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NEPHROLOGY PROGRAM
DEPARTMENT POLICIES AND PROCEDURES

Hemodialysis - Section 10 - Gambro Artis - Neph 10-10
Single Needle Double Pump (SNDP) Hemodialysis using Gambro Artis Machine
No.: 01550 (TOH Standardized Policy Number)

ISSUED BY: Hemodialysis Clinical Practice Committee	**DATE OF APPROVAL:** 2015/12
APPROVED BY: Program Clinical Director & Division Head	**LAST REVIEW/REVISION DATE:** 2018/02
CATEGORY: Medication	**IMPLEMENTATION DATE:** 2015/12

PURPOSE:

- To prepare the Gambro Artis hemodialysis machine for a Single Needle Double Pump (SNDP) hemodialysis treatment maintaining aseptic technique and adhering to Routine Practices
- Single needle hemodialysis treatment is a viable option to avoid multiple cannulation attempts and/ or to reduce the need for insertion of a Hemodialysis central venous catheter (CVC)

CRITERIA for (SNDP):

- In the event that:
  - Only one needle can be successfully inserted into the fistula
  - One of the cannulation sites has infiltrated during the hemodialysis treatment and successful insertion of a second needle is uncertain
- The following three scenarios for using SNDP will be outlined in the Procedures section of this policy:
  - **Planned SNDP:** Prime with single needle (SN) tubing. Aware to cannulate one needle only prior to starting treatment.
  - **Planned SNDP**: Prime with SN tubing. Based on nursing assessment the nurse is able to cannulate with two needles prior to starting treatment. Start as SN and change to double needle (DN) modality with the option to switch back to SNDP during the treatment if complications develop **(refer to section F**).

- **Unplanned:** Complications arising during double needle (DN) treatment leading to the need to switch the circuit to SNDP setup to provide SNDP treatment (**refer to section E**).

BACKGROUND STATEMENTS:

The Gambro Artis will be prepared (concentrates opened and conductivity attained) **no more than three hours prior to the patient's hemodialysis treatment**

- Supplies (Normal Saline 0.9% (NS), Blood lines, Dialyzer) are to be opened just prior to preparing the machine
- Always use aseptic technique when making or breaking any fluid path connection
- Bloodlines are sterile if package is not damaged and the protective sterility caps are in place. If these caps are found loose in the package and sterility of the bloodlines is not compromised, the caps or a syringe may be applied to maintain sterility.
- Expiry dates should be checked for all supplies

DEFINITION(S):

Mean blood flow rate is visible on the main screen	The blood flow rate during one cycle: Mean of Arterial flow and Venous flow from the Blood Setting screen
Arterial Flow	Arterial pump speed
Venous Flow	Venous pump speed
Stroke volume	The volume of blood passing through the dialyzer during a cycle (20 mL to 60 mL)
SN pressure Max	Automatically calculated in accordance with the set stroke volume
SN pressure	Actual pressure in the post dialyzer chamber
SN pressure Min	Fixed at 40 mmHg

NURSING ALERTS:

- **Do not use a needle that is located below a hematoma for providing a SNDP hemodialysis treatment**
  - If hematoma develops, attempt to re-needle above area if possible
  - If unable to re-needle assess the situation and determine option to return the blood. Consult with Care Facilitator, Nephrologist and/or Dialysis Access nurse as required.
  - If clinical situation requires blood return, and blood return worsens hematoma, stop and discard circuit. Manage complications as appropriate.
- When using low blood flows for New Fistula Protocol (NFP) rounds may not be captured by NephroCare. Hourly rounds will need to be entered manually.
- Diagram of SNDP tubing available as Appendix B

- **Saline administration (same infusion lines as with double needle modality)—the arterial infusion line on the Arterial blood pump.** It will take longer for the NS to infuse because the arterial and venous pumps are on alternating cycles.
- **Saline infusions for patients who are not anti-coagulated (same infusion lines as with double needle modality)—arterial and venous infusion lines on Arterial pump.**
- **Blood transfusion—Patients are at greater risk of clotting the circuit.** Infuse blood transfusion via the arterial chamber on the Arterial blood pump and monitor for evidence of clotting in the circuit by performing periodic saline flushes to visualize the circuit e.g. every half hour or more often as necessary.
- **Functions available with SNDP:** Diascan, Hemoscan (with mean blood flow >180), Isolated UF
- **Hemocontrol is not available with SNDP:** Hemocontrol is based on Hemoscan which requires a minimum flow of 180 throughout the treatment.
- **Transonic monitoring is not to be done** with single needle as this will provide inaccurate results

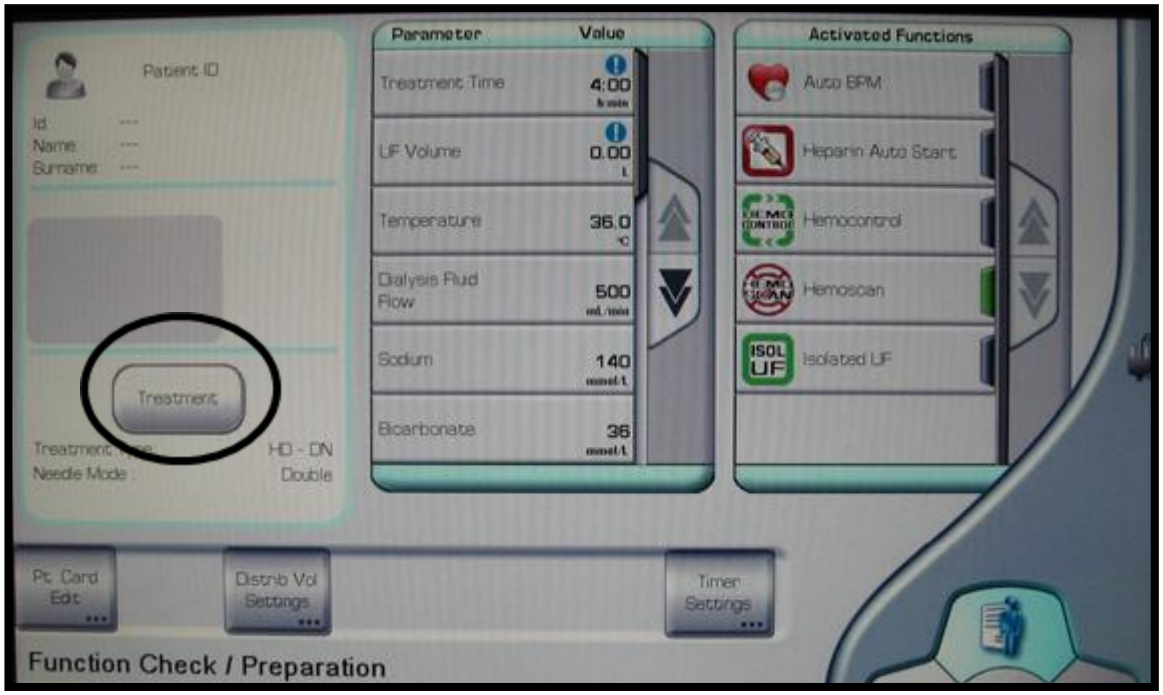
SUPPLIES:

- Gambro Artis Hemodialysis Machine
- Acidified dialysate concentrate - as prescribed
- Acid concentrate wand
- BiCart cartridge ArtiSet (SNDP) blood tubing SPD # 320905
- Two- 1-liter bags of NS for IV injection
- Dialyzer- as prescribed
- Y-connector if converting existing needle or single needle fistula needle SPD # 320925
- 1-20 mL syringe if using Y connector
- 1-18 gauge blunt needle if using Y connector

PROCEDURE:

Section A: Machine Preparation for SNDP

1. Follow machine preparation as per Neph 10-1 with the appropriate tubing.
2. For planned SNDP treatment do the following:
   - press the ‘Treatment” button to enter the “Treatment Settings” screen
   - press ‘Type” and select “HD-SN”
   - press “confirm”
   - press “close”
   - confirm Dialysate flow
   - Return to home screen



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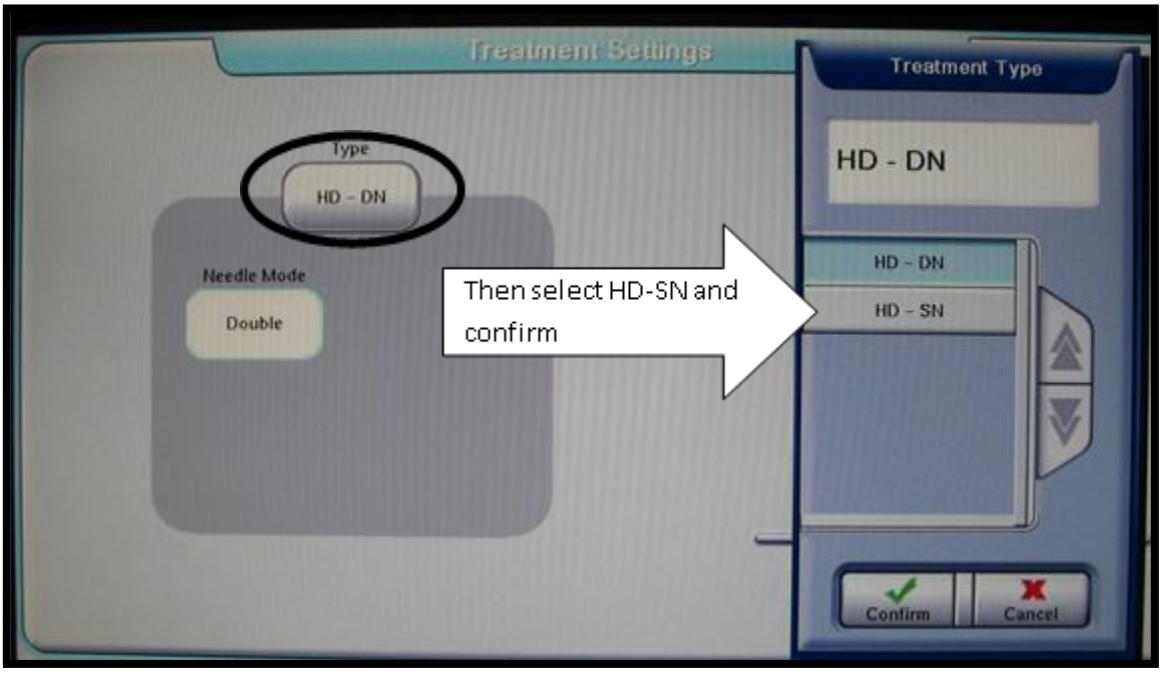


- **Clamping for cassettes:** The only open clamp on the cassettes during the prime procedure is the blue clamp attached to the saline re-infusion line on the cassette adjacent to the arterial blood pump.

  Note: The machine requires 1100 mL to prime the single needle circuit. Change NS bag before initial bag empties to prevent alarms.

- Program the single needle treatment:

  - Press the "Prescription NavPad" button to enter the prescription screen
  - The "Treatment Time", "UF Volume" and "Stroke Volume" are mandatory and identified by a blue circle with an exclamation mark in the center. If any of these parameters are not entered and confirmed, the "Connect Patient" button will not be available.

    Note: <u>The stroke volume is the volume of blood that is pumped into the expansion chamber with each cycle</u>

    - Start with a stroke volume of 30 (default) and then adjust once patient is on
    - Minimum stroke volume allowed is 20 mL, maximum is 60 mL.
    - Higher stroke volumes will give better clearances once the blood flow has been maximized for that treatment
    - After any changes in the program, it will take 3 complete cycles for the new stoke volume to be displayed

    Note: The levels in the expansion chamber will self-level during prime. Even when leveled, they will appear to be 'low' compared to the arterial and venous chambers in the arterial cassette.

3. If the dialyzer needs to be changed once the priming is complete follow the steps as outlined in Neph 10-1
4. Once the patient has arrived, press "End Low Consumption" and "Confirm". Change to second bag of NS (unless already done during prime). Press extra prime. Tap or gently shake the dialyzer to facilitate removal of air from the blood and dialysate compartments.
5. Verify that there is no air present in the circuit. If air is present perform an extra prime.
6. Follow the machine instructions to prepare to connect the patient
7. The Artis is now ready for patient connection

Section B: Patient Connection for SNDP

1. Prepare supplies as per Neph 5-01 adding Y connector and extra syringe with NS
2. Prime Y connector with NS and clamp. Ensure there is no air in the connector.
3. Insert needle as per Neph 5-01

   - For planned SNDP treatment, luer lock the Y connector to the fistula needle or Teflon needle

4. Connect machine bloodline to patient's fistula access

5. The machine will alternately pull blood from the access and return NS to the patient with each cycle to fill the circuit. This alternating pull/push will continue through-out the run.
6. Initial blood flow to fill the circuit starts at a mean of 50 mL/min. This may be increased to a mean of 70 mL/min while the circuit is filling. The venous pump will run 30% faster than the arterial pump.

    - Once blood is detected in the venous portion of the cassette, the blood pump will stop. Verify that both lines are connected to the patient and re-start the blood pump.

7. Increase pump speed using the blood flow hard keys on the front of the machine

8. As soon as the blood is detected by the machine in the venous patient line, the "**Blood Settings**" button becomes available in the blood screen. To check/adjust single needle parameters:

    i. Press "**Blood Settings**" button in the Blood Screen (appendix A)
    ii. Begin to optimize blood flow for arterial (max pressure -260) and venous (max pressure +260) pressures, as per program standards. Observe the arterial pressure during the arterial cycle and the venous pressure during the venous cycle. The set and actual stroke volume will change as you adjust parameters.
    iii. A higher stroke volume means less access recirculation. Maximizing arterial blood flow will shorten the arterial phase. This will increase the cycles which increases mean blood flow rate.
    iv. Each time the set mean blood flow (average blood flow) is changed, the ratio arterial flow\venous flow is changed
    v. When the "Blood Setting" sub-screen is open, the blood flow hard keys on the front of the machine are disabled

9. Optimize stroke volume to further improve clearances:

    vi. Open the Blood Screen
    vii. Press the "Stroke Volume" button: a keypad opens
    viii. Enter the new stroke volume in the following range (20 mL to 60 mL with default 30 mL)
    ix. Press "Confirm" on the keypad
    x. **Note:** after any changes in the program, it will take 3 complete cycles for the new data to be displayed

Section C: During treatment - Assessing Single Needle Treatment and Troubleshooting

1. During treatment, the **mean blood flow** (average flow) is displayed on the home screen
    a. To view details of the blood flows during the different phases of the cycle, press the "Blood Screen" on the Navpad and then 'Blood Setting" (appendix A)

2. Maintain the levels in the arterial and venous chambers on the arterial cassette at the frosted line using a 10 mL syringe

a. **Note:** to adjust the chamber levels, you must pull up or push down during the corresponding part of the single needle cycle

3. **Levels in the expansion chamber** should not be adjusted unless you see that it is pulling in an air bubble. The venous expansion chamber can be raised slightly by attaching a syringe and pulling up the level SLIGHTLY while the expansion chamber is filling. Do not overfill.

4. **Any time changes are made** e.g. increasing the blood flow or increasing the stroke volume, it will take 3 full cycles for the machine to display the new data

5. **Air in Venous line alarm** is handled in the same manner as for DN treatments. Clamp just before the inflow into the venous chamber as well as below the venous line clamp and distal to any air. Use help button as required.

6. **Recirculation of blood**: give NS flush to clear circuit, then press "special procedures", and select "pause treatment." Follow machine prompts for recirculation.

7. ***Manual rinseback***
    a. Switch the machine OFF
    b. Using a blue clamp, clamp the venous line under the venous line clamp
    c. Clamp the arterial patient line and the arterial access line
    d. Carefully remove the arterial and venous patient lines from the arterial and venous machine clamps
    e. Ensure you have at least 500 mL in the saline bag on the IV pole
    f. Open the Venous pump cover and manually extract hand crank followed by manually removing the pump segment from the rotor.
    g. Open the Arterial pump cover and extract the hand crank
    h. Open the sensor bar door and check for any air bubbles in the lines (no alarms will be active)
    i. Open the saline line and attached arterial administration port
    j. Remove blue clamp from the venous patient line
    k. Check that all the cassette clamps are closed, except for the clamp on the line connected to the saline bag
    l. Slowly turn the blood pump hand crank counter-clockwise to return the blood to the patient. Watch for air in the venous patient line.
    m. When the blood has been returned and the line is clear, close the clamps on the venous patient line and access
    n. Open the clamps on the arterial patient line and access
    o. Allow the arterial line to clear by gravity or by gently squeezing the saline bag. Watch for air in the arterial patient line.
    p. When the blood has been returned and the line is clear, close the clamps on the arterial patient line and access
    q. Discontinue access from patient blood lines as per policy Neph 5-02 (# 00742) or Neph 6-02 (# 00749)

Note: Failure to remove the venous pump segment, remove patient lines from venous or arterial machine clamps, or to open appropriate clamps on the machine can result in rupture of blood lines or dialyzer when hand cranking the arterial pump.

To remove the pump segment from the rotor on venous side (left side of the machine when facing it):

- extract the hand crank
- rotate the pump segment while pulling slightly until comes out easily
- you should not pull forcefully

Section D: Discontinuation of treatment

1. Press “stop treatment”, clamp arterial bloodline. Open the clamp on the NS reinfusion line and the arterial medication port that is attached to the reinfusion line.
2. Press ‘Rinseback’ and ‘Confirm.” The blood pump will begin to rinse back the patient’s blood in the same manner as for DN rinseback. Press ‘Empty Bicart.’
3. Once the venous portion of the line is clear, clamp the venous bloodline and allow the arterial bloodline to rinseback by gravity observing the drip chamber for clots or air

Note: If bloodwork is to be done post dialysis, it must be drawn from the patient’s fistula needle **AFTER** rinseback. Use a 10 mL syringe to aspirate saline from needle tubing and discard. Use a vacutainer and needle adaptor to draw sample (similar to usual pre-dialysis collection). Flush needle with NS.

Section E: Changing from DN to SNDP after treatment has started

1. Attempt to rinse back, unless there is a hematoma at the venous needle site
2. Remove needle and hold site until hemostasis has occurred
3. Press “change circuit” and follow instructions to remove double needle circuit
4. Press treatment button to enter the “Treatment Settings” screen. Press ‘Type” and select “HD-SN”, Press “close”, confirm Dialysate flow and close.
5. Load and prime single needle circuit as per Section A
6. While machine is priming prepare access for SNDP. If you need to re-needle, assess need for metal needle versusTeflon needle. Obtain a “Y” connector and prime both limbs with NS.
7. Follow steps in section B for patient connection

Section F: Start Treatment with SNDP set up using the DN Modality

1. This option is used when you are able to cannulate two needles but would like the option to switch from DN to SNDP during the treatment
2. The prime is completed using the SNDP modality
3. Proceed to patient connection. Once "Connect Patient" is pressed you can press Special Procedures to select Switch to DN.
4. To return to SNDP option during the treatment press Special Procedures and select SNDP. **Note:** you will need to enter a stroke volume back to default of 30 mLs and confirm.
5. If patient card is scanned when the machine is still in double needle mode the parameters will transfer over once mode changed to single needle. However, if patient card is scanned when the machine is in single needle mode the card parameters will not transfer if changed back to double needle.

DOCUMENTATION:

1. In 'Incidents' select 'Single Needle DP'

2. At the end of treatment enter a progress note outlining average blood flows, stroke volume achieved and patient tolerance of treatment

RELATED POLICIES / LEGISLATION:

1. Nephrology Policies and Procedures - Hemodialysis - Section 05 - AV Fistula/Graft - Neph 5-01 (#00741) Initiation of Hemodialysis using an Established Arterio-Venous Fistula/Graft using the Gambro Artis Hemodialysis Machine

2. Nephrology Policies and Procedures - Hemodialysis - Section 05 - AV Fistula/Graft - Neph 5-02 (#00742) Discontinuing Hemodialysis for a Patient with a Fistula/Graft using the Gambro Artis Hemodialysis Machine

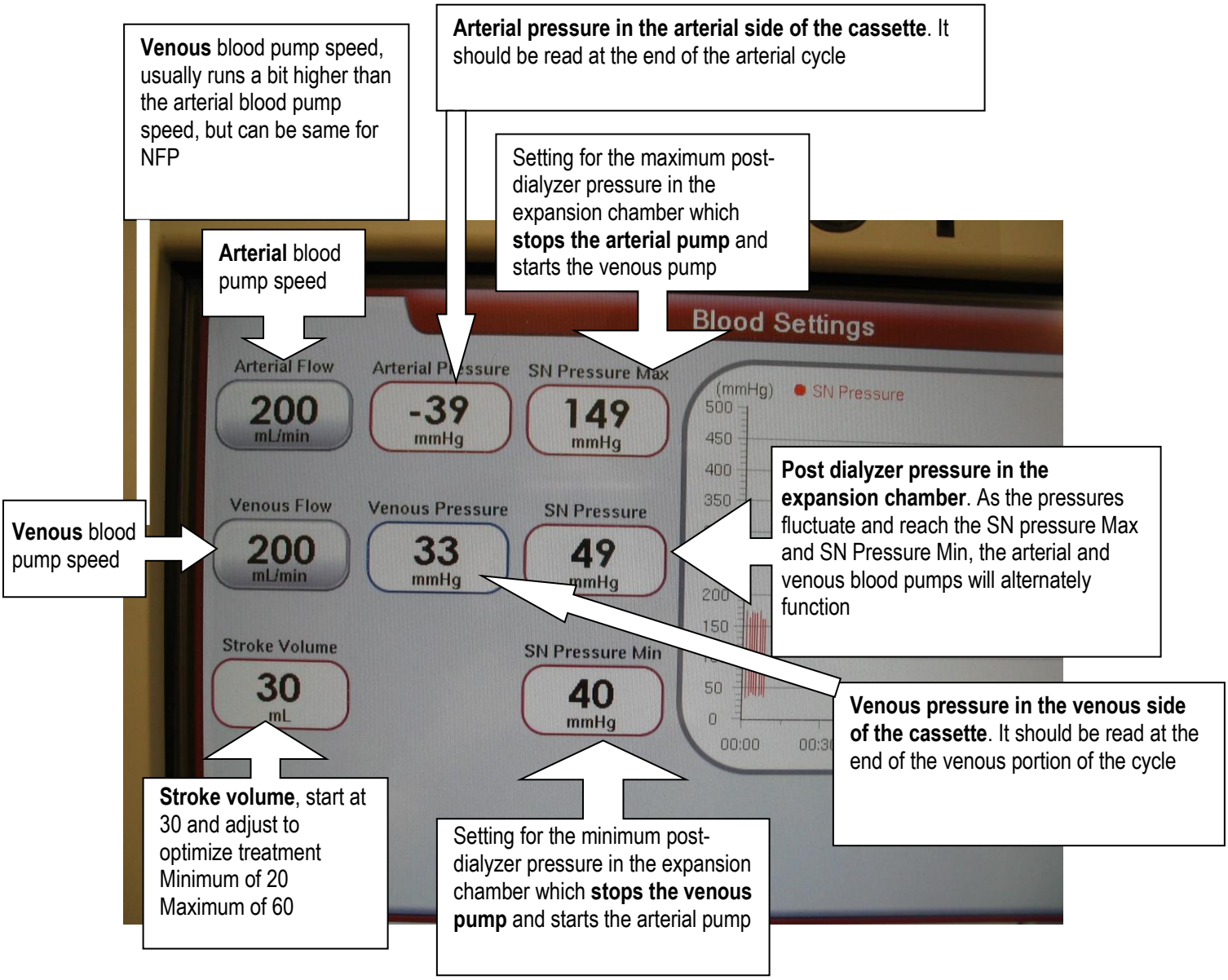
3. Nephrology Policies and Procedures - Hemodialysis - Section 10 - Gambro Artis - Neph 10-01 (#01160) Preparing the Gambro Artis Machine for Double Needle Hemodialysis

REFERENCES:

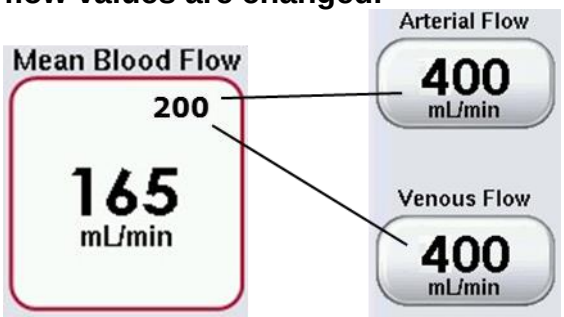
1. Gambro Artis User Manual, 2012 Version 8.09

COMMENTS / SIGNIFICANT REVISIONS:

Appendix A



The Mean Blood Flow is automatically recalculated when arterial or venous flow values are changed.



Appendix B