Venipuncture and Peripheral IV

**Brief Overview:** This module is designed to teach the necessary skills needed to perform proper peripheral intravenous (IV) catheter insertion and venipuncture techniques on an adult patient. This program employs the use of an over-the-needle catheter (angiocath) for peripheral intravenous catheterization and a vacutainer device for phlebotomy. The program describes a proficiency-based training curriculum for each of the two components. Training and practice is conducted using mannequin arms, which provide consistent and cost-effective instruction. Testing and assessment is conducted utilizing adult volunteer patients or medical student colleagues, who provide real life experience. Virtual reality simulators may also be used but are outside the scope of this module.

**Component 1: Intravenous Catheter Placement**

I. **Objectives**

   At the end of this training session the medical student will be able to:

   1. Identify potential and preferred sites for IV catheter insertion.
   2. List the steps and identify potential pitfalls of the IV catheterization procedure.
   3. Demonstrate proper terminology, handling, and use of supplies for IV catheterization.
   4. Demonstrate proper insertion, stabilization, and discontinuation of an intravenous catheter.

II. **Assumptions**

   Participants will be expected to have:

   - A basic knowledge of venous anatomy.
   - A basic knowledge of the required handouts/checklists.

III. **Suggested Readings**


IV. Description of the Laboratory Module

Following discussion of the procedure and module requirements, participants are introduced to the equipment and supplies needed to perform the intravenous catheterization. Demonstration is performed by the instructor during initial training.

Participants will complete the following stations, often on separate days, to separate training and assessment:

- Mannequin arm IV catheterization—Training (fig. 1)
- Volunteer patient IV catheterization—Assessment (fig. 2)

Individual stations should be set up by the proctor prior to training.

The first station will require the use of a mannequin arm, and the second station will require a volunteer patient or mannequin arm, each with appropriate supplies and checklists.

Each session is conducted by a proctor on a one-on-one basis with the student. Students will be given two training attempts at IV catheterization. The proctor will record errors and/or deficiencies using the checklist. The checklist is immediately provided to the student at the completion of each station. Competency is determined by correctly performing 20 of the total number of steps with no automatic failures from missed or incorrect steps.
V. Description of Techniques and Procedure

Mannequin Arm or Volunteer Patient

Steps as follows:
1. Review indication/patient order.
2. Introduce yourself and identify patient.
3. Assess patient and explain procedure.
4. Assemble universal equipment (see Supply List) (fig. 3).

5. Perform hand hygiene.
6. Apply gloves.
7. Open equipment aseptically.
8. Select appropriate venous site on model.
9. Apply tourniquet and palpate vein.
10. Clean insertion site with antiseptic.
11. Apply skin traction.
12. Enter skin with catheter (fig. 4).

Depiction of Universal Equipment

Orientation of Angiocatheter for Appropriate Skin Entry
13. Confirm blood return and advance catheter (fig. 5).

![fig. 5](image1.png)

Complete Advancement of Angiocatheter following Blood Return

15. Apply pressure proximal to catheter and pull needle out.
16. Connect selected adapter or line (fig. 6).

![fig. 6](image2.png)

Proximal Venous Pressure for Needle Extraction and Adapter Connection

17. Flush catheter when appropriate for model.
18. Apply proper dressing.
19. Tape intravenous tubing in place (fig. 7).
20. Apply label. (fig. 8)

21. Discontinue IV upon completion of module.
22. Dispose of equipment.

VI. Common Errors

- The extremity is not stabilized or is positioned incorrectly to minimize movement of the extremity during the procedure and optimize ergonomic positioning during technique.
- The angle of the catheter is insufficient for proper advancement or proper approach to the vein. Approach should be at a 15 to 30 degree angle of insertion and not too shallow.
- The tourniquet is applied too loosely to create appropriate venous resistance for vein engorgement.
- The site is contaminated by touch, violating aseptic technique.
- The catheter cannot be advanced due to back wall purchase. Backflow of blood into angiocath must be ensured prior to advancement.
- Pressure is not placed above the site before needle removal to minimize blood loss and site contamination.
- Performance is incorrect or steps have been omitted (see checklist).
VII. Supplies and Station Set-Up

A. Mannequin
   - Mannequin arm—Adult Venipuncture and Injection Training Arm IV
   - Blood supply
   - Table
   - IV pole

B. Volunteer Patient
   - Desk with arm support or phlebotomy chair/table

C. Universal Equipment
   - Biohazard container
   - Disposable gloves (small, medium, large, extra-large)
   - Towel or disposable pad
   - 22 gauge angiocaths
   - Selected IV adapter
   - 1–3mL prefilled normal saline syringe
   - Tourniquet
   - Approved topical antimicrobial cleansing agent
   - Sterile 2x2’s
   - Tape
   - Transparent dressing
   - Label
   - Hand wash
   - Sink

D. Anticipated Cost/Budget

**IV Catheter Competency Supplies Per Student**

<table>
<thead>
<tr>
<th>Supplies</th>
<th>Per Student/Session</th>
<th>Each</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 gauge angiocath</td>
<td>3 each</td>
<td>$1.09</td>
</tr>
<tr>
<td>IV start kit</td>
<td>3 each</td>
<td>$1.50</td>
</tr>
<tr>
<td>Underpad</td>
<td>2 each</td>
<td>$0.20</td>
</tr>
<tr>
<td>Sterile 2x2’s</td>
<td>3 each</td>
<td>$0.20</td>
</tr>
<tr>
<td>Cap adapter</td>
<td>1 each</td>
<td>$0.55</td>
</tr>
<tr>
<td>Band aid</td>
<td>1 each</td>
<td>$0.05</td>
</tr>
<tr>
<td>Gloves</td>
<td>3 pair</td>
<td>$0.30</td>
</tr>
<tr>
<td>IV line w/3cc NS syringe</td>
<td>1 each</td>
<td>$1.75</td>
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</tbody>
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**Phlebotomy Supplies Per Student**

<table>
<thead>
<tr>
<th>Supplies</th>
<th>Per Student/Session</th>
<th>Each</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacutainer device</td>
<td>2 each</td>
<td>$1.30</td>
</tr>
<tr>
<td>Vacutainer tube</td>
<td>2 each</td>
<td>$0.30</td>
</tr>
<tr>
<td>Vacutainer needle</td>
<td>2 each</td>
<td>$0.60</td>
</tr>
<tr>
<td>Tourniquet</td>
<td>2 each</td>
<td>$0.02</td>
</tr>
<tr>
<td>Alcohol swab</td>
<td>3 each</td>
<td>$0.03</td>
</tr>
</tbody>
</table>
Sterile 2x2’s 3 each $0.20
Band aid 1 each $0.05
Cotton ball 3 each $0.03
Gloves 3 pair $0.30
Under pad 2 each $0.20

**Miscellaneous Supplies (Dependent on # of Students Per Year)**
- Biohazard container 1 per station $3.53
- Artificial blood 1 bottle/100 students $13.95
- Arm skin replacement 1 per station $102.95
- Disposable Gloves 1 box of 100 $4.10
- Alcohol prep 1 box $1.23
- Cotton balls 1 bag $2.00

**VIII. Suggested Module Length**

**A. Training duration is approximately 40 minutes:**

- Ten minutes for initial description of supplies and demonstration provided for participant or group of participants.
- Each participant is given up to 30 minutes to perform two proctored IV catheterizations on the mannequin arm. Since this is a competency-based skill, the duration of training will vary, as participants will possess different skill and experience levels.
- Concurrent sessions often run with multiple mannequins, each with one-on-one proctoring.

**B. Testing/assessment is approximately 20 minutes for each participant:**

- Each participant is given 20 minutes to perform IV catheterization. Testing is conducted by a proctor on a one-on-one basis.
- The participant is often paired with a classmate who serves as a volunteer or uses an adult mannequin arm for catheterization.
- Testing is separated from training by approximately one week.
Component 2: Venipuncture/Phlebotomy

I. Objectives

At the end of this training session the medical student will be able to:

1. Identify potential and preferred sites for blood draw.
2. List the steps and identify potential pitfalls of the phlebotomy procedure.
3. Demonstrate proper terminology, handling, and use of supplies for IV phlebotomy.
4. Demonstrate proper insertion, stabilization, and discontinuation of a vacutainer needle or a butterfly catheter.

II. Assumptions

Participants will be expected to have:

- A basic knowledge of venous anatomy.
- A basic knowledge of the required handouts/checklists.

III. Suggested Readings


IV. Description of the Laboratory Module

Following review of a demonstration and a discussion of the procedure and module requirements, participants are introduced to the equipment and supplies needed to perform the venipuncture. Demonstration is performed by the instructor during initial training.

Participants will complete the following stations, often on separate days, to separate training and assessment:

- Mannequin arm venipuncture—Training
- Volunteer patient IV venipuncture—Assessment

Individual stations should be set up by the proctor prior to training.
The first station will require the use of a mannequin arm, and the second station will require a volunteer patient or mannequin arm, each with appropriate supplies and checklists.

Each session is conducted by a proctor on a one-on-one basis with the student.

Students will be given two training attempts at venipuncture. The proctor will record errors and/or deficiencies using a checklist. The checklist is immediately provided to the student at the completion of each station. Competency is determined by correctly performing 21 of the total number of steps with no automatic failures from missed or incorrect steps.

V. Description of Techniques and Procedure

Mannequin Arm or Volunteer Patient

Steps as follows:
1. Review indication/patient order.
2. Introduce yourself and identify patient.
3. Assess patient and explain procedure.
4. Assemble universal phlebotomy equipment (see Supply List) (fig. 9).

5. Perform hand hygiene.
6. Apply gloves.
7. Open equipment aseptically.
8. Select appropriate site.
9. Apply tourniquet and palpate vein.
10. Clean insertion site with antiseptic.
11. Apply skin traction below insertion site.

fig. 9
Depiction of Universal Phlebotomy Equipment
12. Enter skin with needle (fig. 10).

Appropriate Angle of Skin Entry

fig. 10

Identification of Blood Return

fig. 11

13. Press vacutainer stopper onto needle (fig. 12).

Engagement of Vacutainer into System

fig. 12
14. Confirm blood return into tube (fig. 13).

15. Stabilize vacutainer, release tourniquet, and fill vacutainer to appropriate volume.
16. Pull needle out.
17. Apply gauze pad and pressure to site.
18. Place cotton ball on puncture site.
19. Cover site with bandage.
20. Dispose of equipment.
21. Label tube and place in biohazard bag (simulated).

VI. Common Errors

- The extremity is not stabilized or is positioned incorrectly to minimize movement of the extremity during the procedure and optimize ergonomic positioning during technique.
- The angle of the catheter is insufficient for venipuncture or proper approach to the vein. Approach should be at a 15 to 30 degree angle of insertion and not too shallow.
- The tourniquet is applied too loosely to create appropriate venous resistance for vein engorgement.
- The site is contaminated by touch, violating aseptic technique.
- The vacutainer device is not stabilized while pushing on the tube.
- Pressure is not placed above the site before needle removal to minimize blood loss and site contamination.
- Performance is incorrect or steps have been omitted (see checklist).

VII. Supplies and Station Set-Up

A. Mannequin

- Mannequin arm—Adult Venipuncture and Injection Training Arm IV
- Blood supply
- Table
- IV pole
B. Volunteer Patient
   - Desk with arm support

C. Universal Equipment
   - Biohazard container
   - Disposable gloves (small, medium, large, extra-large)
   - Towel or disposable pad
   - Vacutainer device
   - Vacutainer tube
   - Vacutainer needle
   - Tourniquet
   - Approved topical antimicrobial cleansing agent
   - Sterile 2x2’s
   - Band aid
   - Tube labels
   - Cotton balls
   - Hand wash
   - Sink

D. Anticipated Cost/Budget (refer to table in Intravenous Catheter Placement Module)

VIII. Suggested Module Length

A. Training duration is approximately 40 minutes:
   - Ten minutes for initial description of supplies and demonstration provided for participant or group of participants.
   - Each participant is given up to 30 minutes to perform two proctored venipunctures on the mannequin arm. Since this is a competency-based skill, the duration of training will vary, as participants will possess different skill and experience levels.
   - Concurrent sessions often run with multiple mannequins, each with one-on-one proctoring.

B. Testing/assessment
   - Each participant is given 20 minutes to perform venipuncture. Testing is conducted by a proctor on a one-on-one basis.
   - The participant is often paired with a classmate who serves as a volunteer or uses an adult mannequin arm model for venipuncture.
   - Testing is separated from training by approximately one week.
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