

PROTOCOL FOR: Ultrafiltration (for Patients with CHF) using the Aquadex System

PURPOSE: To describe responsibilities of health team members related to initiation, maintenance and monitoring of ultrafiltration therapy for patients exhibiting fluid overload secondary to CHF, and to outline related patient care.

SUPPORTIVE STATEMENTS:

1. The Aquadex System is indicated for ultrafiltration treatment of patients with fluid overload who have failed diuretic therapy and require hospitalization.
2. Patient selection as outlined below:
 - a. Signs and symptoms of fluid overload
 - 1) 10 lbs over dry weight, dyspnea, edema
 - b. Inadequate diuretic and/or natriuretic response
 - 1) Net fluid output < 125 ml/hr or 1500 ml in 12 hours, net fluid = urine output - fluid intake
 - c. Exclusion of patients
 - 1) In which venous access cannot be achieved or requiring renal clearance (e.g. serum creatinine sCr > 3.0, creatinine clearance < 15ml/min)

POLICY:

1. Cardiology evaluation is required, and renal consultation is recommended prior to initiating ultrafiltration. Cardiology, Nephrology and ICU are the only services allowed to write ultrafiltration orders.
2. The preferred access catheter is a 6 FR dual lumen dELC (extended length peripheral catheter) 20 cm or a 7 French dual lumen central venous catheter. A Quinton catheter may be used per MD/APRN order. The attending cardiologist is responsible for consulting a credentialed provider to obtain this access.
3. An ultrafiltration standing order sheet will be utilized and desired pre-treatment labs, anticoagulation therapy, fluid removal rate, duration of therapy, notification parameters (HR, SBP) and post-treatment labs will be indicated in the orders.
4. All treatments will be administered per physician/APRN orders by a CSDU or ICU RN who has completed competency training on the Aquadex System.
5. The initial set-up of the Aquadex system will be performed by a CSDU or ICU trained RN. The entire system must be set up and maintained utilizing strict aseptic technique.
6. Once therapy is initiated, the CSDU or ICU nursing staff will be responsible for the maintenance of the Aquadex system, patient monitoring during the procedure, and disconnect from therapy as indicated.
7. The patient may not be transported off the unit during

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ultrafiltration. Tests which would require transport off the unit (i.e. CT, MRI) should not be scheduled during therapy time.

8. On CSDU, the patient-nurse ratio during circulating treatment is not to exceed 3:1.

DESIRED PATIENT

OUTCOMES:

1. The patient will maintain hemodynamic stability during therapy.
2. The patient will exhibit improvement of fluid overload symptoms as excess fluid is removed through ultrafiltration.

**CLINICAL
ASSESSMENT AND**

CARE:

1. Obtain patient weight and pre-treatment labwork per MD/APRN order prior to each treatment session.
2. Insert a peripheral IV for fluids/medications.
3. Administer anticoagulation therapy as ordered. Use nomogram on ultrafiltration orders. For systemic Heparin infusion, PTT range should be maintained between 80-100 (Maintain PTT 50-70 if patient is on coumadin and INR is ≥ 2).
4. Set-up, prime, connect and secure Aquadex circuit; Connection should be hub to hub for use with the 7 FR dual lumen central venous catheter or the 6 FR dual lumen extended length catheter. If a Quinton (dialysis) catheter is used, attach needleless caps prior to connecting the circuit.
5. Begin therapy as ordered and evaluate blood flow rate; Set ultrafiltrate pump rate per orders.

Note: With use of the 6 FR dual lumen dELC (extended length peripheral catheter) ultrafiltration rate should yield a blood flow rate of 25 ml/min initially and may be increased per MD/LIP order.

When central venous access is used (7 FR dual lumen or Quinton catheter) ultra filtration rate should yield a blood flow rate of ≤ 40 ml/min.

6. Monitor vital signs every 15 minutes during the first hour of treatment, then every hour (more frequently if indicated) for the remainder of the treatment.
7. Adjust ultrafiltration rate as ordered for SBP and HR parameters (usually SBP < 90, HR > 130).
8. Record intake and output on an hourly basis on the ICU/CSDU flowsheet. (Record all ultrafiltrate as output.)
9. Monitor and record patient's temperature every 4 hours during treatment.
10. Monitor the Aquadex ultrafiltration system and respond to any

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alerts/alarms per guidelines the system provides.

11. If the filter "clots" prior to the completion of therapy, notify the prescribing physician/APRN (or cardiologist/nephrologist on call) to determine if treatment will need to be restarted with a new filter.
12. Discontinue therapy as ordered, and flush/maintain catheter per peripheral central IV catheter guidelines.
13. Obtain post-treatment lab work per MD/APRN order.
14. Maintain fluid restriction as ordered.
15. Discontinue Heparin infusion when ultrafiltration completed unless there is a specific order to continue the infusion.

REPORTABLE

CONDITIONS: Notify the prescribing MD/APRN of the following:

1. VS exceeding written parameters.
2. Clotting of the Aquadex system.
3. Signs of infection or bleeding at access site.

PATIENT

TEACHING:

1. Instruct patient/significant family members as to rationale, projected outcomes and risks of the procedure.
2. Explain to the patient/family that though the patient may move in bed to position themselves comfortably, activity will be restricted to bed rest while connected to the Aquadex system.

DOCUMENTATION:

1. Document vital signs, I/O, blood flow rate and ultrafiltrate settings on the ICU/CSDU flowsheet.
2. Document treatment and patient response to ultrafiltration in a focus/DAR nursing progress note.

APPROVAL:

ICU Nursing Standards Committee
ICU Advisory Committee
Nursing Standards Committee

EFFECTIVE DATE: 4/16/08

REVISION DATES: 8/11/08

Please see attachments for helpful hints, treatment steps, re-priming instructions, troubleshooting tips and triple lumen catheter instructions for the Aquadex system (provided by CHF Solutions).

Helpful Hints for the Aquadex FlexFlow™ fluid removal system



Recommended IV access options:

- Peripheral- CHF Solutions 6Fr. Dual Lumen Peripheral ELC
- Central- 7-8 Fr Dual Lumen Central Line(Dual 14ga or Dual 16ga)
8.5Fr Quad Lumen Catheter (Use the 14ga and 16ga ports)

Ensure Catheters are patent by infusing and withdrawing 10ml/10sec

With Central Line Access the ideal blood flow is 40 mL/min. If this cannot be achieved, consider using the BLOOD FLOW button to decrease the blood flow in 5 mL/min increments until stable blood flow is achieved.

With the dELC Peripheral Line Access the starting blood flow is 25 mL/min. If this cannot be achieved, consider using the BLOOD FLOW button to decrease the blood flow in 5 mL/min increments until stable blood flow is achieved. If this is easily achieved, consider increasing the BLOOD FLOW.

For help loading the circuit and priming, use the on-screen help guide by pressing: PRIME followed by HELP

Prime the device using 500 mls or 1 liter of normal saline

During therapy, it is recommended that the patient be therapeutically anticoagulated to 2 times normal values (i.e. PTT: 80-100). Draw PTTs every 6 hours throughout treatment.

Heparin bolus and drip (if ordered) should be given 30 minutes prior to initiating treatment. Heparin should be administered via the access port of the WITHDRAWAL line.

Average Removal Rate is 250ml/hr. UF Rates are 10-500 mL/hr in increments of 10 mL/hr.

If other access is not available during therapy:

- o Blood draws may be taken from the withdrawal access port
- o IV medication can be administered through the infusion access port

If you have any questions, call the 24/7 clinical and technical toll free number: 1-866-709-4030

chf solutions®

The Aquadex™ FlexFlow™ is indicated for temporary (up to 8 hours) ultrafiltration treatment of patients with fluid overload who have failed diuretic therapy; and extended (longer than 8 hours) ultrafiltration treatment of patients with fluid overload who have failed diuretic therapy and require hospitalization. All treatments must be administered by a healthcare provider, under physician prescription, both of whom having received training in extracorporeal therapies.

Aquadex FlexFlow Ultrafiltration Treatment Steps:

1. Refer to Physician Orders and Nursing Policy and Procedure
2. Obtain Venous Access
 - Check for patency by aspirating and flushing 10ml/10second)
3. Gather Supplies:
 - Aquadex FlexFlow Pump (make sure it was plugged in! If not, plug in and charge for 30 minutes)
 - 1 UF 500 Set
 - Heparin for Initial Bolus if required in the Heparin protocol
 - Heparin for anticoagulation during treatment
 - 1 bag of priming solution – recommend 500 ml NS
 - Multiple 10 ml NS syringes available at bedside for use throughout treatment
 - Multiple 4x4's for use throughout treatment
 - 1 graduated liquid waste receptacle
 - Replacement caps/claves for the IV access at the end of treatment
4. Initiate Anticoagulation Therapy at least 30 minutes prior to treatment
5. Set Up and Priming of the UF 500 Set
 - a. For help loading and priming the UF 500 Set, press the PRIME key, followed by the HELP key
 - b. Follow prompts to clamp and release the infusion line during PRIME
 - c. Prime access ports on the UF 500 Set when PRIME complete
 - d. Ensure that the message: "Prime Successfully Complete" appears on the screen
(if Prime is not successful, it must be repeated)
 - e. Empty priming solution from the fluid collection bag prior to start of therapy
6. Starting Therapy:
 - a. Connect to the withdraw venous access catheter:
 - ◆ Close the clamp on the IV spike and the clamp on the blue withdraw line
 - ◆ Disconnect the blue withdraw line from the IV spike adapter
 - ◆ Connect the blue withdraw line to the venous access that has been chosen for with withdraw
 - b. Connect to the infusion catheter:
 - ◆ Close the clamp on the UF collection bag and the white clamp on the infusion line
 - ◆ Connect the white infusion line to the venous access that has been chosen for infusion
 - c. Open all clamps
 - d. Determine proper blood flow rate. Central line begin treatment at blood flow of 40ml.min. Peripheral (dELC) begin treatment at a blood flow of 25ml/min. Titrate blood flow as catheter and vein tolerates.
 - d. Start treatment by pressing the RUN key
 - e. The default blood flow for the machine is 40 ml/min. If using venous access that is not compatible with 40 ml/min, you must decrease the blood flow by pressing the BLOOD FLOW button and using the arrow keys to decrease the value in 5 ml/min increments
 - f. Allow the circuit to fill with blood to ensure flow from the withdraw and infusion catheters
 - g. Once the blood flow rate is stable with no alarms, the UF Rate can be set using the arrow keys to select the rate of ultrafiltration. Rates are between 0-500 ml/hr in increments of 10 ml/hr.
 - h. Administer Heparin therapy, if ordered, via the withdraw access ports on the UF 500 tubing
NOTE: When encountering multiple Withdraw/Infusion Line Occlusions that are not remedied by repositioning the patient and flushing the lines, consider disconnecting from the patient, reconnecting to the priming solution bag and flushing blood from the filter to prevent clotting the filter.
7. Ending Therapy:
 - a. Once therapy is complete, follow these steps to end the treatment and return the blood in the circuit to the patient:
 - ◆ Press the STOP key to stop the pumps
 - ◆ Clamp the withdraw line
 - ◆ Disconnect the withdraw line and connect it to the priming solution bag
 - ◆ Flush the withdraw IV access according to protocol
 - ◆ Clamp the infusion line
 - ◆ Disconnect the infusion line
 - ◆ Flush the infusion IV access according to protocol
 - ◆ Maintain any catheters that remain in place according to institution protocol and the information detailed in the appropriate catheter Directions for Use (DFU)
 - ◆ Remove the blood circuit from the console by pressing the clips on the front and side cartridges and rotating knobs while removing tubing.
 - ◆ PLUG in Aquadex Flexflow to electrical outlet when not in use

Instructions for Re-Priming/Rinsing the Filter

Reasons for Re-Priming:

- Save filter while trying to gain/check/fix venous access
- Ultrafiltrate Pressure (Pu) is reaching its upper limits
-300 to +300 acceptable range
- Ensure filter is clotted
- Patient needs to go for a STAT travel

Do Not Throw Original Priming Spike Away

Ensure there is adequate priming solution of Normal Saline

Disconnect blue withdraw line from patient

Attach blue withdraw line to priming spike in bag of solution

Flush withdraw catheter

Disconnect white infusion line from patient

Attach infusion line to ultrafiltration bag

Flush infusion catheter

Empty UF Bag, measure, and record

Open all clamps

Press PRIME, then ACCEPT or Press and hold MANUAL (If filter does not prime it is clotted)

Allow priming solution to fill the tubing set and blood to be completely cleared from the tubing

Press STOP when it instructs you to clamp the infusion line

(You will want to re-prime the filter until the fluid is light pink after the filter, you can do this by pressing and holding manual or by pushing prime again)

When you are ready to reconnect patient: Empty UF bag of priming solution, attach withdrawal line to patient, attach infusion line to patient, open all clamps, and press RUN

Triple Lumen Catheter Instructions with Aquapheresis

1. Reinforce that this is not a recommended catheter to use with aquapheresis.
2. Remove all caps/claves

Best way to run therapy

MOST OPTIMAL

- Withdraw from the distal port (brown). It is the 16ga port
- Infuse through a 18ga PVL (peripheral line).
- This is optimal as the blood flows can still achieve possibly 40ml/min.

LESS OPTIMAL

- Used only if a PVL cannot be achieved.
- Withdraw from the distal (brown) port. It is the 16ga port.
- Infuse through the white port (proximal). It is an 18ga port. This port is furthest from the distal port so you may get less recirculation.
- Titrate the blood flow to 20-30ml/min. Increase the BF as the pressures (Pi & Pw) tolerate.

LEAST OPTIMAL

- Used only if a PVL cannot be achieved and the white port (proximal) cannot infuse easily (not being able to infuse 10mls in 10seconds).
- Withdraw from the distal (brown) port. It is the 16ga port.
- Infuse through the blue port (medial).
- Titrate the blood flow to 20-30ml/min. Increase the BF as the pressures (Pi and Pw) tolerate.

