Comprehensive Hemodialysis Management

**Dialysis Adequacy/Vascular Access Patency**

- **Start**
  - New patient or revised vascular access

- **Initial Dialysis Adequacy & Vascular Access Patency**
  - Measure initial Qb, AR, AF,

- **Nurses’ Analysis**
  - Optimize dialysis delivery immediately from Qb, AR results. Repeat at established intervals.

- **Nephrologist Analysis**
  - Establish Access Flow levels
  - Establish testing schedule (monthly per KDOQI)

  **Vascular Access Patency Study**
  - (monthly, or other interval)

  **Is AF above the critical threshold?**
  - **NO**
  - **YES**

  **Nephrologist Analysis**
  - Schedule appropriate flow restoration procedure or refer patient for duplex scan and/or fistulogram.
  - After flow restoration procedure

**Cardiac Function**

- **Initial Cardiac Function Study**
  - Hourly CO tests (CHP Study) performed when cardiac complications are suspected during hemodialysis.

  **Prescription Concern**
  - **Cardiovascular Concern**

  **Nephrologist Review**

  **Baseline Cardiac Studies**
  - A second CHP study and third, one month later, establishes reliable average cardiac function parameters for the patient.

  **Nephrologist Analysis**
  - Set cardiac baseline values, warning levels, testing schedule.

  **Follow-up Cardiac Function Study**
  - CHP study performed after a weekend break.

  **Nephrologist Review**

  **Further Studies, and/or Treatments**

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Hemodialysis Management Protocol includes an initial dialysis adequacy study, followed by periodic access patency surveillance and a cardiac function assessment.
Vascular Access Flow
Best Practice in Hemodialysis Care
Flow-QC® Vascular Access Surveillance Protocol

Access Blood Flow Surveillance (mL/min each month)

- **Normal**
  - AVG: > 600 mL/min
  - AVG: > 500 mL/min
  - Nephrologist re-evaluates indicators of dysfunction.

- **Abnormal**
  - AVG: < 600 mL/min
  - AVG: < 500 mL/min
  - AV access flow falls 25% in 4 months
  - Duplex Scan
  - Suspect
  - Abnormal
    - AVG: > 2000 mL/min
    - AVG: > 500 mL/min
    - Evaluate for steal, hand ischemia, high CO and cardiac failure

  - Fistulogram
  - 5% of cases

  - Abnormal
    - Technical Failure
    - Interventional Radiologist (PTA/Thrombolysis/Stent)
    - Preferred referral path

  - Surgeon (Revision or new access)

  - Presumptive Success
    - Post-Intervention Surveillance
      - AV flow increases 300-400 mL/min or
      - AV flow > 1 L/min or
      - AV flow returns to its baseline

  - Success Criteria Met

  - Success Criteria Not Met

1 If AVG flow falls by 25% in four months, and flow < 1000mL/min, refer for fistulogram per KDOQI Guidelines.
2 Lower access flow may result if a patient’s BP is significantly lower than his or her BP history. Therefore, compare current BP with BP history and/or confirm measurement results by repeating measurement before referring for fistulogram.
**Flow-QC® Delivered Blood Flow Protocol**

**Measure Delivered Blood Flow Rate**
Measure Delivered Blood Flow. Transonic Delivered blood Flow rate (Qb) is within 0-10% of the hemodialysis machine’s set blood pump speed or delivery flow rate.*

**YES**

*Transonic Delivered Blood Flow rate (Qb) is within 0-10% of Hemodialysis Machine’s Set Blood Pump Speed or Delivery Flow Reading*

True Delivered Blood Flow correlates with the Hemodialysis machine’s setting.

Proceed to Recirculation Measurement

**NO**

*The Discrepancy betw. Transonic Delivered Blood Flow rate (Qb) is >10% and the Hemodialysis Machine’s Set Blood Pump Speed or Delivery Flow Reading* is >10%*

Turn pump speed to 200 mL/min and repeat the blood flow measurement.

**YES**

*Transonic Delivered Blood Flow rate (Qb) is within 0-10% of Hemodialysis Machine’s Set or Delivered Flow Reading*

True Delivered Blood Flow correlates with the Hemodialysis machine’s setting. The previous deviations at high pump settings could be due to needle size and/or site of needle placement.

Proceed to Recirculation Measurement

**NO**

*Transonic Delivered Blood Flow Rate (Qb) Does Not Agree with the Hemodialysis Machine’s setting at 200 mL/min*

Check tubing selection on the Hemodialysis machine to make sure it agrees with the dialysis tubing being used.

Other reasons for the discrepancy could be:
- The Hemodialysis machine is not in calibration.
- The arterial needle tip is too close to the vessel wall.

*Some Hemodialysis Machines display both a Set Blood Pump Speed and Delivery Flow Reading. If both readings are displayed on your Hemodialysis machine use the Delivery Flow Reading*
Dialysis Adequacy
Recirculation Management In Accesses & Catheters

- **ARTERIAL LINE**
- **VENOUS LINE**
- **Normal Line Position**
- **Saline**
- **Recirculation**
- **Access Flow**
Flow-QC® Recirculation Protocol

Perform Initial Recirculation Measurement

0% Recirculation

Proceed to Access Flow Measurement

0% Recirculation

Confirm Zero % Recirculation with a third Measurement

> 0% Recirculation

Reverse blood lines at needle tubing connection.

Perform a Reversed Line Recirculation Measurement

0% Recirculation

Lines are now in conventional position for dialysis, but were reversed for initial measurement

0% Recirculation

Lines are now reversed, initial measurements were made with lines in conventional position.

Is reversed line recirc > or < than initial Recirc?.

Greater

Lines are now in conventional position for dialysis, but were reversed for initial measurement

Less

Document Correct Line Placement & Direction of Access Flow

When 0% recirculation is confirmed, proceed directly to an access flow measurement. When recirculation is present, a series of steps is presented to identify the cause.
Dialysis Adequacy Protocol for Catheter Optimization

Step 1

Measure Delivered Blood Flow Rate
With the bloodlines configured as normally used (document configuration), measure flow. Transonic Delivered blood Flow rate (Qb) is within 0-10% of the hemodialysis machine’s set blood pump speed or delivery flow rate.*

YES

Transonic Delivered Blood Flow rate (Qb) is within 0-10% of Hemodialysis Machine’s Set Blood Pump Speed or Delivery Flow Reading
Current blood pump setting is maximizing the Delivered blood Flow with the current catheter to bloodline configuration.
Proceed to Recirculation Measurement

NO

Transonic Delivered Blood Flow rate (Qb) is >10% lower than the Hemodialysis Machine’s Set Blood Pump Speed or Delivery Flow Reading*
Only proceed if both catheter lumens had blood return with treatment initiation.
Using aseptic technique, reverse the catheter configuration by reversing the blood lines to the opposite lumens of the catheter than used for the initial measurement. Document configuration. Repeat the blood flow measurement.

YES

Transonic Delivered Blood Flow rate (Qb) is within 0-10% of Hemodialysis Machine’s Set or Delivered Flow Reading
Current blood pump setting is maximizing the Delivered blood Flow with the current catheter to bloodline configuration.
Proceed to Recirculation Measurement

NO

Transonic Delivered Blood Flow Rate (Qb) is 10% lower than the Hemodialysis Machine’s Set Blood Pump Speed
Carefully document measurement and catheter configurations.
Proceed to recirculation measurements with both catheter configurations.
Escalate the results of the findings to the nephrologist for possible catheter evaluation or prescription adjustment to address catheter dysfunction.

*Catheter Configurations:

- Normal Configuration: Arterial Catheter Hub to Arterial Bloodline + Venous Catheter Hub to Venous Bloodline
- Reverse Configuration: Arterial Catheter Hub to Venous Bloodline + Venous Catheter Hub to Arterial Catheter Hub
Dialysis Adequacy Protocol for Catheter Optimization

Step 2

**Check Recirculation**
With the bloodlines configured from Step One with maximized Delivered Blood Flow Rate,

**Measure Recirculation:** Recirculation is within 0 - 10%

- **NO**
  - **Recirculation is > than 10%**
    - Only proceed if both catheter lumens had blood return with treatment initiation
    - Using aseptic technique, reverse the catheter configuration by reversing blood lines to the opposite lumens of the catheter than used for the initial measurement.
    - **Repeat Recirculation Measurement**

- **NO**
  - **Recirculation is > than 10%**
    - Current blood pump setting is maximizing Delivered Blood Flow with the current catheter to bloodline configuration.

- **YES**
  - **Recirculation is within 0-10%**
    - Current blood pump setting is maximizing Delivered Blood Flow with the current catheter to bloodline configuration.
Cardiac Function
Best Practice in Hemodialysis Care
Cardiac Function Assessment Protocol

Initial Cardiac Function Study
Hourly CO tests (CHP Study) performed during hemodialysis when cardiac complications are suspected.

Nephrologist Review

Acceptable

Baseline Cardiac Studies
A second CHP study and third, one month later, establishes reliable average cardiac function parameters for the patient.

Nephrologist Analysis
Set cardiac baseline values, warning levels, testing schedule.

Further Studies, Treatments
Cardiovascular Concern

Acceptable

Follow-up Cardiac Function Study
CHP study performed after a weekend break.

Nephrologist Review
Cardiovascular Concern