



MANITOBA RENAL PROGRAM

SUBJECT <ul style="list-style-type: none"> ▪ Single Needle Double Pump on the Formula 2000 	SECTION 50.30 Home Hemodialysis – Bellco
	CODE 50.30.02
AUTHORIZATION <ul style="list-style-type: none"> ▪ Professional Advisory Committee, Manitoba Renal Program 	EFFECTIVE DATE November 2014
	REVISION DATE October 2017

PURPOSE:

1. To control and monitor the blood flow through the extracorporeal circuit during Single Needle Double Pump Dialysis
2. To control and monitor the dialysate flow through the dialysate flow path during Single Needle Double Pump Dialysis
3. To maintain a pathogen free blood circuit during Single Needle Double Pump Dialysis

POLICY:

1. Registered Nurses (RN)/Licensed Practical Nurses (LPN) as per facility that received instruction and who have demonstrated competency in Single Needle Double Pump use of Formula 2000.
2. Home Hemodialysis Nurse Patient Educators, who have previously demonstrated competency with use of Single Needle Double Pump on the Formula 2000, may instruct patients to perform independent Single Needle Double Pump hemodialysis with the Formula 2000.
3. Acid clean/heat disinfection performed at the end of the treatment day.
4. Disinfection Chemical Full (Bleach) is performed at least once per week or per Unit guidelines and following a blood leak (Blood Leak Alarm: responding by a nurse in Dialysis).
5. A 2-litre rinse is required for dialyzers when a nursing assessment determines that the biocompatibility of the dialyzer is an issue.

EQUIPMENT:

- Formula™ 2000 (2 blood pumps)
- 2- 1L 0.9% NaCl
- 3 syringe 20mL
- Dialyzer (per physician order)
- 18 gauge blunt needle
- Alcohol swab
- Acid Bath (per physician order)

KEY POINTS:

- Ensure all supplies are not expired

- Liquid Bicarbonate or Bicarbonate Cartridge per unit protocol
 - “Y” priming bag
 - Bellco arterial bloodline
 - Bellco venous bloodline (ie. V328-4) with venous blood pump segment
 - Transducer.
 - Forceps
 - Single needle for fistula with Y connector(sharp or blunt)
 - Heaprin Sodium
- Fresenius drain bag
 - Required for initiation of treatment

PROCEDURE:

1. Start the Reverse Osmosis (RO); Aquaboss EcoRO Dia 702 Once the 2nd line of the display on the RO reads OPERATION start the Formula
2. Turn on main power switch at rear of machine (if not already on)
3. Press the POWER BUTTON on the front of the monitor to turn on the machine.
4. The auto diagnostic tests will run for several minutes:
 - Ensure the Formula reads RUNNING AUTO TEST on the monitor. (2-3 min).
 - Ensure the Formula reads RINSING/SELFTEST in the upper left status bar once rinsing has started (5 min).
 - DO NOT CONNECT THE TRANSDUCEUR PROTECTORS OR HEMOX TUBING until after the auto test is complete.
5. SYSTEM READY appears.
 - Press OVERRIDE to quiet alarm.
6. Press “select dialysis”.
 - Ensure “single needle double pump” is highlighted and “Bidry + STD A Conc” per unit protocol.
7. Press OK to verify

KEY POINTS:

- See procedure 30.30.01 *Use of AQUABOSS EcoRO Dia 70 RO System* or 30.30.02 *Use of Fresenius AquaC UNO H RO system*
- Ensure the Formula is connected to an appropriate electrical source and drain.
- Main switch is left on to facilitate adequate charge of battery.
- LED will turn from orange/yellow to green
- The auto test and self-test must be done. The tests ensure the Formula is functioning and will provide a safe dialysis.
- The auto test is complete when SELECT PRIMIMG appears on the right hand side of the monitor screen.
- During self-test note if the battery icon is red, turn main switch off and back on to attempt to reset the icon to green. If the battery icon remains red there may not be battery back-up in the event of a power interruption.
- The self-test is complete when SELECT DIALYSIS appears on the right hand side of the monitor screen.
- The Formula™ will remain quiet until start of dialysis treatment
- If using liquid bicarb ensure: BIC + STD A Conc” is highlighted.
- Top right of main screen blood side window will read, “Priming SNdp” (single needle double pump)

A. Set Up Dialyzer and Bloodlines:

1. Hang 2 litres of 0.9% NaCl on the IV pole.
2. Place dialyzer in holder venous end up

PROCEDURE:

KEY POINTS:

B. Install Venous Blood line

1. Remove the venous bloodline from the package ensuring all the end caps and connections are tight.
 2. Install venous bloodline:
 - Hang priming bag on the pole and check that connection to venous line is snug.
 3. Place large expansion chamber in holder left of the venous blood pump area
 - Clamp medication port.
 - Place blood line into the sensor below the large expansion chamber.
 - Attach 20mL syringe.
 4. Attach the switching monitor transducer to the switch pressure monitor
 - Leave clamp open
 - Attach 2nd transducer.
 5. Open the venous blood pump door and place the blue bloodline segment above the blue arrow.
 - Insert into the blood pump blue end at pump tubing above blue arrow.
 - Load the end of the tubing in the exit point and close the door.
 6. Place venous drip chamber in holder
 - Ensure the filter in the chamber is below the holder.
 7. Connect venous (blue) end of bloodline to the dialyzer.
- Remove prime bag included with lines and replace with "Y" priming bag will need to replace the one that comes on this line.
 - The blood pump must be vertical
 - Use the heparin "↓" (down) arrow key to semi-automatically load the blood pump segment.
 - Leave line out of the air detector and venous line clamp at this time until the chamber has been levelled with saline
 - Ensure all connections are tight

C. Install Arterial Bloodline

1. Remove the arterial bloodline from the package ensuring all the end caps and connections are tight.
 2. Place the large expansion chamber in top left corner of machine
 - Place couvette in Hemox
 - Clamp the medication line on the top of the expansion chamber.
 3. Place arterial chamber just above the arterial blood sensor.
 - Clamp the medication port at the top of the chamber.
 4. Open the arterial blood pump door and insert the red blood pump section outside of the blood pump beside the red arrow.
 - Close pump door
- Ensure the line is securely installed into the arterial sensor point.
 - Note: The closer the base of the chamber is to the arterial sensor, the less likely the chamber is to tip away from the front of the Formula™
 - The blood pump is semi-automatic loading using the Heparin up "↑" arrow key.

PROCEDURE:

KEY POINTS:

5. Press the arterial tubing below the blood pump and arterial chamber into the optical blood sensor and tubing guide below the blood pump.
 6. Connect the arterial and venous transducer lines securely to their respective transducer connectors.
 7. Connect red end of the blood line to the dialyzer.
 8. Remove the spike from the arterial tubing and attach the arterial tubing to the drain bag.
 9. Spike the 0.9% NaCl bag with administration set
 - Unclamp IV line and fill drip chamber ½ full
 - Slide clamp a T-line closer to bloodline. DO NOT CLAMP
 10. Prepare the heparin infusion in a 20 mL syringe.
 11. Attach the heparin syringe to the heparin line.
 12. Insert the Heparin Syringe in the Heparin pump:
 - Line up the heparin syringe with the numbers facing outwards.
 - Hold the flange of the syringe at the level of the clips under the syringe barrel holder.
 - Adjust the syringe plunger on the heparin pump with the up and down arrow keys beside the heparin pump until the syringe barrel and plunger slide into the mount.
 - Make sure the flange on the plunger of the syringe is secure in the slit on the plunger holder of the heparin pump.
 - Make sure the flanges on the barrel are secure in the flange holder.
 - Tighten the screw on the bottom of the syringe plunger.
 13. Press the up arrow on the heparin pump control until 1 mL of Heparin fills the heparin line.
- Check that connection of saline line to arterial bloodline is snug
 - The formula heparin pump is calibrated for a 20 mL BD syringe.
 - Preparation of heparin is a 2 nurse check (site specific)

D. Preparation of Dialysate

1. Press SELECT DIALYSIS
 - Verify the appropriate defaults are highlighted: “single needle double pump” and “Bidry + STD A Conc.”
 - Press OK to verify
- IF NOT ALREADY DONE
 - If treatment not selected prior to placing bloodlines when the Formula™ has alarmed “System Ready”.

PROCEDURE:

2. **A) Connect the Bicarbonate cartridge:**
 - Rotate the locking bracket to release the upper piercing connector.
 - Disconnect the upper piercing connector from the mobile bypass.
 - Lift the mobile bypass.
 - Place the bottom of the cartridge into the lower piercing connector.
 - Press the upper piercing connector onto the top of the cartridge.
 - Insert the upper connector into the upper clip support.
3. Press DIALYSATE PREPARATION

E. Priming:

1. The Formula should display PRIMING SNdp in the top right hand display bar.
If it does not then:
 - Press SELECT PRIMING on the left side of the monitor screen.
 - Press SINGLE NEEDLE if not already green.
 - Press OK to verify.
2. Back fill the 0.9% NaCl administration set and arterial bloodline:
 - Open the clamp on the 0.9% NaCl administration set and T line.
 - Fill the patient end of the arterial blood tubing to the drain bag
 - Clamp Y tubing of drain bag attached to the arterial tubing.
3. Set blood pump speed to ~150 mL/min.
4. Start pump Fill arterial expansion chamber to 1/3
 - Removing from holder and invert the chamber.
 - Clamp port above the chamber.
5. Fill the venous expansion chamber (above the venous blood pump), fill to ½.
 - Tighten cap and clamp the tail at the top of the chamber
6. When saline has reached the venous chamber, loosen cap at the top of the venous chamber
 - fill to 2/3
 - Tighten cap and clamp the tail at the top of the venous chamber.
 - Tap the bottom of the venous chamber to remove micro bubbles from the venous filter.

KEY POINTS:

- If using liquid Bicarbonate ensure: BIC + STD A Conc” is highlighted
 - Connect the Bicarbonate concentrate:
 - Place the bicarbonate concentrate on the left side of the concentrate shelf on the front of the machine.
 - Insert the blue concentrate wand.
 - Attach the blue concentrate line to the concentrate wand.
- Note: All patient specific treatment parameters can also be programmed once “select dialysis” has been verified.

- Ensure venous end dialyzer up to aid with de-aeration.
- Note: Both arterial and venous blood pumps will run at speed set with the arterial flow regulator.
- Note: There is not a level adjuster for this chamber.
- You will need to attach a 20mL syringe to adjust.

PROCEDURE:

7. Load venous bloodline into the air detector
 - Ensure that it is completely inserted in the sensor.
8. Load the venous bloodline into the venous clamp .
9. Tap and rock dialyzer to remove air with venous end up.
10. Blood pump will stop automatically when 800mL 0.9%NaCl infused.
11. Clamp below priming bag
 - Open clamp at “Y” drain bag
 - Change to new bag of 0.9%NaCl,(if needed)
12. Leave the saline open
 - Ensure clamp(s) open on the arterial and venous bloodlines.
13. Turn blood pump on and set speed for recirculation per unit protocol (400mL)
14. Perform level detector test.
15. Once the Formula™ has entered BYPASS
 - Turn dialyzer red end up
 - connect dialysate hoses to the dialysate ports on the dialyzer
 - press “bypass” key to prime the dialysate compartment.
16. Prime dialysate compartment of the dialyzer as in above if not already done.

KEY POINTS:

- The venous clamp will open automatically once the venous chamber has been filled.
- Note: Never open the venous clamp to load the bloodline with the blood pump running, as high venous pressure alarms will occur
- Ensure dialyzer is deaerated.
- Continue to prime dialyzer.
- Note: The Formula™ can be configured to automatically stop the blood pump when recirculation time is complete.
- Press DIALYSATE PREP (if not already done)
- Allow dialysate to fill with arterial end up.

F. Initiating SNDP Treatment

1. Program patient parameters.
 - Ensure that all chamber heights are at levels recommended throughout this procedure, as room to expand volume inside the blood circuit is needed.
2. Spike new 0.9% NaCl
 - Open small clamp on venous side, open small clamp on arterial side
 - Allow 0.9%NaCl to flush arterial side by gravity.
 - Close small clamp on arterial side, open small clamp on venous side
 - Start blood pump at 300ml/hr.
 - Only required if 0.9% NaCl backed up into drain bag.
 - NB: Ensure drain bag clamp open.
 - Ensure 400ml refreshes the system.
3. Close 7 clamps.
4. Connect arterial and venous bloodlines to saline primed “Y” connector at access site.
 - Ensure using single needle dialysis needle

PROCEDURE:

5. Clamp off saline, and open all patient clamps.
6. Turn arterial blood pump on and set speed to 150mLs/min.
 - Start blood pump
7. The arterial blood pump will stop when blood is detected at the sensor below the arterial chamber.
 - Restarting the blood pump will initiate the arterial pump drawing blood into the circuit, with the venous pump then running to return blood to the patient.
8. Formula™ will automatically enter connect mode when blood is detected at the arterial sensor (below the arterial chamber).
9. The default STROKE is usually set to 17 mL, but can be configured to unit specifications.
10. Slowly increase the arterial blood pump speed (Qb)
11. Once arterial blood pump speed has been reached, increase the STROKE.
 - Press SEE/MOD PARAMETERS
 - BLOOD
 - STROKE.
 - Use the right “→” arrow key to set the volume,
 - Press “ok” to verify.
12. To view venous blood pump speed,
 - Press SEE/MOD PARAMETERS
 - Press SEE OTHER PARAMETERS

G. Rinseback

1. When dialysis is finished, “END UF” will display in amber at the bottom of the main screen alarm bar.
2. Press RINSEBACK,
 - Press “ok” to confirm.
3. Clamp arterial clamp at patient “Y” access,
 - Disconnect bloodline from needle, attach syringe to end of needle.
 - Attach arterial bloodline to 0.9%NaCl administration line.
 - Open saline .
 - Turn blood pump to 150mLs/min to 200ml.
4. Turn on the blood pump.
 - Pumps stops automatically when more 0.9%NaCl detected then blood in venous

KEY POINTS:

- Note: It is necessary to run the pump speed at this speed to ensure switching pressure can be reached and activate the venous blood pump.
- As blood enters the circuit, follow same steps as with double needle dialysis re: activation of Heparin, Heparin bolus, and activation of UF.
- The goal is generally 350-400mLs/min. to ensure a mean blood flow (Qbm) of at least 150mLs/min.
- The recommended stroke for SNDP is 23-30mLs
 - Increase by increments of 3
- Pressure commutation (pc) is the switching pressure, and is also displayed on the main screen
 - Set at 50-70
 - Efficiency alarms set at 0.7-1.2
- “Qb vene” displays the venous blood pump speed
- Efficiency, litres processed, and arterial pump speed are also displayed on this screen.
- The UF rate will also turn amber and read 0.1Kg/hr.
- The blood pump will stop automatically.
- The Formula™ will run both blood pumps at the speed set with the arterial (red) dial.
- Both pumps will stop when diluted blood is detected in the venous chamber.

PROCEDURE:

chamber.

KEY POINTS:**H. Discontinuing dialysis**

1. See procedure 50.30.01 Bellco (Formula 2000)
– Delivery System, Use of for discontinuation procedure.
- Tear down procedure will only have the addition of removing the venous blood pump segment, additional expansion chamber, and switch pressure transducer connector (refer to Discontinue Dialysis procedure if needed.).

DOCUMENTATION:

- Hemodialysis Treatment Worksheet
- Hemodialysis Flowsheet
- IPN to patient record as required Treatment

REFERENCES:

Formula 2000 Plus Information Binder