


Troubleshooting Scenarios
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AKI 2010
Acute Kidney Injury and Renal Support

I have no actual or potential conflict of interest in relation to this program or presentation.

AKI 2010
Acute Kidney Injury and Renal Support

Purpose



Wrong Set loaded

Failure of recognition test (set can't be used with therapy selected):

Ensure directions on screen have been followed

- Did you install pressure pods?
- Did you leave a clamp on the dialysate line?
- Is the dialysate pump segment loaded?

Remedy: press unload then reload

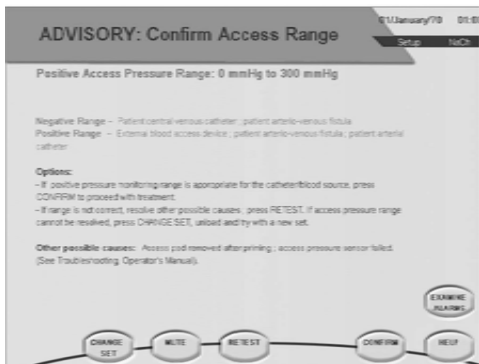
Access/Return Pressures

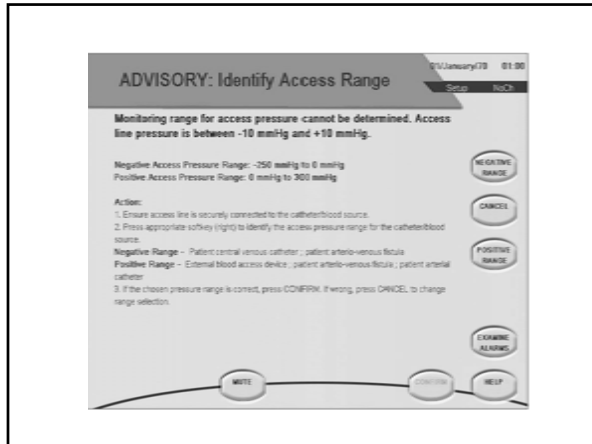
Advisory: Cannot detect access: 0 to -10mmHg

- Low blood flow – increase blood pump speed

Advisory: Cannot detect return: 0 to +10mmHg

- Loose or disconnected return line
- Low blood flow for type of vascular access
- Loose or disconnected chamber monitor line
- Wet fluid barrier filter





Blood Leak Detector - BLD

- BLD detects RBC's in effluent line

Check your effluent colour

- Other causes:
 - Effluent line is not installed, is improperly installed, or is removed from detector
 - Liquid or other debris in tubing path through the detector/effluent line
 - False light/Sunlight
 - Bilirubin or myoglobin

Blood Leak Detector - BLD

Check for air in line and remove

- Reposition effluent line
- Clean BLD with alcohol swab and tubing with gauze
- Draw sample of effluent and send to lab for RBC (yellow sample port)
- Urine myoglobin (if available)
- Patient CK value

Blood Leak Detector - BLD

- If confirmed negative, normalize BLD (system tools) and continue
- The presence of myoglobin or hemolyzed blood may cause a false positive result
- If confirmed positive, let the CNEs know about the blood leak alarm. Provide as much information as possible (Lab values, patient diagnosis, machine name, filter lot # and download PC data)
- If confirmed positive, rinse blood back to patient
- Do not use Hem-a-Stix or other urine dipstix

Normalization failed

Attempt to normalize blood leak detector has failed
3 X

- Filter blood leak
- Defective effluent line
- Air bubble in effluent line at level of BLD
- Effluent line not correctly installed
- Blood leak detector failed
- Press CHANGE SET and follow the instructions to load a new set
- If alarm recurs with new set, detector has failed
- Press DISCONNECT to end treatment
- Call service

FYI

- Any time the effluent line is removed and reinserted in detector, the detector must be reset (normalized) by pressing NORM BLD on System Tools screen

You finally have everything under control... Then...

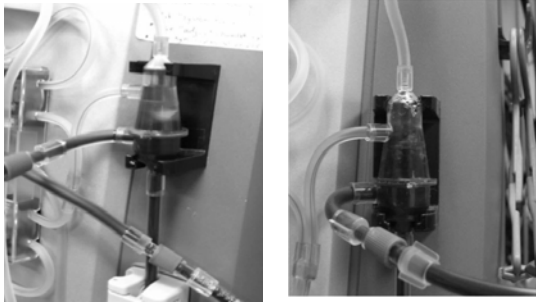


Changing Therapies During a Run



Replacement
Pre/post, what's the difference?

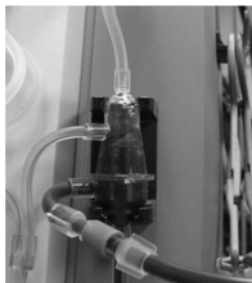
CLOTS





Clots in De-Aeration Chamber

- Blood Clots form due to the {blood ↔ air} interface
- DON'T PANIC - A visible clot is tolerated in the chamber (provided the Return Pressure is within 'normal operating range')
- If experiencing issues with your Return Pressure:
RETURN BLOOD TO PATIENT



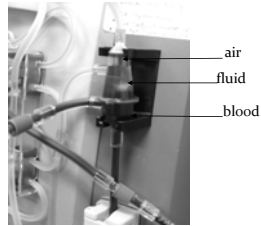
Clots in De-Aeration Chamber

Prevention:

- Post filter replacement with levelling of fluid and blood in chamber
- Change anticoagulation
- High blood pump rates
- CVVH - purple scale becomes pre filter replacement
 - green scale becomes post filter replacement

Added advantage to post filter replacement

- prevents clot formation in the de-aeration chamber
- Blood ↔ fluid ↔ air interspace is created rather than an air ↔ blood interspace



Filtration Fraction (FF) "Sludge factor"

The filtration fraction is the proportion of blood flow (QB) per min that is removed as plasma filtrate

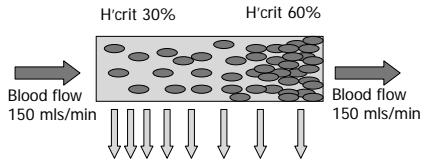
$$FF = QUF/QB$$

QUF = the total ultrafiltration rate

QB = blood flow rate

- FF is a predictor of hemoconcentration of the filter membrane
 - FF > 25% = Hemoconcentration ↔ clotting
- Numerically % displayed on the enter flow rate screen under replacement

Filtration fraction example



QB 150 ml/min and replacement of 3L/hr = FF 33%
↑QB 250 ml/min and replacement of 3L/hr = FF 20%
 Filtration fraction is the proportion of blood flow/min that is removed as plasma filtrate. Should not exceed 30%

Post Filter Replacement FF

Blood Flow Rate (BFR)	FF@ 1L/hr	FF@ 2L/hr	FF@3L/hr
150 mL/min	12%	23%	34%
200 mL/min	9%	17%	25%
250 mL/min	7%	14%	20%

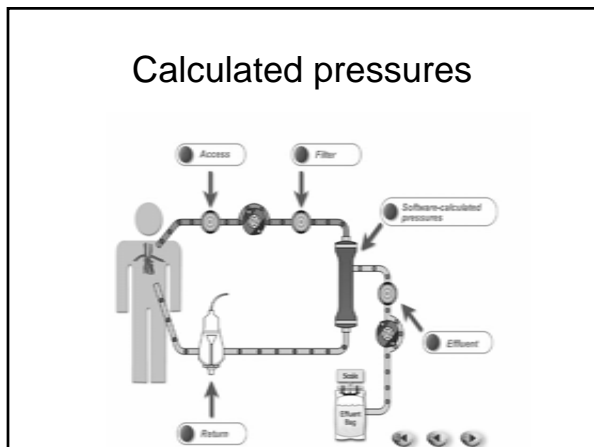
Just with a touch on the arrow you can change the replacement delivery to post filter

Filtration Fraction >25% – what do I do?

If greater than 25%- Inform physician:

- Increase blood pump speed (caution if using Citrate anticoagulation – the faster the pump speed, the higher the citrate requirement)
- Change to pre filter replacement
 - All pumps stop for a few seconds... Don't worry... Then you will see replacement fluid in de-aeration chamber

Calculated pressures



Transmembrane pressure

- Pressure exerted **on the Membrane** during CRRT
- Reflects Pressure Difference between:
 - **BLOOD** Compartment
 - **FLUID** Compartment
- TMP Membrane Capacity: +450mmHg
 - **TMP 'Too High' Alarm: 300mmHg**
- CALCULATED Value:
$$\text{TMP} = \frac{\text{Filter} + \text{Return}}{2} - \text{Effluent}$$

REMEMBER: Don't automatically turn your blood pump speed down if your TMP is high

TMP

TMP calculations reset with changes to:

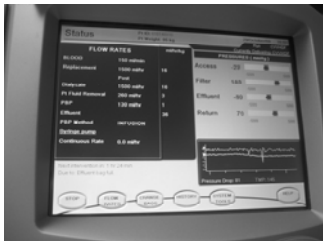
- blood flow rate
- patient fluid removal or replacement rate change
- after self test

Filter pressure drop ΔP

- Determines pressure conditions within the hollow fibers of the membrane
- Over time, **MICRO-CLOTTING** occurs in the fibers
 - Clotting creates **RESISTANCE** to blood flow
 - **Clotting causes Filter Pressure Drop to INCREASE**
- Filter Pressure Drop:
 - >200mmHg = Filter CLOTTED
- Is a CALCULATED Value:
FPD = Filter Pressure – Return Pressure

Filter pressure drop ΔP

Pressure Drop calculations reset with changes to blood flow rate



CVVH - hemofiltration, but why?

- Allows pre and post filter replacement AND anticoagulation
- Pre and post filter replacement - decreased filter clotting and clots in de-aeration chamber
- Provides removal of fluids and solutes while allowing higher replacement flow rates
- Fluid removal by ultrafiltration

CVVH

-If 1500mL per hour ordered for each replacement bag, choose 3000mL for replacement rate, then choose 50% for each (pre and post)

-Unable to do CVVHDF if set up in CVVH

What?? You want me to change something else???

- When switching anti-coagulant you DO NOT have to change your set
- Change dialysate and replacement additives (i.e., Pouch A, add/remove Calcium)
- Adjust pump speed accordingly
 - Heparin – 300mL/min
 - Citrate – 170 mL/min
- Calcium Gluconate infusion as required (remember to include calcium infusion as intake and remove it on your hourly fluid removal)

Incorrect Weight Alarms

Any alteration to bag weight on the scales that causes a variance from expected programmed volume amount (weight)

Causes:

- Flow obstruction that results in +/- 40mL deviation from set patient fluid removal
- Partial obstruction that results in +/- 120 mL deviation from the set patient fluid removal rate in 1 hour
- If not corrected, a fluid loss or gain limit will continue to apply until 330 mL is reached

Causes of Incorrect Weight Alarms

- Swinging or partially supported bag
- Changing 2 bags at once
- Bag leak
- Luer connection is loose
- Cross threaded connection
- Clamp, kink or obstruction of tubing
- Clamp on bag
- Frangible pin not broken
- Dialysate line to replacement bag and replacement line to dialysate bag

Incorrect Weight Alarms

If limit is reached – you have no choice but to return blood (safety feature)



Changing Bags



NEVER OPEN any of the 4 scales **unless**:

- FLEX tells you to change a particular bag (Caution alarm)
- You press the 'CHANGE BAG' key on the status screen to change the bag you want
- Pull the appropriate scale out, replace with a new bag, and gently push scale back in before pressing CONTINUE
- MOST IMPORTANT THING TO REMEMBER
 - Only change one (1) bag, then press *continue*
 - If you have to change another bag wait until the flex tells you to change it or press the 'change bag' key

Changing Bags



If you have to check for a clamp or assess a bag hanging on scale:

- never just open the scale or manipulate the bag.
- Always press the **change bag** key on the status screen, *then* open up the scale of choice and assess the bag then press continue

EEEkkkk Power Failure

- Loud buzzer will alarm
- If greater than 15 seconds, flow rates will have to be reset
- Once in run screen, reset blood flow first, press confirm (this will start blood pump), then set fluid removal, dialysate and replacement rates

Manual blood return, I know I can.. I know I can...

- Use clinical judgement regarding clotted filter
- Turn machine off
- Remove return line from return line clamp
- Take hand crank from back of machine
- Attach patient access line to NS bag and flush catheter with NS
- Crank handle till set is pink
- Disconnect return line from patient and flush and lock lines as per protocol

Take home points

1. Stop the noise... ALWAYS SELECT SILENCE FIRST
2. Take a deep breath
3. Read the screen
4. Ask for help (remember there are no "foolish" questions)

THANK – YOU !!
