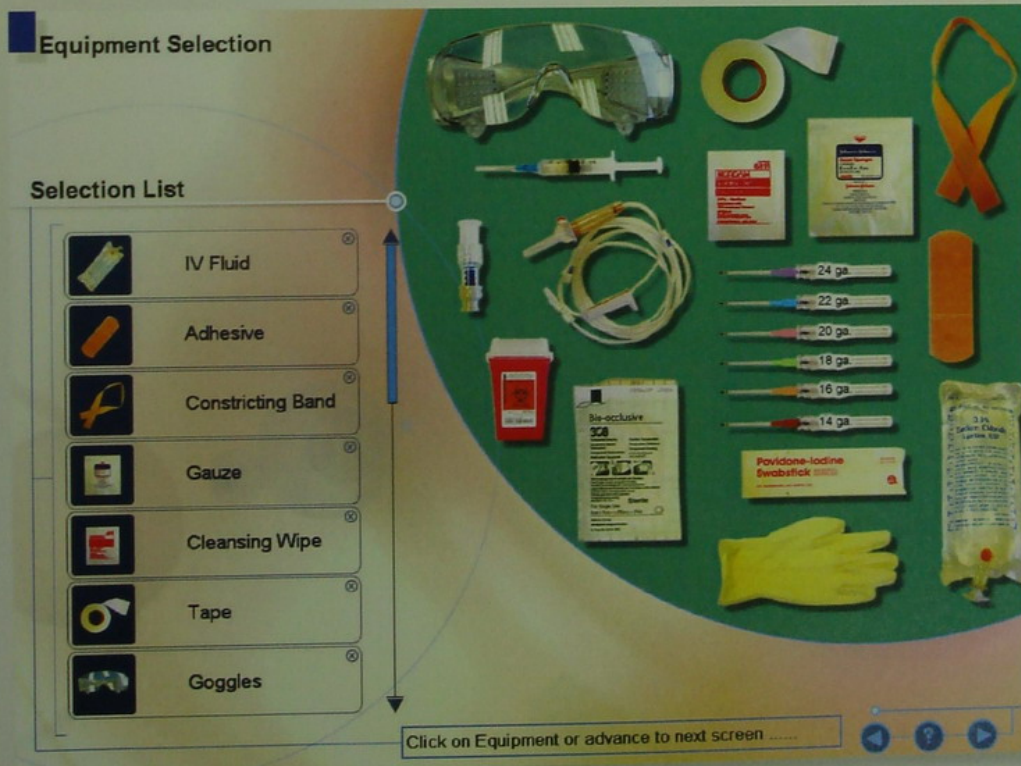


Equipment Selection

This screen presents the inventory of equipment that can be used in the simulation. Holding the mouse over an item will present the trainee with a brief description of the corresponding piece of equipment. To select an item, click on that item and it will appear on the Selection list on the left hand side of the screen. The trainee may click on an item multiple times, and the quantity of that piece of equipment will appear in parentheses after the item on the Selection list. To deselect an item, click on the item in the Selection list. You can use the scroll bar to study your inventory of selected equipment items.

After choosing the equipment, the trainee should click on the advance arrow to move to the Site Selection screen. It is possible to return to the Equipment Selection screen at any time during the procedure.




2007 2 22

Site Selection

This screen shows four (4) views of the arm that corresponds to the patient presented in the Case Scenario. Two (2) images are with the arm in the supinated position and two (2) images are with the arm in the pronated position.

Based on the information presented in the preceding Case Scenario, choose the site which is most suitable for intravenous cannulation. Select the site by clicking in the box associated with the anatomical descriptor of the best site, and the trainee should be aware that he or she will be assessed on site selection. Once the trainee has chosen a site, the selection is final and an advance arrow will appear in the lower right corner of the screen. Click on that arrow to advance to the **Simulation Screen**.

Site Selection



<input type="radio"/> Antecubital fossa	<input type="radio"/> Upper Arm
<input type="radio"/> Hand	<input type="radio"/> Forearm

Select insertion site and advance to next screen

Navigation icons: back, forward, help

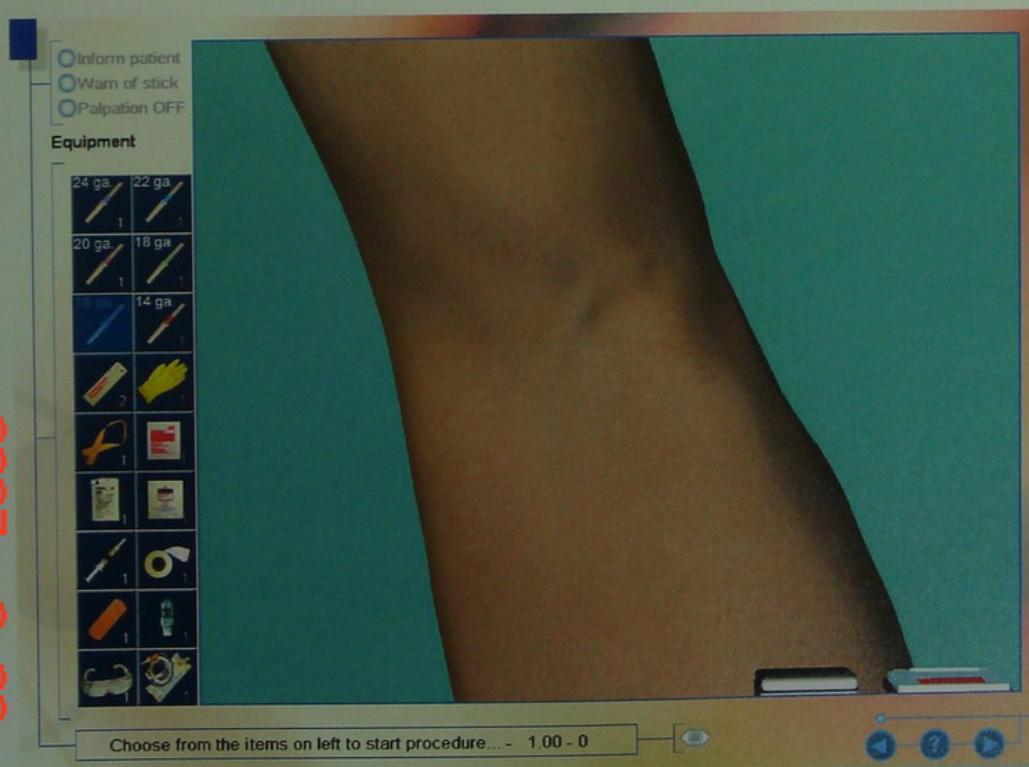
Simulation Screen and Performance of the Intravenous Procedure

The Simulation component of the Virtual I.V. Self-Directed Learning System allows the trainee to perform the I.V. insertion procedure using the haptic device. All of the items chosen from the Equipment Selection screen will appear on the left side of the screen and be available for use in the procedure.

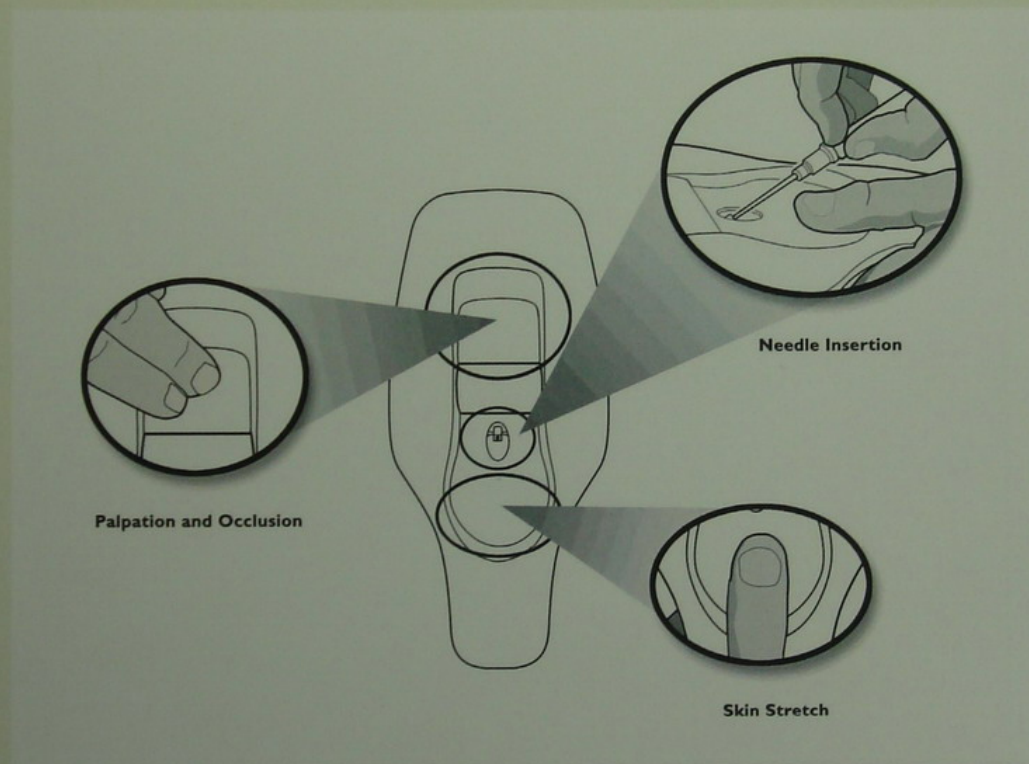
If not already done, remove the needle from the haptic device, and completely attach the catheter to the needle before beginning the procedure. To zoom in and out of the arm model, scroll the middle mouse button. To orient the arm differently, click and hold the middle mouse button and move the mouse around.

To select a piece of equipment, click on the inventory on the left side of the screen. Once an item is chosen, it must either be placed on the arm, or disposed of in either the metal trashcan or sharps container.

Certain items, such as the constricting band (tourniquet), catheter, lock and I.V. tubing, can be removed by clicking on them.



The haptic device contains three (3) separate regions: (1) The top of the device is for vein palpation and occlusion, (2) The middle of the device is for needle insertion, and (3) The bottom of the device is for skin stretch:



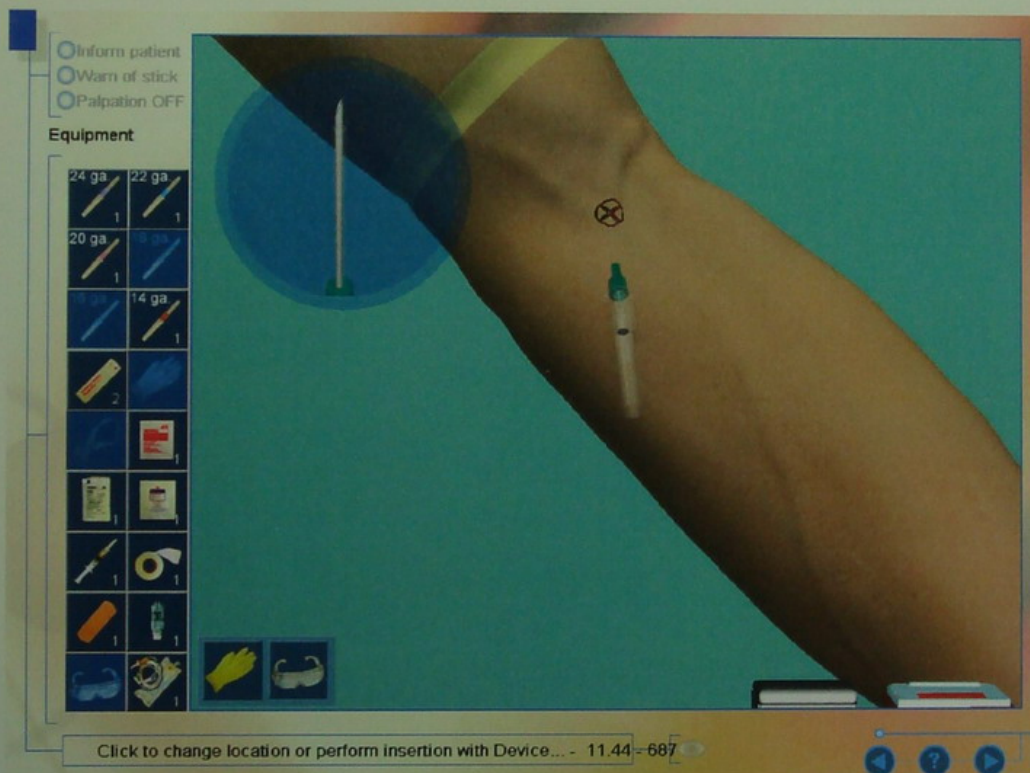
To begin the procedure, the catheter must be attached to the needle. Align the ridge located on the needle with the groove on the catheter to ensure proper configuration of the needle/catheter combination.

**** Special note: Under no circumstances should any needle or catheter other than those supplied with the Virtual I.V. Self-Directed Learning System ever be used with the haptic device.**

The constricting band (tourniquet) can be placed on the arm to enhance vein engorgement. However, be aware that the trainee is negatively assessed if the constricting band is left on the arm for too long a time.

To use a needle, select the appropriate gauge from the inventory on the left side of the screen and move it to the arm. A target cursor will appear on the arm. Locate the insertion point on the arm with the target cursor; click and the needle will appear. Insert the needle/catheter combination into

the needle insertion receptacle located in the middle of the haptic device. A slight tug will be felt as the needle is engaged by the haptic device. After engagement, the transparent needle on the screen will be highlighted. The position of the bevel will also appear in the circle next to the arm.



To palpate the arm, select the Palpation button on the top left of the Simulation Screen. Move the palpation fingers to a location on the arm, click and feel the vein using the top part of the haptic device. To palpate a new location on the arm, move the cursor and click a new location. The palpation fingers are automatically removed when you select another piece of equipment, or select the palpation button a second time.

All appropriate measures should be taken for Body Substance Isolation (BSI). These may include gloves and goggles, which can be selected and deselected by clicking on the corresponding icon.

The area of the needle insertion point can be prepared using the cleansing supplies in the inventory. All items must be disposed of properly, either in the trashcan or the sharps container. Depending on the patient case, it may be more or less difficult to correctly insert the needle. During needle insertion, stretching the skin at the bottom part of the haptic device should assist in securing the vein for insertion. Similarly, vein occlusion can be performed using the top part of the haptic device.

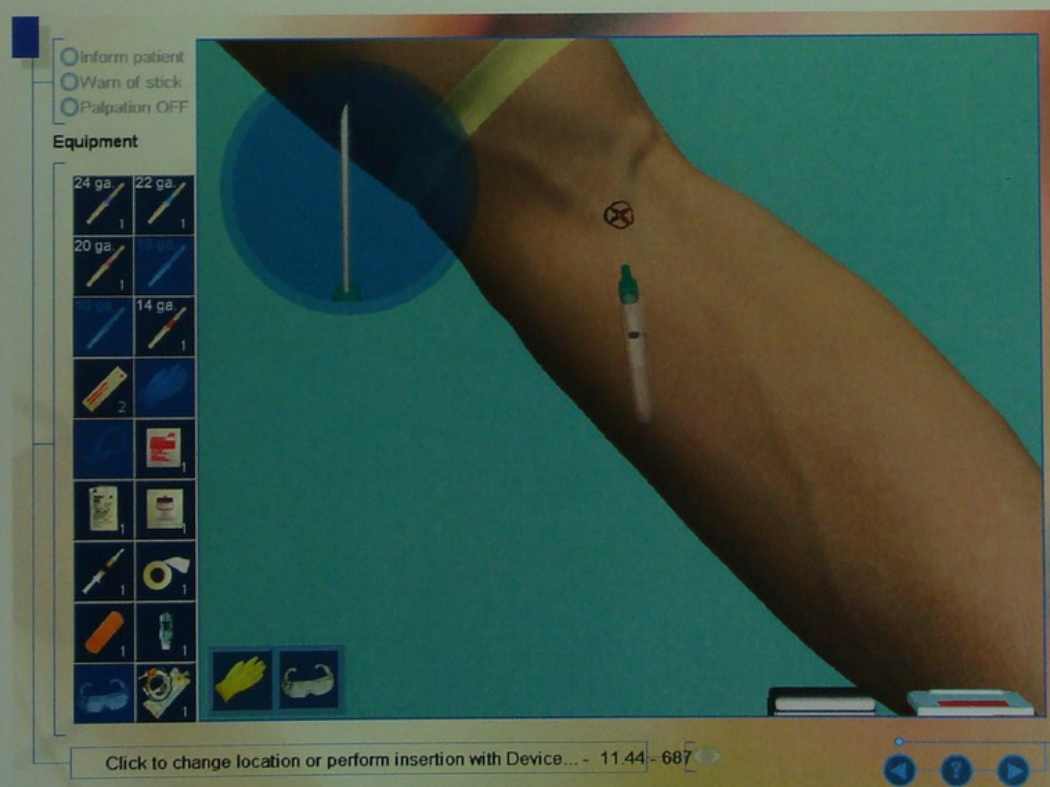
There are over forty (40) different arms supplied with the Virtual I.V. Self-Directed Learning System, ranging from pediatric to geriatric, and including rolling veins, fragile veins and arms and hands with difficult-to-penetrated skin.

The appropriate angle for needle insertion is 10-30°. A flash of red will appear in the needle if the stylet penetrates a vein. After needle insertion, the needle should be withdrawn and the catheter secured in place with the appropriate material, such as tape. Catheter lock, syringe flush and I.V. tubing can be placed or used on the secured catheter.

In some cases, the trainee will perform the procedure in an incorrect fashion, resulting in bleeding, bruising or swelling that will appear on the arm.

Procedure Assessment

Following the procedure, the trainee will be assessed as to how well he or she performed the procedure. To view the debriefing screen, push the advance button after performing the procedure. The assessment is divided into Critical and Non-Critical errors. Critical errors are vital to proper performance



of the procedure. Depending on the configuration chosen by the administration under Training / Simulation Options, a quantitative score may be displayed. This Overall Rating may be high, but the trainee can still fail the procedure if Critical errors were made. The total time of the procedure, as well as the time the constricting band was placed on the arm is timed.

For some Critical and Non-Critical errors, a movie icon will appear next to the error. Clicking on that error will display a video showing the proper way to perform that sub-task of the procedure.

Clicking on the cannulation event video shows the trainee an "under-the-skin" view of what occurred during cannulation. For example, if the angle of insertion was too steep, the video will display the consequences of a steep insertion.

If the trainee is in Career Mode and succeeds at the procedure, then the next case or a qualification test will be automatically presented when the trainee advances to the next screen. If the trainee fails the procedure, he or she may be presented with the same case scenario, a different case scenario, the procedure training screen, or with a hints screen to help the trainee better understand proper performance of the procedure.

Procedure Assessment

Procedure Time 0:54 C-Band Time 0:37

70% Overall Rating

seiler
Practitioner Level 2

Unsuccessful Completion of Procedure

Cannulation Events

- X Angle of Insertion Too Shallow [video icon]
- X Rolling Vein: Incorrect Insertion Point [video icon]

Critical Points

- BSI performed correctly
- Constricting Band applied correctly
- Constricting Band removed correctly
- Cannula or catheter used correctly
- X Cannulation Error (-5 %) [video icon]
 - The catheter was not threaded.
- X Flash not observed in chamber (-5 %) [video icon]
- Site preparation correct
- No site contamination

Non-Critical Points

- Site selection correct
- Correct equipment selection
- Bevel up
- X Catheter angle was incorrect (-5 %) [video icon]
 - The stick angle was too small.
- X Incorrect use of lock or IV (-5 %) [video icon]

2007 2 22

Cannulation Event Animations

These generic animations display a record of the trainee's performance in terms of the angle of needle insertion, lateral or direct needle placement, vein behavior (rolling), needle-catheter behavior (buckling, re-cannulation), vein puncture (vein present, vein punctured through, etc.), and whether the trainee entered the vein correctly. The animation is controlled using standard video control buttons.

An example is presented here:

The screenshot displays a software interface for 'Procedure Assessment'. At the top right, it shows 'Procedure Time 1:08' and 'C-Band Time 0:49'. A central video player window shows a close-up of a green syringe needle being inserted into a vein. The video player includes standard playback controls: a back button, a play button, a pause button, a stop button, and an 'Exit' button. To the left of the video player is a checklist of performance events:

- demouser1
- Student Level
- Cannulation Events
 - ✗ Angle of Insertion
 - ✓ Vein Puncture
 - ✓ Correct Cannulation
- Critical Points
 - ✗ BSI not performed
 - Action taken
 - ✓ Tourniquet applied
 - ✓ Tourniquet released
 - ✓ Cannula or catheter selected
 - ✓ Catheter Needle inserted
 - ✓ Catheter threaded
 - ✓ Flash chamber
 - ✗ Site preparation
 - No site prep
- Non-Critical Points
 - ✓ Site selection
 - ✓ Correct equipment selection
 - ✗ Bevel down
 - ✗ Catheter angle was incorrect