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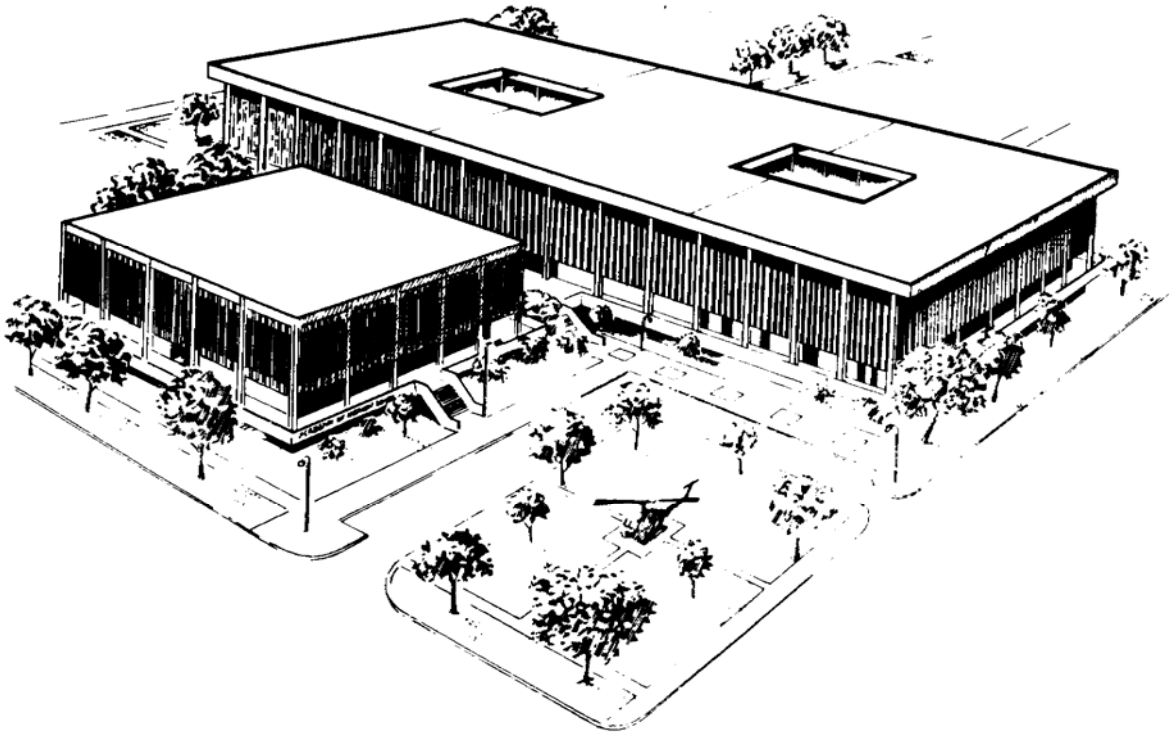

# INTRAVENOUS INFUSIONS AND RELATED TASKS

## SUBCOURSE MD0553 EDITION 200

## DEVELOPMENT

This subcourse is approved for resident and correspondence course instruction. It reflects the current thought of the Academy of Health Sciences and conforms to printed Department of the Army doctrine as closely as currently possible. Development and progress render such doctrine continuously subject to change.

## ADMINISTRATION

Students who desire credit hours for this correspondence subcourse must enroll in the subcourse. Application for enrollment should be made at the Internet website: http://www.atrrs.army.mil. You can access the course catalog in the upper right corner. Enter School Code 555 for medical correspondence courses. Copy down the course number and title. To apply for enrollment, return to the main ATRRS screen and scroll down the right side for ATRRS Channels. Click on SELF DEVELOPMENT to open the application; then follow the on-screen instructions.

For comments or questions regarding enrollment, student records, or examination shipments, contact the Nonresident Instruction Branch at DSN 471-5877, commercial (210) 221-5877, toll-free 1-800-344-2380; fax: 210-221-4012 or DSN 471-4012, e-mail accp@amedd.army.mil, or write to:

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## CLARIFICATION OF TERMINOLOGY

When used in this publication, words such as "he," "him," "his," and "men" 'are intended to include both the masculine and feminine genders, unless specifically stated otherwise or when obvious in context.

## USE OF PROPRIETARY NAMES

The initial letters of the names of some products may be capitalized in this subcourse. Such names are proprietary names, that is, brand names or trademarks. Proprietary names have been used in this subcourse only to make it a more effective learning aid. The use of any name, proprietary or otherwise, should not be interpreted as endorsement, deprecation, or criticism of a product; nor should such use be considered to interpret the validity of proprietary rights in a name, whether it is registered or not.

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**CORRESPONDENCE COURSE OF**
**THE U.S. ARMY MEDICAL DEPARTMENT CENTER AND SCHOOL**

**SUBCOURSE MD0553**

# INTRAVENOUS INFUSIONS AND RELATED TASKS

## INTRODUCTION

The medical soldier caring for patients provides a valuable service to his comrades. He must meet high standards with integrity, dignity, calm thinking, and careful study. The purpose of this subcourse is to provide you with a working knowledge of the procedures discussed herein; however, you must receive guidance and hands-on supervision to become proficient at the procedures described.

**Subcourse Components**:

The subcourse instructional material consists of three lessons and an appendix as follows:

Lesson 1, Initiate an Intravenous Infusion and Manage a Patient with an Intravenous Infusion.
Lesson 2, Obtain a Blood Specimen.
Lesson 3, Initiate Treatment for Anaphylactic Shock.
Appendix, Universal Body Substance Precautions.

Here are some suggestions that may be helpful to you in completing this subcourse:

--Read and study each lesson carefully.

--Complete the subcourse lesson by lesson. After completing each lesson, work the exercises at the end of the lesson, marking your answers in this booklet.

--After completing each set of lesson exercises, compare your answers with those on the solution sheet that follows the exercises. If you have answered an exercise incorrectly, check the reference cited after the answer on the solution sheet to determine why your response was not the correct one.

**Credit Awarded**:

Upon successful completion of the examination for this subcourse, you will be awarded 5 credit hours.

To receive credit hours, you must be officially enrolled and complete an examination furnished by the Nonresident Instruction Section at Fort Sam Houston, Texas.

You can enroll by going to the web site http://atrrs.army.mil and enrolling under "Self Development" (School Code 555).

A listing of correspondence courses and subcourses available through the Nonresident Instruction Section is found in Chapter 4 of DA Pamphlet 350-59, Army Correspondence Course Program Catalog. The DA PAM is available at the following website: http://www.usapa.army.mil/pdffiles/p350-59.pdf.

## LESSON ASSIGNMENT

| | |
|---|---|
| **LESSON 1** | Initiate an Intravenous Infusion and Manage a Patient With an Intravenous Infusion. |
| **TEXT ASSIGNMENT** | Paragraphs 1-1 through 1-8. |
| **LESSON OBJECTIVES** | After completing this lesson, you should be able to: |

1-1. Identify the purpose of initiating an intravenous infusion.

1-2. Identify fluids used in intravenous infusions.

1-3 Identify when an intravenous infusion should be initiated.

1-4. Identify the procedures for initiating an intravenous infusion.

1-5. Identify the procedures for performing a F.A.S.T.1 TM (First Access For Shock and Trauma) procedure.

1-6. Identify complications from intravenous infusions and how they can be prevented and treated.

**SUGGESTION** After completing the assignment, complete the exercises of this lesson. These exercises will help you achieve the lesson objectives.

# LESSON 1

## INITIATE AN INTRAVENOUS INFUSION AND MANAGE A PATIENT WITH AN INTRAVENOUS INFUSION

## INITIATE AN INTRAVENOUS INFUSION

### 1-1. GENERAL

As a soldier medic, you will be providing medical care in a variety of situations. The method you will use to control hemorrhage in a casualty will likely depend on the tactical situation. Once hemorrhage has been controlled, the casualty may need fluid resuscitation to combat hypovolemic (low volume of fluid in the circulatory system) shock or to help prevent hypovolemic shock. This lesson will concentrate on the battlefield methods. It is imperative that all bleeding has been stopped before any attempt to start an intravenous infusion is performed.

NOTE: In this subcourse, the abbreviation "IV" can mean either "intravenous" or "intravenous infusion."

### 1-2. FLUID RESUSCITATION

a. The goal of managing hypovolemic shock is to increase tissue perfusion and oxygenation status. Treatment is directed at providing adequate oxygenation and ventilation. STOPPING THE BLEEDING must be the priority before any fluid resuscitation is attempted.

(1) Circulation and hemorrhage control priorities include controlling severe hemorrhage immediately, obtaining intravenous access, and assessing tissue perfusion.

(2) If the casualty has a significant injury, initiate a single 18-gauge catheter in a peripheral vein and place a saline lock on it. If no significant injury exists, parenteral fluids are not required; however, the casualty should be encouraged to drink oral fluids as he will likely be somewhat dehydrated.

NOTE: Sometimes, a casualty who has had been wounded may not need intravenous fluids at the time of initial treatment, but may need them at a later time. It is usually a good idea to prepare for administering IV fluids while the vein is still strong and easy to find. This is done by inserting the needle/catheter into the vein, removing the needle, and inserting a saline lock adapter into the catheter hub. The adapter seals off the catheter until you are ready to administer fluids intravenously.

b. If you are unable to initiate peripheral IV access, consider initiating a sternal intraosseous (IO) line. Although there are many other IO methods available, the sternal kit known as F.A.S.T.1™ has been chosen.

NOTE: Intraosseous means "within the bone."

(1) The sternum is protected by body armor and the cortex of the bone is much thinner than the tibia. Many injuries are to the lower extremities.

(2) If the patient no longer has a sternum, he will not likely benefit from an IO infusion.

(3) Indications for the need of an IO infusion include:

(a) Inadequate peripheral access.

(b) Need for rapid access for medications, fluid, or blood.

(c) Failed attempts at peripheral or central venous access.

## 1-3. SOLUTIONS USED IN INTRAVENOUS THERAPY

a. **Resuscitation Solutions**. Different types of IV fluids can be used for different medical conditions. These solutions are generally categorized as colloid or crystalloid.

(1) Colloids. Colloids contain protein, sugar, or other high molecular weight molecules and are used to expand intravascular volume. Examples include:

(a) Whole blood (most common) (see figure 1-1).

(b) Packed red blood cells (PRBC).

(c) Fresh frozen plasma (FFP).

(d) Plasma protein fraction (PPF).

(e) Hypertonic saline and dextran (HSD).

(f) Hextend® (a 6 percent hetastarch solution in a balanced electrolyte solution).

Figure 1-1. Blood products. (Left--whole blood. Right--plasma.)

(2) Crystalloids. Crystalloids are solutions that do not contain protein or other large molecules. Sodium (Na+) is the primary osmotic agent. These fluids do not remain in the vascular spaces very long. Examples include:

(a) Normal saline (NS) (0.9 percent sodium chloride [NaCl] solution).

(b) Ringer's lactate (RL).

b. **Fluid Distribution**. Fluids are distributed throughout the body in several different spaces and the body continually works to maintain equilibrium within these spaces. The average adult male has approximately 42 liters of fluid within the body. The fluid is distributed as follows:

(1) Intracellular space. Fluids within the cells amount to about two-thirds of the body's weight.

(2) Extracellular space. Fluids outside the cells amount to about one-third of the body's weight.

(a) Interstitial space. About eighty percent of the extracellular fluid is in spaces between tissues.

(b) Vascular space. About twenty percent of the extracellular fluid is in the circulatory system.

c. **Fluids**.

(1) One thousand milliliters (ml) of Ringer's lactate (about 2.4 pounds) will expand the intravascular volume by 200 to 250 ml within one hour. Sodium is the primary osmotic agent in RL and will not remain in the vascular system very long. It diffuses out into the interstitial space and eventually into the intracellular space. This fluid is better for treating dehydration.

(2) Five hundred milliliters of Hextend® (about 1.3 pounds) will expand the intravascular volume by 800 ml within one hour and will sustain this expansion for up to eight hours. Hextend® contains large sugar molecules that remain in the vascular system for a much longer time than RL. Hextend® also pulls additional fluid from the interstitial spaces and holds this fluid in the vascular space for a longer period of time. Hextend® is better for treating hypovolemia secondary to blood loss than RL.

d. **Resuscitation Indicators**.

(1) The blood pressure is commonly used to determine who needs fluid resuscitation. However, stethoscopes and blood pressure cuffs are rarely available or useful to the front line soldier medic in the typically noisy and chaotic battlefield environment.

(2) A palpable radial pulse and normal mentation (mental ability) are adequate and tactically relevant resuscitation endpoints to either start or stop fluid resuscitation. Both can be adequately assessed in noisy and chaotic situations without mechanical devices.

(3) Casualties should only be resuscitated to a systolic blood pressure of 80 millimeters of mercury (mmHg). This blood pressure is adequate to perfuse all vital organs and, yet, not high enough to cause a possible re-bleed of a vessel that has already clotted. Re-bleeding can occur with a systolic blood pressure as low as approximately 93 mmHg.

(4) The systolic blood pressure may be approximated by palpating pulses in specific areas:

(a) A palpable carotid pulse indicates a systolic blood pressure of at least 60 mmHg.

(b) A palpable femoral pulse indicates a systolic blood pressure of at least 70 mmHg.

(c) A palpable radial pulse indicates a systolic blood pressure of at least 80 mmHg.

e. **Fluid Resuscitation Algorithm**.

(1) Superficial wounds. More than 50 percent of injured soldiers have only superficial wounds. These soldiers require no immediate intravenous fluids, but oral fluids should be encouraged.

(2) Significant wound. Any significant extremity (arm or leg) or truncal (neck, chest, abdomen, or pelvis) wound, with or without obvious blood loss or hypotension, may require an IV (see figure 1-2). If the casualty is coherent and has a palpable radial pulse, blood loss has likely stopped. Initiate a saline lock, hold fluids, and re-evaluate as frequently as the situation will allow. If the casualty is not nauseated, have him sip small quantities of water to assist hydration.

Figure 1-2. Significant wound to the leg.

(3) Significant blood loss. For significant blood loss from any wound where the soldier has no palpable radial pulse or is not coherent, perform the following.

(a) STOP THE BLEEDING by all means at your disposal (tourniquet, direct pressure, pressure dressing, hemostatic dressing, hemostatic powder, or other means). Many of these hypotensive casualties suffer from truncal injuries which are unaffected by these resuscitative measures (casualty may have lost as much as 1,500 ml of blood [about 30 percent of their circulating volume]).

(b) Once hemorrhage has been controlled to the extent possible, initiate IV access and administer 500 ml of Hextend®. If the mental status improves and the radial pulse returns, maintain a saline lock and hold fluids. If there is no response observed within 30 minutes, administer an additional 500 ml of Hextend® and monitor the casualty's vital signs. If no response is seen after 1,000 ml of Hextend® has been administered, you may need to consider rationing your resources and turning your attention to more salvageable casualties.

NOTE: Remember, a liter of Hextend® is equivalent to more than six liters of Ringer's lactate.

(c) If a casualty's pulse does not return after one liter of Hextend®, the casualty is probably continuing to bleed internally. This casualty needs a rapid evacuation to a surgical facility for hemorrhage control. If you continue to give large amounts of fluids to a casualty who continues to bleed, you can speed the loss of the remaining red blood cells. This dilutes the blood's natural ability to clot and raises the casualty's blood pressure. Doing so will actually cause the wound to bleed faster. Consequently, you only want to raise the blood pressure high enough to perfuse all the vital organs, but not enough to promote more rapid hemorrhage.

## 1-4. HYPOTHERMIA PREVENTION

a. Care must be taken to protect the casualty from hypothermia (low body temperature). Casualties who are hypovolemic become hypothermic quite rapidly if traveling in a casualty evacuation (CASEVAC) or medical evacuation (MEDEVAC) asset and are not protected from the wind, regardless of the ambient temperature.

NOTE: Figure 1-3 depicts why casualties can rapidly become hypothermic. When transporting casualties by rotary-wing aircraft, they must be protected from the wind coming in the cargo doors when flying with the doors open.

Figure 1-3. Casualties exposed to possible hypothermia.

b. Casualties who become hypothermic develop the vicious triad:

(1) Hypothermia.

(2) Acidosis (from decreased profusion secondary to shock and hypothermia).

(3) Coagulopathy (hypothermic patients lose their ability to clot).

c. When these three elements are present, the casualty's blood will not clot. Most of these casualties need surgery to repair their wounds. However, if their blood will not clot, they must undergo a transfusion to augment their blood with fresh blood, clotting factors, or platelets. This can delay the life-saving surgery they need.

d. Prevention is the best method.

(1) In cold environments, ensure IV fluids are warmed prior to administration. The use of MRE heaters on either side of an IV bag or a blood box with a hole cut in it and a light bulb to provide heat will help warm IV fluids (figure 1-4).

Figure 1-4. Field expedient warming.

(2) Prior to evacuation, casualties must be wrapped in a blanket to prevent heat loss during transport (even if the temperature is 120 degrees Fahrenheit).

(3) Protect the casualty by wrapping them in a protective wrap (Blizzard Rescue Wrap®) as shown in figure 1-5.

NOTE: Figure 1-5 shows the Blizzard Wrap which contains a cellular technology that traps air in these cells and allows the body heat to warm them. It also shows another new technology, a blanket that warms itself when exposed to air. The Ready Heat Blanket® warms to between 110 and 118 degrees Fahrenheit and, in conjunction with the Blizzard Wrap, provides excellent protection from hypothermia. Figure 1-6 shows a new product developed by North American Rescue Products that contains a Blizzard Wrap, Ready Heat Blanket and a reflective cap to prevent heat loss during transport.

Figure 1-5. Casualty in protective wrap.


Figure 1-6. Package containing Blizzard Wrap, Ready Heat Blanket, and reflective cap.

e. All of these tasks and products help to prevent hypothermia from developing in casualties that have become hypovolemic, regardless of ambient temperature. Prevention of hypothermia is extremely important even if the ambient temperature is above 100 degrees Fahrenheit.

## 1-5. PREPARING TO INITIATE AN INTRAVENOUS INFUSION

a. Take body substance isolation (BSI) precautions (see Appendix).

b. Assemble and arrange the necessary equipment (figure 1-7).


Figure 1-7. Required IV equipment.

c. Explain the procedure to the casualty and ask about known allergies (if the casualty is conscious).

d. Prepare and inspect the IV equipment.

(1) Intravenous solution (check expiration date, check solution clarity, check for presence of punctures).

(2) Catheter/needle unit (check for sterility and presence of barbs). Do not touch any part of the catheter that enters the skin/vein.

e. Prepare the intravenous equipment.

(1) Use a macro drip for all hypovolemic resuscitation (10 to 15 drops per milliliter).

(2) Stretch out the IV tubing and close off the flow-regulator clamp.

(3) Remove the protective covering from the port of the IV container and the protective covering from the spike of the administration set (figure 1-8).

Figure 1-8. Preparing to “spike” IV bag

(4) Insert the administration tubing spike into the IV solution port with a quick twist.

(5) Hang the IV solution container at least two feet above the level of the casualty's heart and squeeze the drip chamber until it is half full.

(6) Remove the protective cap from the tubing adapter and open the flow-regulator clamp (figure 1-9), allowing the fluid to flush all of the air from the tubing.

(7) Re-close the flow-regulator clamp and recap the tubing adapter.

NOTE: Do not lose sight of the distal end of the tubing once uncapped.

(8) Cut several strips of tape and hangs them where they are readily accessible or prepare your Tegaderm™ dressing.

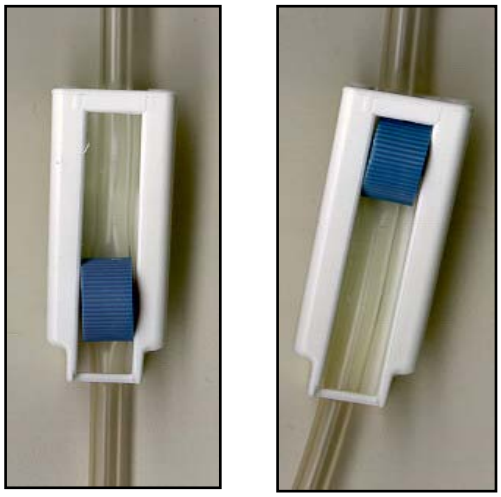

Figure 1-9. Closed regulator clamp; open regulator clamp

## 1-6. PROCEDURE FOR INITIATING AN INTRAVENOUS INFUSION

a. Select a suitable vein for venipuncture.

b. Prepare the venipuncture site.

(1) Apply a constricting band two inches above the venipuncture site. The constricting band should be tight enough to occlude venous flow, but not so tight that distal pulses are lost.

(2) Select and palpate a prominent vein.

(3) Cleanse the skin with an alcohol swab using a spiral motion starting with the entry site and extending outward about two inches. Allow the site to dry.

c. Don gloves.

d. Perform the venipuncture.

(1) Using your nondominant hand, pull all local skin taut to stabilize the vein.

(2) With your dominant hand, position the distal bevel of the needle up and insert the cannula into the vein at approximately a 30 degree angle (figure 1-10).

Figure 1-10. Performing venipuncture.

(3) Continue inserting the needle until blood is observed in the flash chamber of the catheter.

(4) Decrease the angle to 15 to 20 degrees and carefully advance the cannula approximately 0.5 centimeter farther (figure 1-11).

Figure 1-11. Conducting venipuncture.

(5) While holding the needle stationary, advance the catheter into the vein with a twisting motion. Insert the catheter all the way to the hub.

(6) Place a finger over the vein at the catheter tip and put pressure on the vein to prevent blood from flowing out the catheter (figure 1-12).

(7) Remove the needle while maintaining firm catheter control.

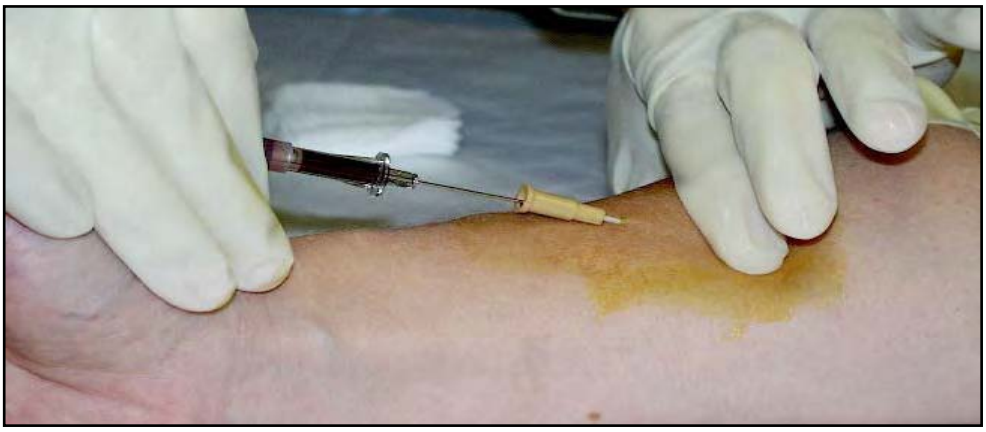

Figure 1-12. Using pressure to limit bleeding.

e. Remove the constricting band.

f. Obtain venous blood samples as required.

g. Attach the administration tubing to the cannula hub (figure 1-13) while maintaining stabilization of the hub with the non-dominant hand.

Figure 1-13. Connecting the IV tubing.

h. Open the flow-regulator clamp and observe for drips in the drip chamber. Allow the fluid to run freely for several seconds.

NOTE: You may drop the solution bag lower than the casualty's heart to observe for a backflash of blood to verify catheter placement.

i. Adjust to the desired flow rate.

j. Clean the area of blood, if necessary, and secure the hub of catheter with tape, leaving the hub and tubing connection visible. Make a small loop in the IV tubing and place a second piece of tape over the first to secure the loop (figure 1-14).

k. Apply a 2x2, a 4x4, or a transparent dressing Tegaderm™) over the venipuncture site (figure 1-14).

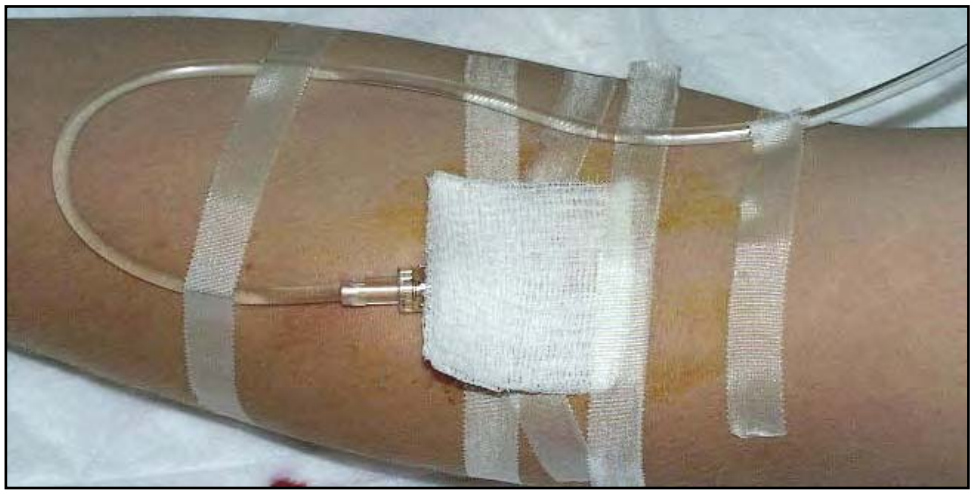

Figure 1-14. Dressed and taped IV (when time permits).

l. Label a piece of tape with date and time the IV was initiated, the catheter size, and your initials. Secure the tape over the dressing.

m. Monitor the casualty and continues to observe the venipuncture site for signs of infiltration. Discontinue the infusion if signs of infiltration are observed.

n. Remove your gloves and disposes of them appropriately.

o. Document the procedure on the appropriate medical form.

## 1-7. THE F.A.S.T.1 TM PROCEDURE

a. Take body substance isolation (BSI) precautions.

b. Assemble and arrange the necessary equipment (figure 1-15).

Figure 1-15. F.A.S.T.1 TM equipment.

c. Explain the procedure to the casualty and ask about known allergies (if the casualty is conscious).

d. Prepare and inspect equipment.

e. Don gloves.

f. Locate the suprasternal notch.

g. Cleanse the site with antimicrobial solution.

h. Emplace the target patch using your index finger to ensure proper alignment with the casualty's sternal notch (figure 1-16).

Figure 1-16. Palpating the sternal notch

i. Recheck the location of the target patch.

j. With the target patch securely attached to the casualty's skin, place the introducer (bone needle cluster) into the target zone of the target patch. Maintain the perpendicular aspect of the introducer to the manubrium (upper portion of the sternum that articulates with the clavicles and first two pairs of ribs) (see figure 1-17).

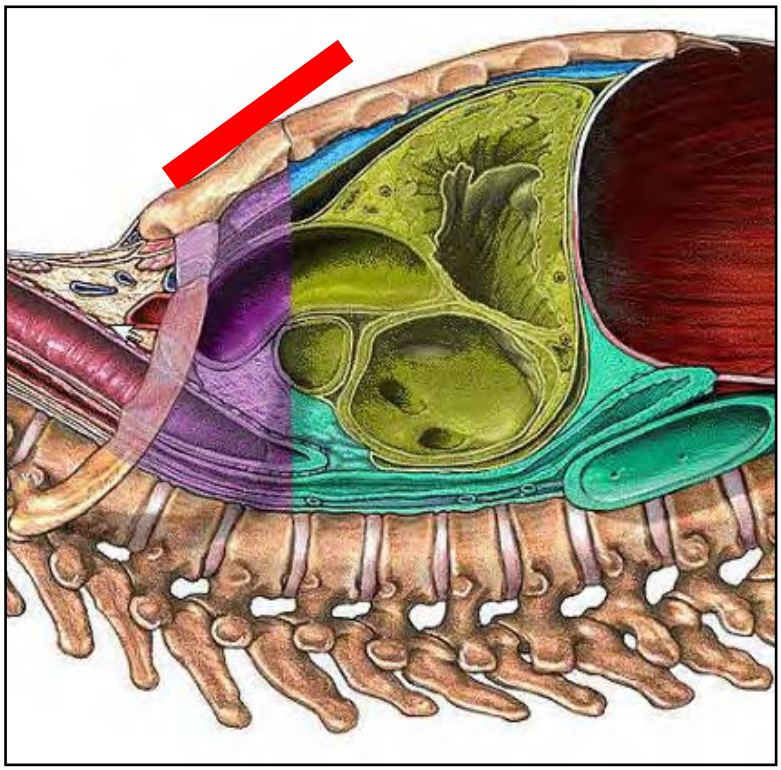

Figure 1-17. Locating perpendicular access.

k. Apply firm, increasing pressure along the axis of the introducer until a distinct release is felt and/or heard.

Figure 1-18. Proper alignment.

**WARNING**

Extreme force, twisting, or jabbing of the introducer must be avoided.

l. Gently remove the introducer by pulling straight back.

m. Flush the infusion tube with five milliliters of sterile saline.

n. Connect the infusion tube to the right angle connector on the target patch (figure 1-19).

Figure 1-19. Connecting the infusion tube.

o. Open the flow-regulator clamp and allow the fluid to run freely for several seconds; then adjust to the desired flow rate.

p. Attach the remover device to the casualty.

q. Remove your gloves and dispose of them appropriately.

r. Document the procedure on the appropriate medical form.

## 1-8. CHECK FOR COMPLICATIONS OF INTRAVENOUS THERAPY

a. **Infiltration**. Infiltration is an accumulation of fluids in the tissue surrounding the venipuncture site.

(1) Cause of the infiltration. Infiltration is the leaking of IV fluid into the surrounding tissue. Infiltration is usually caused by the catheter becoming dislodged or by the needle penetrating through the vein.

(2) Signs and symptoms of infiltration.

(a) Solution is flowing at a sluggish rate or not at all.

(b) Infusion site is cool and pale.

(c) Infusion site or extremity is swollen.

(d) Patient complains of pain, tenderness, burning, or irritation at the infusion site.

(e) Fluid leaking around infusion site.

(f) Absence of blood backflow when IV bag/bottle is lowered below IV site.

(3) Intervention measures for infiltration.

(a) If flow is sluggish, pull back on the catheter a bit and rotate it or elevate and depress the catheter a bit. If elevating the catheter helps, a small piece of gauze may be placed under the needle to hold it in position. The bevel of the catheter may be resting against the side of the vein and this will help to free it.

(b) If this does not correct the flow or if infiltration has occurred, stop the infusion and notify your supervisor. You may be directed to remove the IV and restart it in an alternate location.

(c) Apply a cold pack to site if infiltration has occurred within the last 30 minutes. A cold pack will help reduce the pain and swelling.

(d) Apply warm, wet compresses to promote absorption if infiltration has occurred more than 30 minutes earlier. A warm, wet compress stimulates circulation, promoting the absorption of the infiltrated solutions into surrounding tissues.

(e) Document your observations and actions for future reference.

(4) Preventive measures against infiltration.

(a) Apply a splint for stability and to prevent dislodging the IV catheter.

(b) Tape the catheter securely.

b. **Phlebitis**. Phlebitis is an inflammation of the wall of the vein.

(1) Associated problems. Problems associated with phlebitis include thrombophlebitis and thrombosis.

(a) Thrombophlebitis is an inflammation of the vein accompanied by the formation of a clot.

(b) Thrombosis is a formation of a clot in a blood vessel without accompanying inflammation.

(2) Causes. Phlebitis can be caused by the following:

(a) Injury to the vein during venipuncture or from later movement.

(b) Irritation to vein caused by:

1 Long-term therapy.

2 Infusion of irritating or incompatible additive.

3 Using a vein that is too small to handle the amount or type of IV solution being used.

4 Sluggish flow rate that allows a clot to form at end of the catheter.

5 Infection.

(3) Signs and symptoms. Signs and symptoms of phlebitis include the following.

(a) Swelling and redness around the venipuncture site.

(b) Tenderness of tissue around the venipuncture site.

(c) A yellowish, foul-smelling discharge from venipuncture site.

(d) A sluggish flow rate.

(4) Intervention measures against phlebitis.

(a) When phlebitis is noted, report your observations to the supervisor. Trained personnel will then remove the IV and restart it in an alternate location and initiate proper care for the inflammation.

(b) Document your observations and actions.

(5) Prevention measures against phlebitis.

(a) Keep the infusion flowing at the prescribed rate.

(b) Stabilize the catheter with correct taping and a splint.

(c) Select a large vein when irritating drugs and fluids are given.

(d) Maintain strict aseptic techniques.

(e) Change catheters and tubing every 48 to 72 hours or in accordance with (IAW) local policy.

(f) Change bags, bottles, and dressings every 24 hours or IAW local policy.

c. **Circulatory Overload**. Circulatory overload is a state of increased blood volume.

(1) Causes of circulatory overload.

(a) Fluid is infused too fast.

(b) Too much fluid is infused.

**CAUTION:** Circulatory overload can occur in any patient who receives an excess of fluid. It is not confined to elderly, pediatric, or debilitated patients.

(2) Signs and symptoms of circulatory overload.

(a) Rise in blood pressure.

(b) Dilation of veins with neck veins sometimes visibly engorged.

(c) Rapid pulse, rapid breathing, shortness of breath, and rales.

NOTE: Rales is an abnormal crackling or rattling sound heard upon listening to sound within the chest.

(d) Wide variance between fluid input and urine output.

(3) Intervention measures for circulatory overload.

(a) Slow the infusion to keep open (TKO) rate.

(b) Raise the head of the patient's bed to assist with respiratory effort.

(c) Immediately notify your supervisor.

(4) Preventive measures against circulatory overload.

(a) Monitor the urine output. An Intake and Output (I&O) Worksheet (DD Form 3630) is required for all IV patients. A record of liquid input and output (including IV therapy) is maintained on this worksheet.

(b) Check the flow rate at frequent intervals to ensure the desired rate is being maintained.

d. **Air Embolism**. Air embolism is an obstruction of a blood vessel by air carried via the bloodstream.

(1) Causes of air embolism.

(a) Allowing the solution to run dry.

(b) Air bubbles in the IV tubing.

(c) Disconnected tubing.

(2) Signs and symptoms of air embolism.

(a) Abrupt drop in blood pressure.

(b) Chest pain.

(c) Weak, rapid pulse.

(d) Cyanosis (a blue-gray discoloration of the skin due to inadequate perfusion of oxygen).

(e) Loss of consciousness.

(3) Intervention measures for air embolism.

(a) Notify supervisor immediately.

(b) Administer oxygen, if allowed.

(c) Turn the patient on his left side and lower the head of the bed so the air bubbles can float to and remain in the right atrium. The risk of serious effects of an air embolism increases if the embolism passes to the left side of the heart.

(4) Preventive measures against air embolism.

(a) Clear all air from the tubing before attaching it to the patient.

(b) Monitor solutions closely and change the before they are empty.

(c) Check to see that all connections are secure.

e. **Infection**. Infection is the state or condition in which the body or a part of it is invaded by a pathogenic agent (microorganism or virus) which, under favorable conditions, multiplies and produces effects that are injurious. Localized infection is usually accompanied by inflammation, but inflammation may occur without infection.

(1) Causes of infections.

(a) Poor aseptic techniques.

1 Unsterile venipuncture techniques.

2 Contamination of equipment during manufacture.

3 Failure to keep the site clean or to change IV equipment regularly.

(b) Transmission from another infected part of the body to the infusion site.

(c) Introduction of contaminants while irrigating or manipulating an occluded, leaking, or infiltrated catheter.

(2) Signs and symptoms of infection.

(a) Swelling, redness, and soreness around the infusion site.

(b) A yellowish, foul-smelling discharge from the venipuncture site.

(c) Rise in the patient's temperature and pulse rate.

(3) Intervention measures for suspected infection.

(a) Report observations to the supervisor.

(b) Save the IV equipment for possible laboratory analysis IAW local policy.

(c) Document all of your observations and actions.

(4) Preventive measures against infection.

(a) Use rigid aseptic techniques when initiating and maintaining an IV.

(b) Anchor the catheter firmly with tape.

(c) Check the vein at least once each shift for evidence of tenderness and other signs of inflammation.

f. **Disturbance of infusion**. This is any disturbance or failure of the infusion apparatus to deliver proper prescribed solution infusion rate.

(1) Signs of disturbance in the infusion.

(a) Flow rate slowing down or speeding up.

(b) Solution flow stopping.

(2) Intervention measures for a disturbance of infusion.

(a) Frequent observations of flow rate and equipment.

(b) If flow rate disturbance is noted, attempt to locate the cause and perform follow-up action. Some causes and follow-up actions are given below.

1 Solution container is empty. Stop flow and notify supervisor.

2 Drip chamber is less than half full. Squeeze the drip chamber until it is half full.

3 Control clamp is closed. Readjust clamp to restore prescribed drip rate and notify the supervisor.

4 Defect in equipment. Report the defect immediately to the supervisor.

5 Tubing is kinked or caught under patient. Untangle the line or reposition patient so that the solution flows through the tube at the prescribed rate. Monitor for correct flow and rate.

6 Catheter is bent or compressed in the vein. Reposition the extremity and splint area if necessary.

**Continue with Exercises**

**EXERCISES, LESSON 1**

**INSTRUCTIONS.** Answer the following exercises by selecting the response that best answers the question or best completes the incomplete sentence.

After you have completed all of these items, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercises answered incorrectly, reread the lesson material referenced after the solution.

1. Administration of an IV is indicated when a casualty is on the verge of shock or already in shock.

   a. The statement is true.

   b. The statement is false.

2. Which of the following is/are used in IV therapy?

   a. Hypertonic saline and dextran.

   b. Normal saline.

   c. Ringer's lactate.

   d. Hextend®.

   e. All of the above.

3. When administering and IV, you should continue to administer fluids until the patient has a palpable _____ pulse.

   a. Carotid.

   b. Femoral.

   c. Radial.

4. To prepare an infusion site, you:

    a. Cleanse the skin with an alcohol swab.

    b. Apply a constricting band two inches above the site selected.

    c. Palpate the vein selected.

    d. All of the above.

5. When initiating an IV, you should insert the needle into the vein at approximately a _____ degree angle until blood is observed in the flash chamber of the catheter.

    a. 10.

    b. 20.

    c. 30.

    d. 45.

    e. 90.

6. How often should the IV be checked for signs of inflammation?

    a. At least every shift.

    b. At least every 24 hours.

    c. At least every 48 hours.

    d. At least every 72 hours.

7. The temperature is 95 degrees Fahrenheit and the weather is sunny. The casualty is to be evacuated by air ambulance (helicopter). Do you still need to take precautions against hypothermia?

    a. Yes, hypothermia can still occur.

    b. No, the casualty may overheat.

8. Infiltration is:

   a. Injury to vein during venipuncture or from later needle movement.

   b. A state of increased blood volume.

   c. An accumulation of fluids in the tissue surrounding the venipuncture site.

   d. An obstruction of a blood vessel by air.

**Check Your Answers on Next Page**

## SOLUTIONS TO EXERCISES, LESSON 1

1. a (para 1-1)
2. e (paras 1-3a(1), (2))
3. c (paras 1-3d(3), (4))
4. d (paras 1-6b(1), (2), (3))
5. c (paras 1-6d(2), (3))
6. a (para 1-8n(4)(c))
7. a (para 1-4a)
8. c (para 1-8a)

**End of Lesson 1**

## LESSON ASSIGNMENT

| | |
|---|---|
| **LESSON 2** | Obtain a Blood Specimen. |
| **TEXT ASSIGNMENT** | Paragraphs 2-1 through 2-4. |
| **LESSON OBJECTIVES** | 2-1. Identify the advantages and disadvantages of the Vacutainer® system of obtaining a blood specimen.<br><br>2-2. Identify the procedures of obtaining a blood specimen with a Vacutainer®.<br><br>2-3. Identify the procedures of obtaining a blood specimen with a syringe.<br><br>2-4. Determine the best site to obtain a blood specimen.<br><br>2-5. Identify the procedures for submitting a blood specimen to the laboratory. |
| **SUGGESTION** | After completing the assignment, complete the exercises of this lesson. These exercises will help you achieve the lesson objectives. |

## LESSON 2

## OBTAIN A BLOOD SPECIMEN

### 2-1. GENERAL

Venipuncture is the act of puncturing a vein with a needle, usually for the purpose of withdrawing a specimen of blood. This may be accomplished by using either a needle and syringe or by using the Vacutainer® system.

a. The Vacutainer® is a blood-drawing system using a double-ended needle, a plastic holder, and vacuum tubes. The tubes may be empty or they may contain a measured amount of anticoagulant or other material.

b. Since most blood specimens do not need to be sterile, the stopper on the glass tube is not sterile. However, the needle that is inserted into the vein must be sterile to avoid the spread of infection. The Vacutainer® is not used when a sterile blood specimen is needed such as that needed for a blood culture.

(1) Vacutainer® system advantages.

(a) Provides a rapid way to collect several blood specimens from the same patient.

(b) Enables filling of several tubes to obtain multiple samples with only one needle stick.

(2) Vacutainer® system disadvantages.

(a) Vacuum tube makes it impossible to draw back on the plunger to determine if the needle is in the vein. If the vacuum is broken in the tube, another tube must be used.

(b) The amount of suction created by the Vacutainer® can collapse a small or fragile vein.

### 2-2. TERMS

The following are terms used in this section with comments that may help you understand the procedures for obtaining a blood specimen.

a. **Palpate.** To feel or to examine with the fingertips.

b. **Antecubital Fossa.** Hollow or depressed area in the joint between arm and forearm.

c. **Median Cubital Vein.** First choice for venipuncture (in antecubital fossa).

d. **Cephalic Vein.** Second choice for venipuncture (lateral portion of forearm).

e. **Basilic Vein.** Least desirable for venipuncture (inside of forearm).

f. **Anticoagulant.** A substance which prevents or reduces clotting of the blood. Patients receiving anticoagulents tend to bleed longer than others.

g. **Hematoma.** A collection of blood under the skin. These are the most common complications resulting from venipuncture attempts.

## 2-3. PROCEDURE FOR OBTAINING A BLOOD SPECIMEN

a. **Verify Request to Obtain Blood Specimen.** The following may be used to verify an order to obtain a blood specimen.

(1) Therapeutic Documentation Care Plan (Non-medication), DA Form 4677.

(2) Provider's orders.

(3) Supervisor's directive.

b. **Gather Equipment.** Collect the following equipment (see figure 2-1).

(1) Blood specimen tube. Obtain the proper blood specimen tube based upon your supervisor's directive, ward standing operating procedures (SOP), or laboratory SOP. The type of tube needed will depend on the specific test to be performed. Some tests require a blood specimen that has not been allowed to clot. In this case, a blood specimen tube containing a powdered or liquid anticoagulant is used. If coagulated (clotted) blood is acceptable, other types of tubes are used. Many laboratories use a color code for tubes or bottles required for different tests.

(2) Vacutainer®. The Vacutainer® consists of a plastic holder into which a sterile disposable double-ended needle is inserted. A vacuum tube with a rubber stopper slips into the barrel of the holder. The needle should not penetrate the stopper until the vein end of the double-ended needle has been inserted into the vein. After the needle enters the vein, the tube is pushed the remaining distance into the barrel. The vacuum in the tube will withdraw blood from the vein.

(3) Constricting band or tourniquet. Constricting bands commonly used are made of soft, flat or round latex rubber. Commercial types of constricting bands have a Velcro fastening device.

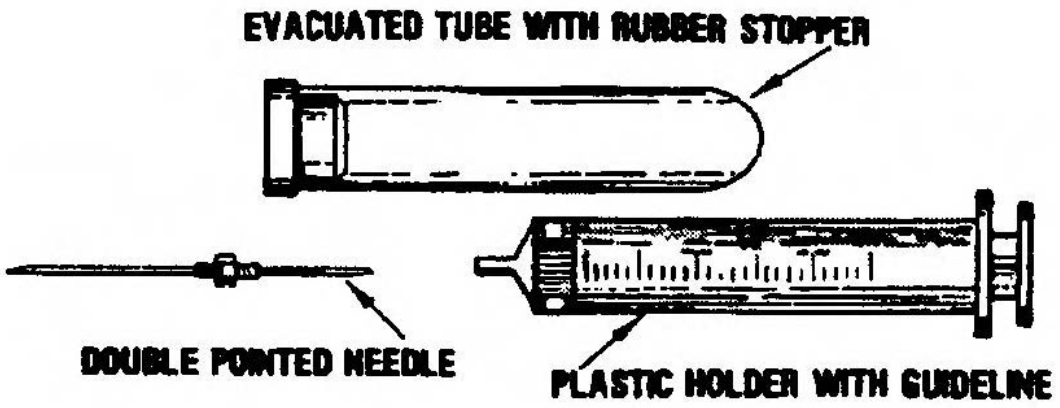


Figure 2-1. Vacutainer® system.

(4) Vacutainer® needle. There are two types of needles available for use with the Vacutainer®. One is designed for drawing single specimens; the other is used for drawing multiple blood samples. A rubber sheath covers the shaft of the multiple sample needle. As the needle is removed from the rubber stoppered tube, the sheath slips back to cover and seals the end of the needle, thus preventing blood from dripping into the holder.

(5) Antiseptic sponge or pledget such as Betadine or alcohol. These are used to clean the skin before the venipuncture is done. Betadine has been demonstrated to be more effective in reducing the number of skin pathogens than alcohol.

(6) Other items. Other items include a protective pad, sterile 2-inch by 2-inch gauze sponge(s), a self-adhesive bandage, a rubber band, and labels to identify the blood specimen tube(s).

c. **Label Specimen Tube(s).** Stamp the label with the patient's addressograph plate or clearly write the patient's identifying information on the label and apply it to the specimen tube. The following information should be printed on the label.

(1) Name of patient.

(2) Hospitalization number.

(3) Social security number.

(4) Date and time specimen was drawn.

(5) Other data as required by local SOP.

d. **Perform Handwash.** Perform a patient care handwash.

e. **Assemble Vacutainer® and Needle.**

(1) Remove Vacutainer® needle from package as you did when you were assembling a needle and syringe.

(2) Insert the short end of needle into the threaded end of the Vacutainer®. Screw it tightly using a clockwise motion.

f. **Explain Procedure.** Explain the procedure to the patient.

g. **Expose Area for Venipuncture.** Expose the selected area. Usually, the inner elbow is used to obtain a specimen, although the forearm, wrist, or hand can be used. See figure 2-2 for the location of some of the veins.

(1) Assist the patient to expose elbow area of arm by rolling the sleeve to above the elbow (if applicable). In some instances, it may be necessary to have the patient remove his garment.

(2) Fully extend the patient's arm with the palm up.

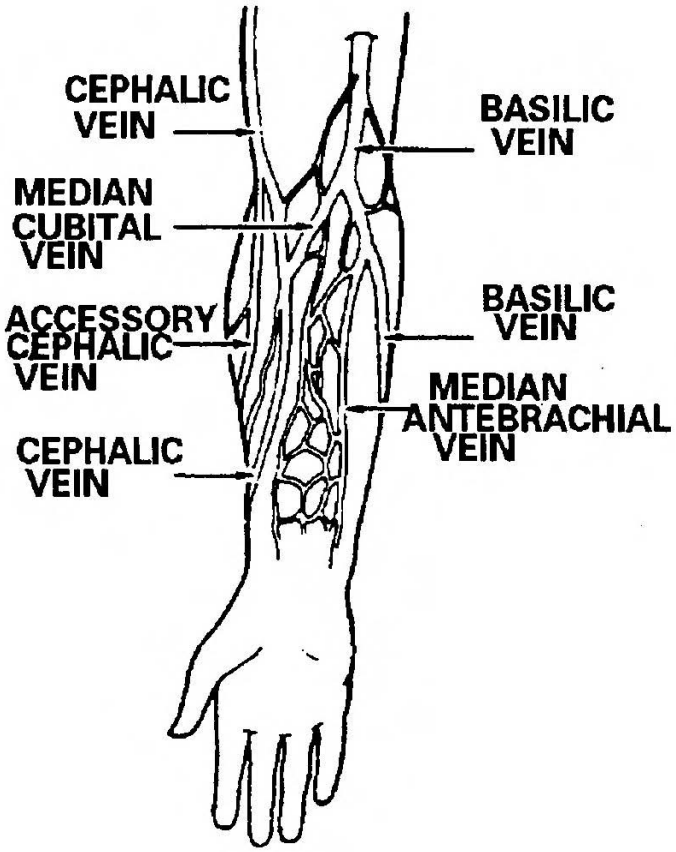


Figure 2-2. Veins.

h. **Select Vein for Venipuncture.** Select the vein as follows:

(1) Palpate or feel the arm by using your fingers to locate an appropriate vein.

(2) Select one of the prominent veins in the antecubital fossa of the arm. The antecubital fossa is the hollow or depressed area located in the joint between the arm and the forearm.

(a) The median cubital vein, though not always visible, is usually large and palpable. Since it is well supported and the least apt to roll (move away from pressure), it is the vein of choice for venipuncture.

(b) The second choice is the cephalic vein. The basilic vein, though oftentimes the most prominent, is apt to be the least desirable because it tends to roll easily, making venipuncture difficult.

i. **Position Protective Pad.** Place the protective pad under the patient's extended elbow and forearm to protect his clothing and the work surface.

j. **Prepare Sponge for Use**. Open the betadine or alcohol pledget (sponge) and 2-inch by 2-inch gauze and place the open package within easy reach.

k. **Apply Constricting Band.** Use the following procedures to apply the constricting band (see figure 2-3).

(1) Place the constricting band around the limb approximately two inches above the proposed venipuncture site.

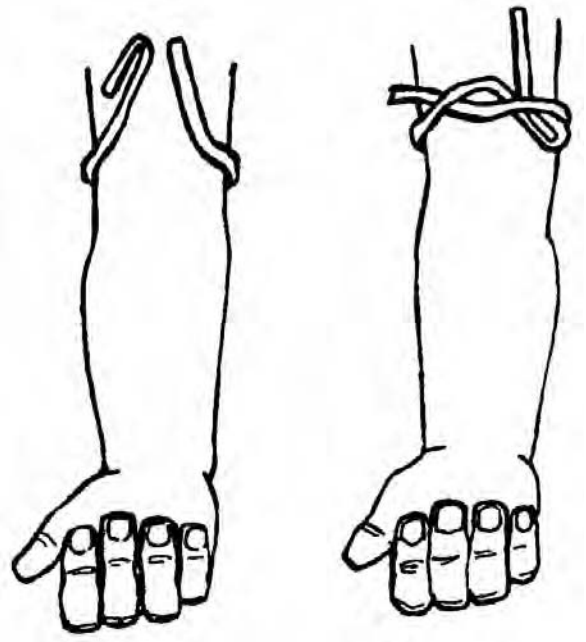

Figure 2-3. Constricting band.

(2) The constricting band must be applied with sufficient pressure to stop venous return without stopping the arterial flow.

l. **Prepare the Vein.** Instruct the patient to form a fist and clench and unclench his fist several times and then hold the hand in a clenched position. Clenching and unclenching the fist with a constricting band in place causes the blood to be trapped in the veins which causes the veins to distend. If the vein does not distend, gently tapping the site with your fingers may assist in raising the vein.

m. **Palpate Selected Vein**. Palpate the vein lightly with the index finger, moving an inch or two above and below the site so that you can determine the size and direction of the vein (figure 2-4). The vein should feel like a spongy tube.

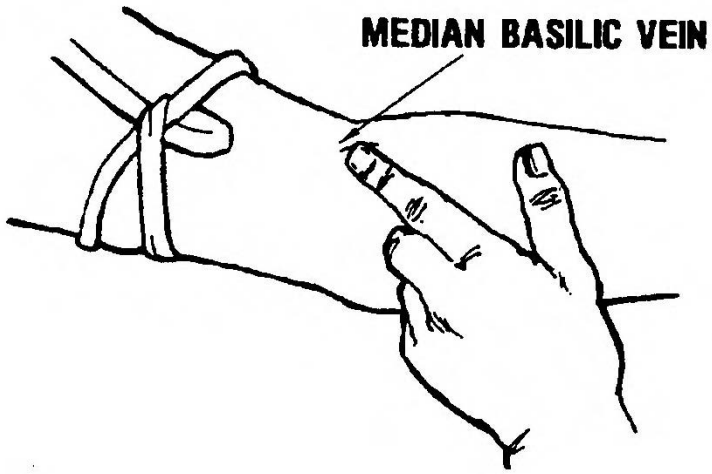


Figure 2-4. Palpating the vein.

n. **Cleanse Skin.** Cleanse the skin with the pledget (sponge) starting on the site and cleansing in a spiral motion outward and away from the selected venipuncture site. Do not retrace your motion. Cleansing the skin in this manner will move the surface skin contaminants away from the proposed venipuncture site.

**CAUTION:** After cleansing the skin, do not repalpate the area.

o. **Prepare to Puncture Vein.**

(1) Grasp the Vacutainer® unit and remove the protective cover from the needle.

(2) Position the needle parallel to and above the vein and grasp the patient's arm below the point of entry with the free hand.

(3) Place the thumb approximately one inch below the expected point of entry and pull the skin taut and toward the hand.

p. **Puncture Vein.** Puncture the vein in the following manner.

(1) Place the needle bevel up in line with the vein and pierce the skin at approximately a 15 to 45 degree angle. (Entering with the bevel up causes the sharp tip to pierce the skin first, paving the way for the rest of the needle. Entering the vein with the bevel down will cause painful tearing of the skin.)

(2) Decrease the angle of the needle until it is almost parallel to the skin surface. Direct the needle toward the vein and pierce the vein wall.

(a) A faint "give" will be felt when the vein is entered and the tube will begin filling with blood.

(b) If venipuncture is unsuccessful (vein wall is not punctured), pull the needle back slightly (not above the skin surface) and attempt to direct the point of the needle into the vein again.

(c) If the venipuncture is still unsuccessful, release the constricting band, place a 2-inch by 2-inch sponge lightly over the venipuncture site, quickly withdraw the needle, and immediately apply firm pressure over the site.

(3) Once the needle is withdrawn from under the skin surface, do not reuse the needle. If a second attempt at venipuncture is required, notify the supervisor, obtain a new needle, and repeat the procedure.

q. **Collect Specimen.** When you have successfully punctured the vein, complete the following steps to collect the blood sample.

(1) Hold the Vacutainer® unit and needle steady with your dominant hand. If the unit and needle are not held steady while pushing in the tube, the needle may either slip out of the vein or puncture the opposing vein wall.

(2) Place the tips of the index and middle fingers behind the flange of the Vacutainer®. Push the tube all the way into the Vacutainer® with your thumb until the needle completely punctures the rubber stopper.

(3) If the needle is in the vein, the vacuum will draw the blood into the tube.

(4) Instruct the patient to relax and unclench his fist after the needle has entered the vein. Release the constricting band when the tube is full.

(5) Carefully pull the tube downward, off the tube end of the needle and out of the Vacutainer®. Make sure to stabilize the Vacutainer® and needle with your other hand during the process. If more than one specimen is needed, push another tube onto the needle. Continue exchanging the tubes until the required number have been filled.

NOTE**:** After venipuncture technique has been mastered and manual dexterity is present, either hand may be used in completing blood drawing as long as the needle is securely stabilized.

(6) After obtaining the blood required and the last tube is approximately two-thirds full of blood or the blood stops, prepare to withdraw the needle.

r. **Withdraw Needle.** Withdraw the needle in the following manner.

(1) Release the constricting band by pulling on the long, looped end of the tubing or pull the Velcro® fasteners open. Never withdraw the needle prior to removing the constricting band as this will cause blood to be forced out of the venipuncture site with resulting blood loss and/or hematoma formation.

(2) Place the sterile 2-inch by 2-inch sponge lightly over the venipuncture site.

(3) Withdraw the needle smoothly and quickly and immediately apply firm manual pressure over the venipuncture site with the 2-inch by 2-inch sponge. Keeping the patient's arm fully extended will minimize leakage around and through the venipuncture site. This aids in the prevention of bruising and hematoma formation.

(4) Instruct the patient to elevate the arm slightly. Keep the arm fully extended and continue to apply firm manual pressure to site for two to three minutes.

(a) If the patient is unable to apply pressure and elevate the site, the pressure and elevation must be done by the medical specialist.

(b) Continued bleeding is a complication of a patient receiving anticoagulant therapy. Anticoagulants are usually given to prevent the development of blood clots in the circulatory system. Anticoagulant patients may bleed longer than other patients. Manual pressure applied for a longer period of time will be required to stop the bleeding.

(c) A hematoma is a swelling caused by the collection of blood under the skin or in damaged tissues as a result of an injured or broken blood vessel. They are the most common complication of routine venipuncture for withdrawing blood. They may result from puncturing and exiting the other side of the vein or from incomplete insertion of the needle into the vein. Hematomas can also result from continued application of the constricting band after a successful or unsuccessful attempt has been made to draw blood. Hematomas most frequently result from insufficient time spent in applying pressure following venipuncture and from flexing the arm.

s. **Remove Specimen Tube from Vacutainer®.** Pull the tube out of the Vacutainer® and remove the needle from the holder using an approved safety device such as a toothed grip on the sharps disposal box. Do not recap the needle. If the

specimen tube contains an anticoagulant or other fixing agent (as evidenced by white powder particles or liquid in tube), gently invert tube several times to mix it with the blood. Label all tubes promptly with patient identification and other information as required by local SOP.

t. **Apply Bandage.** Apply a self-adhesive bandage to the venipuncture site after the bleeding has stopped. Self-adhesive bandages do not take the place of pressure.

u. **Provide for Patient's Safety and Comfort.** Provide for patient's safety and comfort as follows:

(1) Remove protective pad.

(2) Assist patient to roll down sleeve, if applicable.

(3) Assist patient to assume a position of comfort, if applicable.

(4) Place personal items and call-light within easy reach, if applicable.

(5) Raise side rails, if applicable.

v. **Dispose of and/or Store Equipment.** Take care of equipment storage/disposal.

(1) Collect all equipment and dispose or store in accordance with (IAW) local SOP.

(2) Do not recap needle at any time; dispose of it in an approved, puncture-proof container as close to the work area as possible.

w. **Perform Handwash.** Perform a patient care handwash.

x. **Check Completeness of Laboratory Request.** Obtain completed laboratory request from the supervisor and check the request. (There may be many lab request slips that are used for requesting specific blood tests.) All slips must be checked for minimum information as given below.

(1) Complete patient identification.

(2) Requesting provider's signature.

(3) Ward number, clinic, or dispensary designation.

(4) Date and time of specimen collection.

(5) Test(s) requested.

(6) Admission diagnosis or type of surgery in the "REMARKS" section, if applicable.

(7) "URGENCY" box completed.

y. **Forward Specimen to Laboratory.** Prepare the specimen and request for transport, then forward to the laboratory IAW local policy.

z. **Report and Record.** Report accomplishment of the procedure to the supervisor and document the date, time, type of specimen collected, and disposition of the specimen on appropriate records IAW local policy.

## 2-4. OBTAIN A BLOOD SPECIMEN WITH AN ASSEMBLED SYRINGE

An alternate method of drawing blood is to use an assembled needle and syringe.

a. Either a straight needle or a butterfly device may be used. The size of the syringe will be determined by the amount of blood required. The syringe volume should not exceed 20 cubic centimeters; the vacuum created during collection of a blood sample with a larger syringe may cause the vein to collapse. Smaller volume syringes should be used with pediatric patients or others with fragile veins.

b. After placing the constricting band and penetrating the vein with the needle as described above, slowly pull back on the plunger to withdraw the required amount of blood. Excessive vacuum will be created if the plunger is pulled back too forcefully, and the vein may collapse.

c. If the blood volume required is greater than the volume of the syringe, the filled syringe may be removed from the needle and a new one attached. The process described above will be continued until the required volume is obtained. Extreme care must be taken to assure the needle is stabilized during blood drawing and syringe exchange.

d. If you have used a needle and syringe to obtain the blood, you will need to transfer the specimen into the tubes. Insert the needle into the rubber stopper of the tube and the vacuum within the tube will draw the specimen in and fill the tube. Transfer must be done promptly to prevent clotting of the blood in the syringe. Label tubes as in the instructions above.

**Continue with Exercises**

**EXERCISES, LESSON 2**

**INSTRUCTIONS:** Answer the following exercises by writing the answer in the space provided. After you have completed all of these items, turn to "Solutions to Exercises" at the end of the lesson and check your answers.

1. List the three parts of the Vacutainer® system.

   _____

   _____

   _____

2. List the steps required to obtain a blood specimen with a Vacutainer®. (Begin after the Vacutainer® and needle have been assembled.)

   _____

   _____

   _____

   _____

   _____

   _____

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   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

3. Describe the steps to follow to position and insert a needle in a vein to obtain a blood sample.

_____

_____

_____

_____

_____

4. What items must be included on the Laboratory Request slip?

_____

_____

_____

_____

_____

_____

5. List the steps to follow to obtain a blood sample with an assembled syringe.

_____

_____

_____

_____

_____

**Check Your Answers on Next Page**

## SOLUTIONS TO EXERCISES, LESSON 2

1. Double-ended needle,
   Plastic holder
   Vacuum tubes marked with a guideline (para 2-1a)

2. Expose area for venipuncture.
   Select vein.
   Position protective pad.
   Prepare pledget (sponge) for use.
   Apply constricting band.
   Prepare the vein.
   Palpate selected vein.
   Cleanse the skin.
   Prepare to puncture the vein.
   Puncture vein.
   Collect specimen.
   Withdraw the needle.
   Remove specimen tube from vacutainer.
   Apply self-adhesive bandage.
   Provide for patient's safety and comfort.
   Dispose of and/or store equipment.
   Perform patient care handwash. (para 2-3)

3. Position the needle parallel to and above the vein and grasp the patient's arm below the point of entry with the free hand.

   Place the thumb approximately one inch below the expected point of entry and pull the skin taut and toward the hand.

   Place the needle bevel up in line with the vein and pierce the skin at approximately a 15 to 45 degree angle.

   Decrease the angle until almost parallel to the skin surface and direct it toward the vein.

   Pierce the vein wall. (paras 2-3o, p)

4. The Laboratory Request form should contain the following:

   Complete patient identification.
   Requesting physician's signature.
   Ward number, clinic, or dispensary designation.
   Date and time of specimen collection.
   Test(s) requested.
   "URGENCY" box completed. (para 2-3x)

5. Syringe volume should not exceed 20 cc.

   Place constricting band and penetrate vein as with Vacutainer.

   Pull plunger back slowly.

   Filled syringe may be removed from needle and a new one attached.

   Insert the needle into the rubber stopper of the tube to transfer the specimen into the tube. (para 2-4a, b, c, d)

**End of Lesson 2**

## LESSON ASSIGNMENT

| | |
|---|---|
| **LESSON 3** | Initiate Treatment for Anaphylactic Shock. |
| **TASK ASSIGNMENT** | Paragraphs 3-1 through 3-3. |
| **LESSON OBJECTIVES** | After completing the assignment, you should be able to: |
| | 3-1. Determine the causes of anaphylactic shock. |
| | 3-2. Identify signs and symptoms of anaphylactic shock. |
| | 3-3. Describe steps in treating anaphylactic shock. |
| **SUGGESTION** | After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you achieve the lesson objectives. |

## LESSON 3

## INITIATE TREATMENT FOR ANAPHYLACTIC SHOCK

### 3-1. GENERAL

Anaphylaxis is an unusual or exaggerated allergic reaction, usually to drugs or to insect bites or stings. The patient with an anaphylactic reaction may quickly develop symptoms of shock. In this discussion, "anaphylaxis" and "anaphylactic shock" are used interchangeably. The most common drug that brings on anaphylactic shock is penicillin, although any drug is a potential source of anaphylactic shock. "Anaphylaxis" is derived from "ana," meaning without, and "phylaxis," meaning protection. Hence, the casualty is without protection from the poison or drug. In anaphylaxis, the release of histamine is profound, causing the bronchial tree to constrict and go into spasm.

### 3-2. CAUSES OF ANAPHYLACTIC SHOCK

Anaphylactic shock may be caused by one or more of the following:

a. **Injections.** The injection of drugs to which one is sensitive, especially antibiotics and vaccines.

b. **Ingestion.** Eating foods to which one is sensitive, such as shellfish or berries.

c. **Insect Stings.** Stings of insects to which one is especially sensitive, such as the bee, wasp, yellow jacket, or hornet.

d. **Inhalation**. Breathing chemicals, dusts, or pollens or other materials to which one is sensitive.

### 3-3. TREATMENT PROCEDURES TO FOLLOW FOR ANAPHYLACTIC SHOCK

a. **Introduction.** Anaphylaxis may occur immediately or up to 30 minutes or more after the patient is exposed to the foreign substance. In general, the sooner this reaction occurs following exposure, the more severe the signs and symptoms of the reaction. All patients receiving medication should be observed for at least 15 minutes following administration to identify developing reactions. The steps below should be followed if your patient develops an anaphylactic reaction.

b. **Survey the Casualty.** Before you can do anything for the patient, you must determine what type of reaction he is having. Follow the basic procedures for surveying the casualty. Check the airway and pulse first.

c. **Identify Signs and Symptoms of Anaphylactic Shock.** The medical specialist should identify the following signs and symptoms of anaphylactic shock in the casualty.

(1) Difficulty in respiration, wheezing, coughing, and a sense of suffocation or anxiety.

(2) Weak, rapid, or imperceptible pulse.

(3) Decreased blood pressure.

(4) Cyanosis (blueness) around the lips. In persons with dark skin, the inside of the lips will appear gray. Cyanosis indicates a lack of oxygen.

(5) Flushing, burning, or itching sensation of the skin. Hives or red patches may be present. The redness of the skin is caused by a congestion of capillaries. Itching will often be present on the palms of the hands, between the fingers, or in the ear canals.

(6) Dizziness. Dizziness is caused by a lack of oxygen due to difficulty in breathing.

(7) Vomiting, convulsions, and abdominal cramps. These signs are caused by the response of the victim's muscular and neurological systems.

d. **Treat Anaphylactic Shock.** The medical specialist will immediately treat anaphylactic shock as follows:

(1) Maintain the airway as necessary.

(2) Assist in ventilation if proper equipment is available.

(3) Administer oxygen if available.

(4) Monitor blood pressure every five to 15 minutes. Leave the blood pressure cuff on the patient. Continue to monitor the blood pressure until it is up and stable and the patient is free of respiratory distress.

(5) Start an IV, preferably using Ringer's lactate or 0.9% NaCl (normal saline) solution.

(6) Perform CPR if necessary for cardiac or respiratory arrest.

e. **Transport.** Unless contradictory to local policy, start supportive treatment and transport as soon as possible.

(1) Administer epinephrine (if available) only under the supervision of the physician, physician assistant, nurse practitioner, or by local protocol. A 1:1,000 solution is given intramuscularly or subcutaneously; the usual dosage for an adult is 0.4 to 0.5 milliliters. A pediatric dose is determined by weight and should be ordered by a physician, physician assistant, or nurse practitioner.

(2) If signs and symptoms worsen or recur, the administration of up to four additional injections of epinephrine may be necessary. These injections may be administered every 15 minutes.

(3) Epinephrine is the drug of choice to relieve the symptoms of acute hypersensitivity reaction to drugs and of other acute allergic reactions. However, in patients suffering from shock from other causes, epinephrine may accentuate the underlying disorder. Therefore, care must be taken to perform an accurate assessment of the patient before administering epinephrine.

f. **Record Treatment.** Record the treatment administered in the patient's health record. If you can determine what drug or food caused the anaphylactic shock, enter that into the record and flag the record appropriately.

g. **Evacuate Casualty.** If you did not evacuate the patient earlier to a comprehensive medical treatment facility, do so at this time. Since symptoms will return in about 20 percent of patients experiencing an anaphylactic reaction, the doctor may require admission for observation and further treatment.

**Continue with Exercises**

## EXERCISES, LESSON 3

**INSTRUCTIONS:** Answer the following exercises by writing the answer in the space provided. After you have completed all of these items, turn to "Solutions to Exercises" at the end of the lesson and check your answers.

1. List four causes of anaphylactic shock.

_____

_____

_____

_____

2. List five of the signs and symptoms of anaphylactic shock.

_____

_____

_____

_____

_____

3. What are the procedures for treating a patient with anaphylactic shock?

_____

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_____

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_____

**Check Your Answers on Next Page**

## SOLUTIONS TO EXERCISES, LESSON 3

1. Injections such as penicillin and tetanus antitoxin.
   Ingestion of foods such as shellfish or berries.
   Insect stings of bee, wasp, yellow jacket, and hornet.
   Inhalation of dust and pollen. (para 3-2)

2. Any five of the following.

   Difficulty in respiration, wheezing, coughing, and a sense of suffocation.
   Weak, rapid, or imperceptible pulse.
   Decreased blood pressure.
   Cyanosis or blueness around the lips.
   Flushing, burning, or itching sensation of the skin.
   Dizziness.
   Vomiting, convulsions, and abdominal cramps. (para 3-3c)

3. Maintain the airway.
   Assist in ventilation, if equipment is available.
   Administer oxygen, if available
   Monitor blood pressure every five to 15 minutes.
   Start an IV, preferably using Ringer's lactate or normal saline solution.
   Perform CPR if necessary. (para 3-3d)

**End of Lesson 3**

# APPENDIX

## UNIVERSAL BODY SUBSTANCE PRECAUTIONS

### Prevention of Transmission of Human Immunodeficiency Virus, and Other Blood-Borne Pathogens in Health Care Settings

- Only blood, semen, vaginal secretions, and possibly breast milk have been implicated in transmission of human immunodeficiency virus (HIV), hepatitis B virus (HBV), and other blood-borne pathogens.

- Blood is the single most important source of transmission of blood-borne pathogens in health care settings. Infection control efforts must focus on preventing exposures to blood.

- Although the risk is unknown, universal precautions also apply to tissues and to cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, and amniotic fluid.

- Precautions are used for all patients. (Reason: It is impossible to know which patients are infected with HIV, HBV, or other infectious agents.)

- Gloves are worn whenever the health care worker may come in contact with blood, body fluids containing blood, and other body fluids to which universal precautions apply. (Reason: Diseases can be carried in the body substances.)

- Wear gloves at all times if you have any break in the skin of your hands. If you have an exudative condition, such as weeping dermatitis, you must be evaluated before working with patients and patient care equipment. (Reason: You may be at great risk of contracting a disease; you might also spread disease.)

- Change gloves after each contact with a client. (Reason: The gloves may be contaminated.)

- Wash your hands after contact with any patient.

- Wash your hands and skin surfaces immediately and thoroughly if they are contaminated with blood or body fluids. (Reason: Proper washing will help to stop the spread of infection.)

- Wear a gown or apron when clothing could become soiled. (Reason: To prevent spread of infection to yourself or others.)

- Wear a mask and eye protection if splashing is possible. Hospital protocol will determine what type of eye protection is required for each specific case. (Reason: Infection could enter your body through the mucous membranes of your mouth or nose or through your eyes.)

- Dispose of sharp objects carefully. Do not recap or break needles. Needles and sharp objects are placed in a special container after use. (Reason: There is a possibility of accidental finger stick. It is important to protect yourself and housekeeping personnel.)

- If you have an on-the-job accident that causes a break in the skin, notify your nursing supervisor immediately. (Reason: Immediate precautions must be taken to protect you.)

- Special care is taken of a deceased patient's body. (Reason: To prevent leakage of body substances. It is safer to assume that all patients are infectious.)

- All health care workers who perform or assist in vaginal or cesarean delivery should wear gloves and gowns when handling the placenta or the infant until blood and amniotic fluid have been removed from the infant's skin. Gloves should be worn until after post-delivery care of the umbilical cord.

- Pregnant health care workers are not known to be at greater risk of contracting HIV infection than health care workers who are not pregnant; however, if a health care worker develops HIV infection during pregnancy, the infant is at risk. Because of this risk, pregnant health care workers should be especially familiar with and strictly adhere to precautions to minimize the risk of HIV transmission.

Adapted from Centers for Disease Control: Recommendations for prevention of HIV transmission in health care settings. MMWR 36: Suppl. 25: 1987. Centers for Disease Control: Update: Universal precautions for prevention or transmission of human immunodeficiency virus, hepatitis B virus, and other blood-borne pathogens in health-care settings. MMWR 37: 24, 1988. (Note: The subject was researched July 2006 and no changes were noted.)

**End of Appendix**