proof tape

C. Procedure

1. Verfy doctors orders.
2. Explain procedure to patient.
3. Wash hands.
4. Prepare heparin lock
   a. Draw about 1cc normal saline into the 2 1/2 ml syringe.
   b. Remove needle.
   c. Attach syringe to heparin lock
   d. Fill heparine lock with normal saline to remove all air from lock and admoining tubing.
   e. Leave syringe attached to heparin lock.
5. Perform venipuncture procedure as outlined in the IV section.
6. Aspirate to determine proper placement of hearine lock.
   a. Blood will appear in line.
   b. Clear lock of blood by injecting a small amount of normal saline.
7. Secure lock in place using single piece of tape across wings.
8. Fill TB Syringe with:
   a. 0.1ml of heparin
   b. 0.9ml of normal saline
9. Flush lock using TB Syringe with small gauge needle to ensure lock will reseal after repeated injections.
10. Apply antibacterial ointment to band-aid and place over insertion site.
11. Cover with waterproof tape
12. Label tape as you would with an IV.
13. Change dressing and give site care daily.

A. Purpose

1. To administer intravenous medicatins through a piggyback infusion.(IVPB)

B. Supplies and Equipment needed and procedure

1. Prepare IV admixture

   a. Select medications and draw into syringe.

   b. Select secondary IV solution ensuring compatibility with medication.

   c. Inject medication into secondary IV solution

2. Label solutuon with the following:

   a. Name of medication

   b. Dosage

   c. Date and time

3. Close regulator clamp on IVPB administration set.

4. Inset piercing pin of secondary set. Maintain aseptic technique.

5. Attach 21 or 22 gauge needle to tubing.

6. Clear air from tubing and needle.

7. Lable tubing.

8. Identify patient.

9. Hang secondary IV on stand.

10. Clean upper "Y" junction on primary IV set with antiseptic wipe.

11. Insert secondary needle into "Y".

12. Secure neelde with tape.

13. Open clamp on secondary setup and adjuct rate:
NOTE: Primary and secondary IV's run simultaneously. IVBP's may not run unless primary is lower. It is not necessary to adjust flow rate of primary bottle.

$\frac{DCR}{60}$ X rate/hour = GTTS/MIN

Mini/micro Drip 60GTTS/MIN

$\frac{60}{60}$ X rate/hour EXAMPLE 100 cc's hour

$\frac{60}{60}$ X 100 = ~~60~~ 100 GTTS/MIN (SIMPLE METHOD cc's hour = gtts/min)

MACRO/STANDARD

$\frac{20}{60}$ X 100 = 33GTTS/MIN (SIMPLE METHOD Divide cc's hour by 3)

BLOOD ADMIN SET

$\frac{12}{60}$ X 100 = 20 GTTS/MIN (SIMPLE METHOD Divide cc's hour by 5)

WORK THE FOLLOWING PROBLEMS FOR GTTS/MIN

MICRO DRIP

1. 125 cc's/hour GTTS/MIN ____

2. 60 cc's/hour ____

BLOOD ADMIN SET

3. 1000 cc's/hour ____

4. 500 cc's/hour ____

5. 225/cc's/hour ____

MACRO

6. 125/cc's hour ____

7. 60 cc's hour ____

8. 1 liter/hour ____

9. In number 7 above how long would it take to infuse a 1 liter bag of D5W?

10. In number 4 above how long would it take to infuse a 500 cc unit of blood?

SUPERFICAL VEINS

OF

THE FOREARM