Dialysis Procedures
Dialysis Procedures

• It is simple. There are only 3 procedures:
  – Initiation
  – Monitoring
  – Discontinuation

• Well, maybe not so simple…
Initiation of Dialysis

- Pre Dialysis Safety Checks
- Initiation Procedures
- Immediate Post Initiation Procedures
Predialysis Safety Checks

- **Water system**
  - Temperature
  - Resistivity
  - Residual disinfectant
- **Prescribed Dialyzer & Concentrate**
- **Dialysis Machine Safety**
  - Alarms active
  - Dialysate conductivity &/or pH
- **Integrity of Extracorporeal Circuit**
- **If Dialyzer Reused**
  - Check patient’s name on label
  - Disinfectant residual test
Predialysis Patient Evaluation

• **Physical Parameters**
  - Weight  • BP (stand & sit)  • Temp
  - Pulse & Resp  • Complaints

• **Evaluate Access Status**
  - Signs of infection – redness, tenderness, unusual warmth, purulent drainage
  - Patency
    - Graft & AVF: bruit, thrill
    - Catheter: easy aspiration (*post disinfection*)
  - Direction of flow (identify A & V)

• **Follow Universal Precautions**
  - Wash hands  • Glove  • Gown
  - Eye protection  • Mask
Initiation of Dialysis

- **Graft/Fistula**
  - Select sites
  - Disinfect
  - Anesthetize
  - Insert needles

- **Catheters**
  - Disinfect catheter limbs
  - Aspirate heparin from limbs
  - Evaluate patency

- **Draw Blood Work**
  - Prior to administering heparin
  - From arterial port
  - Administer heparin post draw

- **Initiate Blood Flow to Dialyzer**
  - Connect lines
  - Start at low BFR
Post Initiation

• **Calculate/Apply TMP**
  - Fluid gain/ # Hours = UF vol (ml/hr)
  - UF Volume/ UF Coefficient = TMP
  - TMP = V resistance + Neg pressure

• **Set machine parameters**
  - BFR  • DFR  • UFR  • Alarm limits
  - Dialysate temp  • Heparin Infusion rate

• **Patient comfort measures**
Charting

• **Over-riding objectives**
  • Complete • Legible

• **Treatment documentation**
  • Prescribed parameters
  • Pre & Post patient assessment
  • Vital signs during treatment
  • Medications given
  • Treatment parameters
    – BFR, DFR, A & V pressures, TMP/UFR
  • Patient/machine complications
  • Your signature
Monitoring During Treatment

- Detection of Complications
  - Blood Related
  - Dialysate Related
  - Patient Related
- Extracorporeal Circuit Pressures
- Anticoagulation
- Treatment Factors
  - Impact on Clearance
- Charting
Blood Side Complications

- **Air in Blood Circuit**
  - Minor: usual cause is careless set-up, drip chamber level will drop, alarm will sound

- **Air Embolism**
  - Major: air detector alarm failure

- **Blood Loss**

- **Access Recirculation**

- **Clotting**

- **Poor BFR**

- **Needle Infiltration**
Dialysate Side Complications

- **Dialysate Temperature**
  - Hypothermia
  - Hyperthermia

- **Hemolysis**
  - Dialysate temperature, kinked blood lines, formaldehyde in dialysate lines, inadequate water treatment (chloramines, copper, zinc, nitrates)

- **Crenation**
  - Hypertonic dialysate
Patient Related Complications

- Hypotension
- Hypertension
- Muscle Cramps
- Headache
- Nausea & Vomiting
- Headache
- Fever &/or Chills
- Fistula/Graft Infection, Thrombosis
- Fistula Aneurysm, Psuedoaneurysm
- Central Venous Catheter Infection
- Catheter Thrombosis

- Cardiac Dysrhythmia
- Pericarditis, pericardial effusion, cardiac tamponade
- Dialysis Disequilibrium Syndrome
- First Use Syndrome
- Seizures
- Angina
- Anaphylaxis
- Pruritis
- Steal Syndrome
- Cardiac Arrest
- Dialysis Encephalopathy (Al++)
Extracorporeal Circuit Pressures

• Blood Side
  – Elevated Pre Pump Arterial Pressure
    • RBC damage if greater than -250 mmHg
    • Increase indicates obstruction of blood flow into pump
  – Elevated Post Pump Arterial Pressure
    • Increase indicates obstruction of blood flow into dialyzer
  – Elevated Venous Pressure
    • Increase indicates obstruction of blood flow into patient

• Dialysate Side
  – Failure of Negative Pressure pump

• Watch Both – Transmembrane Pressure is key
Anticoagulation

• Three methods
  • Saline flush
    – Flush blood circuit with saline q 30 min
    – No drugs
    – No bleeding risk during or post dialysis
  • Trisodium citrate
    – Difficult: requires 2 infusion pumps, 0 Ca++ dialysate
    – No bleeding risk during or post dialysis BUT maintaining patient’s calcium balance is difficult & risky
    – Citrate is metabolized into bicarbonate
  • Heparin
Two Heparin Methods

• **Systemic**
  - Method: bolus + constant infusion until last hour
  - Objective: maintain ACT 1.5-2.0 baseline

• **Tight Systemic**
  - Method: same but lower doses
  - Objective: maintain ACT 1.2-1.4 baseline
Treatment Factors: Impact on Clearance 1

- **Blood Flow Rate**
  - ↑ BFR → ↑ small molecule (ex. urea) clearance
  - BFR has much less effect on large molecules

- **Ultrafiltration Rate**
  - ↑ UFR will result in ↑ clearance, via “solute drag”
  - Mainly involves larger molecules
  - Minimal effect on total clearance

- **Dialysate flow rate**
  - ↑ DFR will ↑ clearance
  - Minimal effect on total clearance

  *If BFR > 350, hi flux dialyzer, 500 DFR → 800 DFR = C_{urea} ↑ 5-10%*
Treatment Factors: Impact on Clearance 2

- **Anticoagulation**
  - Clotting reduces available membrane surface area, thus clearance

- **Treatment Time**
  - Longer time = ↑ clearance
  - Shorter time = ↓ clearance

  \[5 \text{ min} \downarrow \text{ per Tx X 156 Tx/yr} = 780 \text{ min or } > 3 \text{ dialysis/yr}\]

- **Access Recirculation**
  - Causes: needles too close, access stenosis, cardiopulmonary recirculation
  - Result: freshly dialyzed blood mixes with uremic blood being drawn into the arterial blood line
Discontinuation

- Termination of Treatment
- Needle Removal/Catheter Care
- Post Dialysis Patient Assessment
- Documentation
- Post Dialysis Machine Care
Termination of Treatment

- **Discontinue Heparin infusion**
  - Per unit protocol (usually 30-60 min pre D/C)
- **Chart patient & machine parameters**
- **D/C TMP**
- **Draw post dialysis blood samples**
  - Reduce BFR to 100 ml/min, wait ≈ 15 seconds
  - Alternative: draw several minutes post dialysis
- **Return blood to patient**
- **Check patient’s BP before disconnection**
  - In case further fluid infusion is required
Needle Removal

- Remove one needle at a time
- Withdraw at same angle as insertion
- Apply pressure over vessel (*not skin*) insertion site
- Amount of pressure matters
  - Too little: prolonged bleeding, hematoma formation
  - Too much: clotted access
- Clean & dress site after bleeding stops

*Note:* If fistula clamps used, should follow strict protocol because application of proper pressure is difficult.
Catheter Care

• Prior to removing dialysis lines, disinfect catheter ports with:
  • Providone iodine or
  • Chlorhexadine gluconate
• Flush each catheter lumen with normal saline
• Instill heparin into each lumen
  • 5,000-10,000 units per lumen is most common dosage range
  • NOTE: volume of heparin should just barely exceed lumen volume
• Place fresh sterile dressing over catheter site
• Label catheter site
  • “DO NOT FLUSH”
  • # units heparin per lumen
  • Date and initials of staff member
Post Dialysis Patient Assessment

- Vital signs
  - BP sitting & standing
  - TPR
- Physical assessment
  - Heart & lung sounds
  - Edema
  - Weight (fluid loss)
- Vascular access
- Patient symptoms
  - Patient comments, complaints
- Overall condition observations
  - General condition, behavior, mental status
Documentation

• Dialysis data
  • Time stopped
  • Volume of rinseback saline
  • Blood loss, if any (include clots in dialyzer, drip chambers)

• Patient condition
  • Vital signs, physical assessment
  • Overall condition, including vascular access

• Special instructions to patient, if any

• Time & method of departure
Post Dialysis Machine Care

• Disconnect and rinse concentrate lines
• Remove dialyzer & bloodlines
  • Dispose in hazardous waste container
  • If to be reused
    – Ensure filled with saline or heparinized saline, per unit protocol
    – Ensure properly labeled with patient ID data
    – Deliver to reuse area within 10-15 min post dialysis

• Remove other disposables
  • Dispose in hazardous or non-hazardous waste container, as appropriate

• Remove & disinfect non-disposables (ex. clamps)
• Clean & disinfect outside of machine
Dialysis Procedures

Summary

- Initiation
- Monitoring
- Discontinuation

*It is not simple!*

YOU are the key.