Indications for Use: The Crit-Line IV monitor is used to non-invasively measure hematocrit, oxygen saturation and percent change in blood volume. The sensor clip measures hematocrit, percent change in blood volume and oxygen saturation in real time for application in the treatment of dialysis patients with the intended purpose of providing a more effective treatment for both the dialysis patient and the clinician. Based on the data that the monitor provides, the clinician/nurse, under physician direction, intervenes (i.e. increases or decreases the rate at which fluid is removed from the blood) in order to remove the maximum amount of fluid from the dialysis patient without the patient experiencing the common complications of dialysis which include nausea, cramping and vomiting. The Crit-Line blood chamber is a sterile, single use, disposable, optical cuvette designed for use with the Crit-Line sensor clip during acute and chronic hemodialysis therapy to non-invasively measure hematocrit, percent change in blood volume and oxygen saturation. The blood chamber is connected between the arterial bloodline and the dialyzer within the extracorporeal circuit during the hemodialysis treatment.

Caution: Federal (US) law restricts these devices to sale by or on the order of a physician.

Note: Read the Instructions for Use for safe and proper use of these devices. For a complete description of hazards, contraindications, side effects and precautions, see full package labeling at www.fmcna.com.
Introduction

The Crit-Line IV Monitor Participant Workbook (Workbook) is solely for training skilled healthcare professionals in the use of the Crit-Line IV monitor. This Workbook is intended to be used as a companion to the Crit-Line IV Monitor User’s Guide (User’s Guide, P/N CL80050002), which contains detailed instructions for all machine functions.

This Workbook is designed to be flexible, taking into account the various experience and skill level of the participants, the number of participants and the amount of time available for training. Similarly, this Workbook recommends that participants have the opportunity to use the Crit-Line IV monitor during a patient dialysis session to enhance the training experience. This hands-on experience may occur at the time of training or over several days depending on the facility, shift schedules, etc., and should be tailored to each facility, participant, and situation.

Each facility determines who will participate in the Crit-Line IV monitor training. It is anticipated that participants will include nurses, patient care technicians (PCTs) and physicians, with nurses being the primary focus of the In-Service Training.
Training Prework:

In order to ensure that participants have the clinical background needed to interpret the data, all nurses must complete the following online course prior to attending this training:


Completion of the prework by other participants (e.g., PCTs) is at the discretion of each facility.

Training Resources:

In addition to this Workbook, the following materials are incorporated into the Crit-Line IV monitor In-Service Training:

- Crit-Line IV Monitor User’s Guide
- Crit-Line IV Reference Guide (P/N 102273-01)
- Crit-Line IV Monitor Quickstart Guide (P/N 102272-01)

Icons and Descriptions:

The following icons are used in this Workbook to provide direction and clarity:

<table>
<thead>
<tr>
<th>Icons and Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="icon.jpg" alt="Instructor" /></td>
</tr>
<tr>
<td>Instructor explanation and demonstration</td>
</tr>
<tr>
<td><img src="icon.jpg" alt="Facilitation" /></td>
</tr>
<tr>
<td>Facilitation tips and supplemental comments</td>
</tr>
<tr>
<td><img src="icon.jpg" alt="Warning" /></td>
</tr>
<tr>
<td>Warning or caution</td>
</tr>
</tbody>
</table>
Training Topics

Welcome/getting Started
- Crit-Line IV Participant Workbook Introduction
- Crit-Line IV Monitor User’s Guide Introduction

Crit-Line IV Monitor Overview
- Monitor features
- Setup
- Blood chamber placement
- Sensor clip

Preparation for Treatment
- Verify accuracy routine

Initiation and Termination of Treatment
- Sensor clip attachment
- Start run
- BV alert level
- O₂ alert level
- Markers
- Ending a treatment
- Printing/downloading treatment results
- Cleaning

Troubleshooting
- Alarms
- Review Profiles A, B and C

Hands-on Demonstration
- Facility patient treatment area
# Getting Started

<table>
<thead>
<tr>
<th>Reading Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Register Your Attendance by Signing the In-Service Training Sign-In Sheet</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Review the Participant Workbook</strong></td>
<td>Note: The <em>Crit-line IV Monitor Quickstart Guide</em>, which will be used during the In-Service Training is an excellent troubleshooting resource.</td>
</tr>
<tr>
<td>**Introduction of the <em>Crit-Line IV User’s Guide</em> **</td>
<td></td>
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<tr>
<td>• If possible, have the User’s Guide available for reference during the training</td>
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<tr>
<td><strong>Introduction of the Support DVD: <em>Crit-Line IV Monitor, an Instructional Video for Dialysis Professionals</em></strong></td>
<td></td>
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<tr>
<td>• For use as a reference tool after the training</td>
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**Notes:**

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Crit-Line IV Monitor Overview

<table>
<thead>
<tr>
<th>Features</th>
<th>Setup and Power On</th>
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</thead>
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<td>• Sensor Clip</td>
<td>• Attach blood chamber and check position</td>
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<tr>
<td>• USB Connector</td>
<td>• Prime (per unit procedure)</td>
</tr>
<tr>
<td>• Zigbee Radio (optional)</td>
<td>• Serial Com 1</td>
</tr>
<tr>
<td>• Verification Filter</td>
<td>• Power Switch</td>
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<tr>
<td>• Crit-Line Blood Chamber</td>
<td>• Power Supply Jack</td>
</tr>
<tr>
<td>• Power Supply Adapter Power Connection</td>
<td></td>
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</tbody>
</table>

Review the physical features and setup of the Crit-Line IV system.

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Crit-Line IV Monitor — System View
Preparation for Treatment

Review the steps required to prepare for a patient treatment using the Crit-Line IV monitor.

Verification Filter
The sensor clip features a verification filter that is unique and used to periodically verify the clip’s accuracy. The verification filter is attached to the sensor clip’s USB cable. The sensor clip should be securely attached to the verification filter when it is not in use.

When the sensor clip is stored on the verification filter, the Crit-Line IV monitor automatically verifies the accuracy of the sensor clip prior to entering patient run mode.

If the sensor clip is not stored on the Verification Filter, the sensor clip must be manually verified at least once per month.

Verify Accuracy Routine

- Place sensor clip on verification filter
- Press the **Verify Accuracy** button
- Follow directions on screen if verify accuracy routine is not successful

Notes:
Verifying the Sensor Clip

Manually Verify Accuracy
Selecting the **Verify Accuracy** button from the Main Menu screen allows the user to perform a manual verification of accuracy on the sensor clip.

**Note:** In most cases, it is not necessary to perform a manual verification. If the sensor clip is placed onto the verification filter, the Crit-Line IV monitor will automatically perform a verification test once per day, and the date of the most recent successful verification will be displayed below the **Verify Accuracy** button.

**Note:** The user cannot access the Patient Run Menu screen until a successful verification has taken place.

**Note:** If the verification fails two or more times, the option is given to perform a field calibration.

Follow these basic steps to manually verify accuracy:

1. **Place sensor clip on verification filter.**
   1. Hold the sensor clip such that one side is held by the index finger and the other side is held by the thumb. Squeeze the clip to spread the sensor elements apart.
   2. Place the sensor clip over the verification filter such that the sensor elements cover the middle portion of the verification filter.
   3. Release the sensor clip to allow the sensor elements to seat on the verification filter.
   4. Make certain that the sensor clip has locked securely into place on the verification filter by noting the audible and tactile click.

2. **Press the Verify Accuracy button.**
   Once the **Verify Accuracy** button is pressed, the following screen will appear. This screen will remain for approximately ten seconds.

```
Verifying system accuracy
Please Wait
```
Verifying the Sensor Clip

3. Verify passed.
If successful, the following screen will appear. Press the OK button to return to the Main Menu screen. At this point the verification is complete and no further action is required.

![Verify passed screen]

4. Verify failed.
If the verification failed, the following screen will appear.

![Verify failed screen]

Follow these basic steps to address a failed verification of accuracy:
1. Ensure that the sensor clip is properly seated on the verification filter. Refer to page 9 for detailed instructions on the proper placement of sensor clip on the verification filter.
2. Ensure that the verification filter is clean of any foreign material and that the surface is not scratched or damaged. Refer to page 19 for cleaning instructions.
3. Press the Verify button to repeat the verification of accuracy. If successful, the following screen will appear. Press the OK button to return to the Main Menu screen. At this point the verification is complete and no further action is required.
Verifying the Sensor Clip

4. If the verification fails again, the following screen will appear.

![Verify failed screen]

At this point the user may do one of the following:

- Repeat the verification. Refer to step 4 (page 10). Verify failed sub-steps one through three on the previous pages.
- Perform a field calibration. Refer to the **Field calibration on the sensor clip** as indicated in the following section.
- Change the sensor clip.
- Cancel the verification process by pressing the **Cancel** button.

**Note**: If the operator chooses to cancel a failed verification process, the sensor clip will not be available for patient treatment monitoring.

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Verifying the Sensor Clip

Field Calibration on the Sensor Clip
Selecting the Field Calibration button from the Verify failed menu screen allows the user to perform a field calibration on the sensor clip.

Note: This option will only be made available if the verification of accuracy fails multiple times.

Follow these basic steps to perform a field calibration:
1. Press the Field Calibration button. Once the Field Calibration button is pressed, the following screen will appear.

Field Calibration
Enter the Filter ID from the verification filter
The code is located at the base of the verification filter
Press the Filter ID button to complete this process

Filter ID  Cancel

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Verifying the Sensor Clip

2. Press the Filter ID button
Once the Filter ID button is pressed, the Enter Filter ID screen will appear.

1. Enter the verification filter ID using the onscreen keypad. As characters are entered, they will display in the top window. The filter ID is located in the middle of the verification filter, as shown.

2. Once the verification filter ID has been entered, press the Save button.

3. Press the OK button
Once the OK button is pressed, a verification of accuracy will be performed as described in the Manually Verify Accuracy section.

Note: If the verification of accuracy continues to fail, the sensor clip is no longer suitable for clinical use and should be replaced.

Notes:
Initiation and Termination of Treatment

Connecting the Crit-Line Blood Chamber
Follow these basic steps to attach the disposable blood chamber to the dialyzer during the extracorporeal bloodline setup before priming the bloodlines.

Note: The Crit-Line blood chamber is tinted blue in color and must be used with the Crit-Line IV monitor.

Note: The blood chamber is intended for single-use only. A new sterile blood chamber must be used for each monitoring session.

1. **Inspect blood chamber and packaging.**
   Inspect the blood chamber and its sterile package prior to use. Refer to the blood chamber package label to ensure that the blood chamber sterilization has not expired.

Warning: Do not use the blood chamber if its package has been opened or its sterility has otherwise been compromised prior to use. The viewing area of the disposable blood chamber should be kept clean and free of obstruction.

2. **Connect the blood chamber to dialyzer.**
   Remove the blood chamber from its sterile package and aseptically attach the red connector to the arterial port of the dialyzer. Make sure the connection is tight.

3. **Continue setting up the bloodlines.**
   Continue to set up the bloodlines as per the manufacturer’s recommendations.

Note: When connecting the arterial bloodline to the blood chamber (not the dialyzer), hold the blood chamber securely in one hand and aseptically attach the dialyzer end of the arterial bloodline with the other hand. Be careful that you do not cross-thread the connection. The connection of the blood chamber to the arterial bloodline must not leak.

Note: Make sure that no air is in the blood chamber after priming. The accuracy of the hematocrit and oxygen saturation readings may be adversely affected if there is any air present in the blood chamber.

Notes:
## Initiation and Termination of Treatment

<table>
<thead>
<tr>
<th>Connecting the Sensor Clip to the Blood Chamber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow the steps below to attach the sensor clip to the blood chamber before connecting to the patient’s vascular access:</td>
</tr>
</tbody>
</table>

1. **Pinch open the sensor clip.**
   - Hold the sensor clip such that one side is held by the index finger and the other side is held by the thumb. Squeeze the clip to spread the sensor elements apart.

2. **Attach sensor clip onto blood chamber.**

**Caution:** Before attaching the sensor clip, check carefully for leaks at the connections between the blood chamber and the dialyzer and the blood chamber and the arterial blood line. Improper attachment of the arterial bloodline to the blood chamber can cause blood or saline to leak onto and into the sensor clip. This can damage the sensor clip.

- Place the sensor clip over the blood chamber so that the optical sensor covers the lens of the blood chamber.
- Release the clip to allow the optical sensor to seat on the viewing area of the blood chamber.
- Make certain that the sensor clip has locked securely into place on the blood chamber by noting the audible and tactile click.
- Ensure that the sensor clip is perpendicular to the top of the dialyzer and cannot be easily rotated up or down while attached to the blood chamber to ensure its proper placement.

**Note:** Make sure that the sensor clip is properly in place before treatment initiation. If the sensor clip is not properly seated on the blood chamber, the accuracy of the hematocrit and oxygen saturation readings may be adversely affected.

3. **Check for proper blood flow before selecting Start Run.**
   - When starting the blood pump at the beginning of treatment, visually verify proper blood flow in the extracorporeal circuit, including the blood chamber, before selecting Start Run.

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**Notes:**

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Initiation and Termination of Treatment

Start Run
- Set initial BV alert level limit

The BV Alert Level button sets the BV Alert Level. When the current BV% change drops below the set BV Alert Level, the Crit-Line IV monitor will display the alert message Rel. Blood Volume Low. This message will occur until the user changes the level or sets the BV Alert Level to OFF. To set the BV Alert Level, select the BV Alert Level button and enter the desired value using the arrow (up or down) keys until the desired level is displayed, then press the CONFIRM key. Press CANCEL to return to the original setting. Press the Disable button to set the BV Alert Level to off.

The BV Alert Level can be set from -1% to -25%, or 0 for OFF. The default setting is OFF. The BV alert level is drawn as a blue dotted line across the BV graph.
- In order to set a BV Alert Level, blood must first be sensed.

Navigate Screens

Setting the Crit-Line IV Monitor Graph

The default Crit-Line IV monitor graph is the blood volume graph. To change the graph, push the MENU button to enter the Patient Run Option Menu Screen. From this screen, you can choose the BV or Hct graph option by selecting the appropriate button.

Reading Graphs on the Crit-Line IV Monitor Screen

The Crit-Line IV monitor screen can display either Blood Volume or Hematocrit on the upper graph depending on user settings. The default setting is Blood Volume. On the lower graph, the Oxygen Saturation graph is displayed.

Graphing of the data begins after the user selects Start Run, the sensor clip reads blood sensed, and the hematocrit has been stable for sixty seconds. Graphs are displayed for a minimum of four hours (default) and will rescale to accommodate treatments longer than four hours. Graphs are resized larger during the treatment depending on the min/max values and alert levels.

- Assess Data Points
  - Hematocrit (Hct)
  - Blood volume change (%)
  - Minimum oxygen saturation
- Adjust BV Alert Level (if necessary)
- Change Profile Display
Initiation and Termination of Treatment

Setting an Event Marker
Selecting the Marker button displays a menu to insert an event marker on the ΔBV%, Hct and O₂ Sat graphs.

1. Press the Marker button.
Once the Marker button is pressed, the event marker selection screen will appear.

2. Select event Marker type.
Press the Symptom button to display a yellow diamond ♦ on the graphs.
Press the Intervention button to display a black triangle ▲ on the graphs.
Press the Cancel button to return without selecting an event marker.

Note: To prevent clutter on the graphs, the time between entering a marker must be at least ten minutes apart. If events occur more frequently than ten minutes, the operator must document it manually in the patient treatment record.

Note: Adding an event marker encodes the markers in the patient treatment history file. These markers appear on each profile screen in the printed graphs.

Note: If the clinical event being marked is a patient symptom, the operator selects the Symptom button. A yellow diamond ♦ on the graphic display indicates an event related to a symptom.

Note: If the clinical event being marked is an intervention to prevent a potential symptomatic response from the patient, the operator selects the Intervention button. A black triangle ▲ on the graphic display indicates an event related to an intervention.

3. Confirm selection.
Once the marker has been selected, the event marker confirmation screen will appear.
Initiation and Termination of Treatment

Ending a Patient Treatment Monitoring Session

1. Press the End Run button.

Once the End Run button is pressed, the End Patient Run option menu will appear.


Press the Print report button to terminate and print the Crit-Line IV monitor patient treatment monitoring session.

Press the Do not print report button to terminate the Crit-Line IV monitor patient treatment monitoring session without printing.

Press the Cancel button to return to the Crit-Line IV monitor patient treatment monitoring session.

Note: When a Crit-Line IV monitor patient treatment monitoring session is ended, either by printing or not printing, the system returns to the Patient Run menu.

3. Remove sensor clip from blood chamber.

When the treatment is complete, pinch the sensor clip to spread the sensor elements apart and gently remove the sensor clip from the blood chamber. Store the sensor clip by securing it to its verification filter, which is connected to its USB cable. Discard the disposable blood chamber with the rest of the bloodlines following appropriate hazardous waste handling requirements.
Initiation and Termination of Treatment

<table>
<thead>
<tr>
<th>Crit-Line IV Monitor Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleaning and Disinfecting the Crit-Line IV Monitor</td>
</tr>
<tr>
<td>The Crit-Line IV monitor is a sensitive electro-optical clip. Use care when cleaning the exterior of the Crit-Line IV monitor, the sensor clip and verification filter so as not to damage them. The exterior of the sensor clip, verification filter, and the Crit-Line IV monitor should be cleaned after every treatment. These can all be cleaned with dilute bleach solution (1:100) or other suitable hospital disinfectant.</td>
</tr>
<tr>
<td>Freshly prepared dilute bleach solution (1:100) is currently recommended by the Center for Disease Control as a suitable disinfectant for the hepatitis virus. Because surface contamination is the general mode of transmission for this type of virus, thorough cleaning of the exterior is essential.</td>
</tr>
<tr>
<td>Caution: Wipe the Crit-Line IV monitor and sensor clip with a cloth dampened with the cleaning solution. Do not spray the solution on the Crit-Line IV monitor or sensor clip. Do not immerse the sensor clip in any type of liquid. If liquid infiltrate the clip, they will damage it.</td>
</tr>
<tr>
<td>Caution: Do not use abrasive materials or solvents to clean the Crit-Line IV monitor or sensor clip. Doing so may cause damage.</td>
</tr>
<tr>
<td>Caution: Be careful not to scratch or damage the verification filter. If the verification filter is scratched or damaged, it may cause the sensor clip to fail verification of accuracy.</td>
</tr>
<tr>
<td>Caution: If the Crit-Line IV monitor or sensor clip becomes contaminated with blood, it must be thoroughly disinfected before the next treatment. Freshly prepared dilute bleach solution (1:100) or surface disinfectants such as Cavicide or Envirocide are recommended.</td>
</tr>
</tbody>
</table>

Sensor Clip Disposal

If the sensor clip continues to fail verification of accuracy, even after recalibration, the sensor clip is no longer suitable for clinical use. Disinfect the sensor clip before disposing of in accordance with U.S. federal regulations and appropriate state and local laws.

Notes:

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## Troubleshooting

<table>
<thead>
<tr>
<th>Common Patient Profiles:</th>
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<tr>
<td>• BV Profile A</td>
</tr>
<tr>
<td>• BV Profile B</td>
</tr>
<tr>
<td>• BV Profile C</td>
</tr>
<tr>
<td>• Oxygen saturation</td>
</tr>
</tbody>
</table>

**Points to Consider When Evaluating Patient Profiles:**

- Was the treatment started correctly?
- Is Hct ≤ 30? What was it the last treatment?
- What is the O₂ saturation?
- What is the patient's access type?
- Does the patient need oxygen?
- Is the BV alert level set?

**Common Technical Errors:**

- Did not start properly
- Setup incorrectly
- Lab differences between the Crit-Line IV monitor hematocrit and lab hematocrit
- Not printing

It is recommended that you continue working with alarms and troubleshooting during the hands-on demonstration time.
Crit-Line IV Monitor In-Service Training Evaluation

Facility Name: _______________________________       Date: __________________

Instructor: _______________________________

Thank you for participation. We value your feedback and appreciate your completing the following evaluation in order to help us provide the best possible training experience.

Please indicate your response to each of the following statements by circling the appropriate number on the right

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
</table>

The Program:

1. Adequate time was allowed to cover the program content 1 2 3 4 5
2. The pace of the training was appropriate 1 2 3 4 5
3. The material was presented in a way that made it easy to learn 1 2 3 4 5
4. The support material was adequate and well-organized 1 2 3 4 5
5. There was adequate time for questions and follow-up 1 2 3 4 5

The Instructor:

6. ...created an environment conducive to learning 1 2 3 4 5
7. ...was knowledgeable about the clinical setting 1 2 3 4 5
8. ...effectively communicated the key concepts 1 2 3 4 5
9. ...encouraged application of theoretical knowledge 1 2 3 4 5
10. ...helped develop problem-solving skills 1 2 3 4 5
11. ...was available for questions and individualized instruction 1 2 3 4 5
12. ...overall, was an effective clinical instructor 1 2 3 4 5

The Overall Experience:

13. The training met my expectations and goals 1 2 3 4 5
14. I feel better-informed regarding the Crit-Line IV monitor 1 2 3 4 5

What did you like most about the training experience?

What could we do to improve the training experience?

Other Suggestions/ Comments:

Name (optional): __________________________________________

Please return this evaluation to your unit supervisor or fax to _________________________. Thank you for your feedback!
## Appendix

1. Case Studies (All case studies are for educational purposes only.)
2. Fluid Distribution Model
3. Frequent Asked Questions
Case Study: Patient #1

Patient History:
Patient #1 is a 43-year-old male with an AV fistula; he dialyzes M/W/F for three hours and thirty minutes. The patient has gained 2.3 Kg since his last treatment. BP 130/70, pulse 70, respirations 18 and regular. He has no edema noted, lungs clear to auscultation. Renal failure is secondary to application of IV contrast media.

Problem:
Treatment was started and the patient quickly dropped into a negative profile. Use the patient history and the Crit-Line IV monitor data to answer the following questions:

1. Did they initiate the treatment according to operating instructions?

2. What may have been the cause of the immediate drop in blood volume at the beginning of the treatment?

3. What is the O₂ saturation reading and is the reading reasonable based on the access type?

4. What is the patient profile at 20 minutes?

5. Were BV and O₂ Alert Levels set? If yes, what are these limits?

6. Based on your assessment, would you recommend any interventions?
Case Study: Patient #2

Patient History:
Patient #2 is a 67-year-old female with R subclavian CVC access used for dialysis while her L AV fistula develops. She dialyzes T/Th/S for three hours and forty-five minutes. She has gained 3.0 Kg since her last treatment, but is only 1.2 Kg above her estimated dry weight. She has been complaining that her weight is always different post treatment depending on her caregiver. Looking back through her treatment records, you notice this is true. Her weight fluctuates by 1.5 Kg. She is an insulin-dependent diabetic patient that has CKD 5 secondary to years of not controlling her diabetes. BP 148/90, pulse 100, respirations 24, mild peripheral edema, assessment shows lobes are clear, bases are full.

Problem:
Use the patient history and the Crit-Line IV monitor data to answer the following questions:

1. Was the treatment started correctly?

2. What profile is displayed in the first hour and what profile is displayed between the first and the second hour?

3. What intervention likely occurred with the first intervention marker?

4. What does the second intervention marker indicate?

5. What does the directional change at the second arrow represent?

6. What is the O₂ saturation reading and is the reading reasonable based on the access type?
Case Study: Patient #3

Patient History:
Patient #3 is an 89-year-old male with a L Internal Jugular (IJ) CVC line. He is scheduled for dialysis M/W/F for three hours. He gains 1.5 Kg between treatments and prides himself in his excellent compliance to all recommendations from his dialysis team. BP 120/80, pulse 68, respiration 20, no peripheral edema, clear lungs and no complaints. Patient history only shows very moderate weight gain between treatments and patient usually is at his dry weight post treatment. Only the fluid gained between treatments has to be removed.

Problem:
Use the patient history and the Crit-Line IV monitor data to answer the following questions:

1. Did they initiate treatment according to operating instructions?
2. Based on your assessment, is this a reasonable profile for this patient?
3. What is the O₂ saturation reading and is the reading reasonable based on the access type?
4. Were BV and O₂ Alert Levels set? If yes, what are these limits?
Case Study: Patient #4

Patient History:
Patient #4 is a 72-year-old male with R IJ CVC access. He dialyzes T/Th/S for three hours. He has an extensive cardiovascular history, including stent placement, previous bypass surgery, and low cardiac output. He is prescribed multiple blood pressure medications, but sometimes forgets to take them at the right time. He arrived for treatment 3.5 Kg over his last post weight and 5.0 Kg away from target weight. BP 90/46, pulse 88 irregular, respirations of 20. His lungs are clear and no edema noted.

Problem:
Use the patient history and the Crit-Line IV monitor clip data to answer the following questions:

1. Did they initiate treatment according to operating instructions?

2. What profile is being displayed in the first hour of treatment?

3. Is the profile in the first hour reasonable for this patient?

4. What is the O₂ saturation reading and is the reading reasonable based on the access type?

5. In your assessment, do you think the physician needs to consider changes for the next treatment?

6. Was refill present?
Case Study: Patient #5

Patient History:
Patient #5 is a 54-year-old female with L AV fistula. She dialyzes M/W/F for four hours after she gets off work. She has 0.5Kg weight gain since her last treatment. As you review her chart you note that she rarely gains much weight between treatments. You notice she brought in 2 jugs for her 24-hour urine collection. Her BP is 110/68, pulse 98, and respirations 16, lungs are clear, no edema noted. She is dialyzed at minimum UF.

Problem:
Use the patient history and the Crit-Line IV monitor to answer the following questions:

1. What profile does this patient graph exhibit?

2. What profile would you expect for this patient given her history and treatment parameters?

3. What is the O₂ saturation reading and is the reading within typical range based on the access type?

4. Were BV and O₂ Alert Levels set? If yes, what are these limits?
Case Study: Patient #6

Patient History:
Patient #6 is a 48-year-old female patient that has L AV fistula. She is scheduled for T/Th/S treatment for four hours. She began dialysis nine months ago and continues to use the same dry weight. Her BP is 158/98, pulse 102, respirations 24, peripheral edema noted before and after treatment, lungs are not clear. Due to clinical signs of over hydration the physician ordered a reduction in dry weight.

Problem:
Use the patient history and the Crit-Line IV monitor data to answer the following questions:

1. Was the treatment initiated correctly?
2. Does the profile shown seem reasonable for this patient?
3. In your assessment, was the O₂ Saturation for this patient adequate throughout the entire treatment?
4. Did the patient convert to a different profile following the first intervention?
5. What interventions were possibly made at the first intervention marker?
6. Did the patient convert to a different profile following the second intervention?
7. Was refill observed at the end of the treatment?
Fluid Distribution Model

- Intracellular fluid (without blood cell fluid)
- Interstitial fluid
- Blood
- Circulating BV
- Peripheral BV
  - Ultrafiltration
  - Dialysate osmolarity
  - Dialysate temperature
Frequently Asked Questions

1. What are the three main measurements that are measured by the sensor clip?
   Hematocrit, oxygen saturation and percent change in intravascular blood volume.

2. How does the sensor clip make its measurements?
   The sensor clip shines a light through the lens of a blood chamber that is placed between the arterial bloodline and the inlet port of the dialyzer. The other end of the sensor clip detects the level of absorption and scattering of the red light as it is transmitted through the patient's blood, which flows through the blood chamber.

3. How does the sensor clip verify that it is measuring accurately?
   Each sensor clip has its own verification filter that is used to periodically verify its accuracy. This filter is attached to the sensor clip’s USB cable.

4. How often should you verify accuracy on the verification filter?
   When the sensor clip is stored on the verification filter, the Crit-Line IV monitor automatically verifies the accuracy prior to entering Patient Run Mode. When the sensor clip is not stored on the verification filter, it must be verified once per month.

5. Can the blood chamber be used more than one time?
   The blood chamber is intended for single-use only.

6. After priming the circuit, what should I look for before connecting the sensor clip to the blood chamber?
   Make sure that no air is in the blood chamber after priming. Any air present in the blood chamber will cause the hematocrit reading to be inaccurate.

7. What are the default sensor clip graphs that are displayed on the Crit-Line IV monitor?
   The blood volume and oxygen saturation graphs are the default screens displayed.

8. What are the other screens that can be displayed?
   The blood volume graph can be switched to a hematocrit graph.

9. When does the sensor clip start to take measurements?
   Graphing of the data begins after the user selects Start Run and the sensor clip reads blood sensed and the hematocrit has been stable for 60 seconds.

10. How are the two types of event markers displayed?
    The symptom marker is displayed as a yellow diamond. The intervention marker is displayed as a black triangle.
FAQs (continued)

11. What is the profile that is displayed?
The profile that is displayed is the average percent change in blood volume ($\Delta BV\%$) of the previous 15 minutes of data gathered. If the $\Delta BV\%$ is $\leq -3\%$ per hour, the profile will be displayed as Profile A. If the $\Delta BV\%$ is $>-3\%$ per hour and $\leq -6.5\%$ per hour, then the profile will be displayed as a Profile B. If the $\Delta BV\%$ $>-6.5\%$ per hour, the profile will be displayed as a Profile C.

12. What is the estimated HB value that is displayed?
The hemoglobin value that is displayed is an estimated measurement based on the measured hematocrit.

13. How is percent change in blood volume calculated?
The percent change in blood volume is calculated from the following equation:

$$\Delta BV\% = \left(\frac{H_2}{H_1}\right) - 1 \times 100$$

$H_2$ = Initial Hct
$H_1$ = Current Hct

14. What is the default BV Alert Level?
The default BV Alert Level is OFF but will be drawn as a blue dotted line across the BV graph once a BV alert value has been entered.

15. What is the default $O_2$ Sat Level?
The $O_2$ Alert Level default is OFF but can be set from 45 to 95.

16. Can you print out the treatment profiles at the end of a treatment?
Yes, treatment profiles can be printed at the end of a treatment. Additional hardware and software are necessary in order to print patient profiles. Technical Support can be reached at 1-800-227-2572.

17. How do you clean the sensor clip?
The exterior of the sensor clip and the verification filter should be cleaned after every treatment. These can be cleaned with the standard diluted bleach solution (1:100). Wipe the sensor clip clean with a cloth dampened with a cleaning solution; do not spray the solution directly onto the sensor clip or immerse the sensor clip into any type of liquid.

18. Can the sensor clip still be used if it continues to fail verification?
No, if the sensor clip continues to fail verification, it is no longer suitable for clinical use unless it can be re-calibrated (see User’s Guide).

19. What do I do if a sensor clip fails to calibrate?
The sensor clip must be taken out of service. Contact Technical Support at 1-800-227-2572.
Crit-Line IV Monitor In-Service Training Checklist

Facility Name: ___________________________ Date: ________________
Address: __________________________________________________________________________
City: ___________________________ State: __________ Zip: __________
Contact: ___________________________ Phone: ________________
Instructor: ___________________________ Title: ___________________________

Training Topics: Topics may be modified to accommodate the specific policies and procedures of the unit being trained. Checks indicate topics reviewed during In-Service Training; no representation is made regarding participant competence or expertise.

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Instructor’s Signature: ___________________________