

 <p style="text-align: center;"><b>DIVISION OF ADULT INSTITUTIONS</b></p> <p style="text-align: center;"><b>POLICY AND PROCEDURES</b></p>	<b>DAI Policy #:</b> 500.31.28	<b>Page</b> 1 of 6
	<b>Original Effective Date:</b> 11/04/13	<b>New Effective Date:</b> 11/04/13
	<b>Supersedes:</b> N/A	<b>Dated:</b> N/A
	<b>Administrator's Approval:</b> Jim Schwochert, Administrator	
	<b>Last Reviewed, No Changes:</b> 11/22/16	
	<b>Required Posting or Restricted:</b> <input checked="" type="checkbox"/> Inmate <input checked="" type="checkbox"/> All Staff <input type="checkbox"/> Restricted	
<b>Chapter:</b> 500 Health Services		
<b>Subject:</b> Crit-Line Monitor		

**POLICY**

Division of Adult Institution dialysis units shall utilize the Crit-Line Monitor at a minimum of once monthly per inmate patient as a tool to optimize fluid removal during the hemodialysis treatment. The Crit-Line Monitor measures Hematocrit, percent change in blood volume and oxygen saturation.

**REFERENCES**

Crit-Line 111 Transcutaneous Access Blood Flow User Manual, Hema Metrics. 2008  
Core Curriculum for Nephrology Nursing, American Nephrology Nurses Association, 2006  
Crit-Line QuickStart Guide, Fresenius Medical Care, 2009-2011  
Nephrology Nursing Scope and Standards of Practice, 2007

**DEFINITIONS, ACRONYMS AND FORMS**

Advanced Care Provider (ACP) – Provider with prescriptive authority.

BV – Blood volume

CLM – Crit-Line Monitor

DOC-3023D – Prescriber's Orders (Standard Orders – Hemodialysis)

DOC-3674 – Hemodialysis Crit-Line Monitor Verification Log Sheet

DOC-3687 – Crit-Line Monitor Flowsheet

Hct – Hematocrit

Hgb – Hemoglobin

PRR – Plasma refill rate

RTD – Remaining time of dialysis

UF – Ultrafiltration

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## PROCEDURE

- I. **Priming of Blood Chamber and Initiating the Dialysis Treatment**
  - A. Remove the CLM blood chamber from the sterile package and inspect it for signs of damage.
  - B. Attach the CLM blood chamber to the arterial fitting of the dialyzer and the arterial blood tubing. For instructions on priming the blood chamber after the dialysis machine has been prepared, refer to the CLM User Guide, Section 2.2.
  - C. Ensure all connections are tightly secured.
  - D. Prime the entire dialysis circuit with saline and remove air bubbles trapped in the chamber.
  - E. Inspect the CLM blood chamber to ensure it is fully primed with flowing saline, absent of leakage and air bubbles.
  - F. Complete the dialysis machine testing.
  - G. Initiate the dialysis treatment.
  - H. Attach the sensor clip attachment to the CLM blood chamber once the blood is circulating through the dialyzer and the blood pump is running.
  - I. Turn the crit-line power switch on.
  - J. Use the up and down arrows to select options:
    1. "Output Options" to print data from prior treatment if necessary.
    2. "Memory Clear" and select "yes" to clear the memory on the menu key.
    3. Complete verification of the CLM if not already completed by selecting "Calibration" then "Verify Accuracy". Document on DOC-3674. Arrow down to "Return" then select.
    4. "Patient Run" on the Main Menu Screen.
    5. "Initial Date" to program the CLM with the inmate patient name and DOC number for identification.
    6. "Set-Up" menu and press "Select". This screen can be bypassed by simply pressing the "Select" key. This screen will automatically revert to the Profile screen after 10 seconds.
    7. "Main Menu."
    8. "Patient Run." Wait 3-5 minutes with the blood pump at > or equal to 150 ml/min to ensure blood is flowing in circuit.
    9. Press Select to initiate "Start Run".
    10. Verify that the BV graph begins at zero.
    11. If battery power fails, turn power off, reattach power supply, wait 20 seconds, turn power back on.

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## II. **Monitoring an Inmate Patient**

- A. Blood volume monitoring shall be utilized in conjunction with the clinical assessment by the Registered Nurse and medical history of the inmate patient.
- B. Activation of the CLM will provide the inmate patient's current Hct and oxygen saturation on the screen. Document this information on the DOC-3687 – Crit-Line Monitor Flowsheet. The Hct limit will blink on the CLM and display asterisks.
- C. Manually enter the HCT limit for the inmate patient by utilizing the up arrow on the screen. Hct limit adjustments are made accordingly:
  - 1. The Hct limit for the first hour shall be no more than two Hct points above the current Hct based on the inmate patient's dialysis treatment history.
  - 2. After the Hct limit is met and the alert alarm is activated the Hct limit shall be increased one point at a time thereafter as the inmate patient tolerates.
  - 3. When the inmate patient's Hct rises to the level of the Hct limit, an audible warning will sound and the red light located between the arrow keys will flash.
  - 4. To silence alarm, press any key.
  - 5. Assess the inmate patient's tolerance of treatment and if indicated, adjust the Hct alarm setting by pressing the menu button followed by the up or down arrow to raise or lower the Hct alarm value limit.
- D. The percentage of BV change, oxygen saturation and Hct shall be assessed every 30 minutes, and more often as clinically indicated.
  - 1. Always treat the inmate patient first, then the CLM.
  - 2. The Hct and BV profiles will be inversely proportionate.
- E. Hypoxemia can result in low blood pressure. Hypoxemia may occur with an acceptable oxygen saturation in the presence of a low Hct/Hgb as the oxygen carrying capacity may be low. The type of dialysis access shall be considered in evaluating oxygen saturations.
  - 1. Acceptable oxygen saturation for arterial blood (fistulas, grafts) is > 90% or per specific ACP order.
  - 2. Acceptable oxygen sat for venous blood (central venous catheter) is 60-80% or per specific ACP order.
  - 3. Utilize oxygen therapy per DOC-3023D – Prescriber's Orders (Standard Orders – Hemodialysis) or other specific ACP Order.
- F. Follow recommendations for BV Profile A, B and C per Crit-Line Quick Start Guide.
  - 1. Blood volume change should not exceed -15% per treatment.
  - 2. Inmate patients with good cardiac function can average -3% to -8% BV change per hour, but no greater than -15% total per treatment. Those with

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a compromised cardiac status shall be monitored to remove equal to or less than -3% BV per hour.

3. The following applies to Profile "A":
  - a. May represent fluid overload.
  - b. At the start of the treatment, wait 10 minutes before changing or increasing goal. The PRR is exceeding the UF rate. The profile appears as a flat, positive or a slope slower than the -3% BV changes per hour.
  - c. An acceptable exception is when the dry weight check is conducted for 10-15 minutes and the curve becomes flat. These inmate patients may already be at their Hct threshold.
  - d. May be present in conjunction with a rapid decrease in blood pressure if the inmate patient is taking vasodilating medications.
4. Profile "B" demonstrates consistent fluid removal with a UF rate greater than the PRR, but at a rate that is well tolerated. The profile resembles a 45 degree angle, obtaining a gradual BV slope of -3% to -8% per hour to a total change of approximately -10 to -15% for the average inmate patient.
5. Profile "C" requires immediate intervention as it represents an impending "crash" because the plasma refill rate is not able to keep up to the UF rate. This is demonstrated by > -8% BV change per hour.

### III. **UF Goal Adjustments**

- A. Increases shall be between 100-500 ml each every 20-30 minutes until the slope is at least -3%. Use the arrow keys to mark events/changes in treatment on the screen.
- B. An ACP order shall be obtained for goal adjustments > 2000ml total per treatment above the present estimated dry weight. Some inmate patients may only tolerate a lesser amount. Consult with the ACP accordingly.
- C. Monitoring with the CLM shall be completed prior to the rinse-back procedure. Plasma refill shall be assessed with each CLM usage to assist in determination of estimated dry weight and plasma refill. The inmate patient may not be at target weight if BV increases by > or = to 1.5% or Hct decreases by > or = to 0.5 mg/dL. Two methods can be utilized to accomplish this:
  1. Turn UF to minimum for 10 minutes and assess plasma refill and evaluate BV change and Hct. Document BV change, Hct, and O2 Saturation result on DOC 3687 – Crit-Line Monitor Flowsheet.
  2. At the initiation of the dialysis treatment set the UF clock to 15 minutes less than the RTD clock. At the end of the UF time wait until the RTD clock alarms and evaluate BV change and Hct. Document BV change, Hct, and O2 Saturation result on DOC-3687 – Crit-Line Monitor Flowsheet.
- D. Turn CLM "Off" or select "Stop" before saline rinse back procedure.
- E. Results may be printed for ACP review as indicated.

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#### IV. **Care and Maintenance of the CLM**

- A. The outside surfaces of the sensor clip shall be cleaned with the chlorine bleach 1:100 dilution between inmate patient treatments. Cleaning agents shall be wiped on, not sprayed. Do not immerse the sensor clip. Allow it to dry completely before using.
- B. The CLM outer casing shall only be cleaned with a standard bleach solution. The cleaning agent shall be wiped on, not sprayed.
- C. Annual maintenance of the CLM shall be completed by the designated biomedical technician, or from the local CLM distributor, as needed.
- D. The CLM shall be calibrated by the manufacturer and may require no further calibration unless verification does not pass.
- E. The CLM is equipped with a verification meter to ensure accuracy. The meter shall be verified for accuracy prior to each use and documented on the DOC-3674 – Hemodialysis Crit-Line Monitor Verification Log Sheet. Refer to the CLM User Manual, Section 5.5. If the Crit Line Monitor does not pass verification, calibration shall be completed.
- F. The CLM shall be plugged in at all times with the power switch off when not in use. When plugged in, a green light will illuminate on the key pad.
- G. Spot Checking
  1. Spot-check measurements may be taken for Hct and oxygen saturation values of multiple inmate patients on the same dialysis shift.
  2. Refer to the CLM User Manual, Section 5.4 for instructions on performing Spot Check measurements utilizing the CLM.

**Bureau of Health Services:** \_\_\_\_\_ **Date Signed:** \_\_\_\_\_

James Greer, Director

\_\_\_\_\_ **Date Signed:** \_\_\_\_\_

Ryan Holzmacher, MD, Medical Director

\_\_\_\_\_ **Date Signed:** \_\_\_\_\_

Mary Muse, Nursing Director

**Administrator's Approval:** \_\_\_\_\_ **Date Signed:** \_\_\_\_\_

Jim Schwochert, Administrator

**DIVISION OF ADULT INSTITUTIONS FACILITY IMPLEMENTATION PROCEDURES**

<b>Facility:</b> Name		
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<b>Chapter:</b> 500 Health Services		
<b>Subject:</b> Crit-Line Monitor		
<b>Will Implement</b> <input type="checkbox"/> As written <input type="checkbox"/> With below procedures for facility implementation		
<b>Warden's/Center Superintendent's Approval:</b>		

**REFERENCES**

**DEFINITIONS, ACRONYMS, AND FORMS**

**FACILITY PROCEDURE**

- I.
  - A.
  - B.
    - 1.
    - 2.
      - a.
      - b.
      - c.
    - 3.
  - C.

II.

III.

**RESPONSIBILITY**

I. Staff

II. Inmate

III. Other