Disclaimer

- Renal Medicine Associates employee
- I have no conflicts of interest.
Access failure

- Infections
- Infiltrations
- Stenoses/Thrombosis
- Aneurysms (requiring surgical revision/shut down)
- Hypotension
Infection Data

- Is there a risk of fistula and graft infection?

What do we see?
- Localized/at needle site
- Buttonhole or buttonhole tunnel
- Cellulitis
- Bacteremia
The first national project to monitor infections in patients undergoing hemodialysis indicated vascular access infection was common but the risk varied substantially among different vascular access types and different dialysis centers. Vascular access infection rate/100 patient-months was 3.2 overall and varied from:

- 0.56 for native AV fistulae
- 1.36 for synthetic AV grafts
- 8.42 for cuffed catheters
- 11.98 for noncuffed catheters

KDOQI Guideline 32: infection rate

- The rate of infection should not exceed 1% in primary AV fistulae and should not exceed 10% in AV grafts, both calculated over the use-life of the access (Opinion).

- Rationale: Infection complications of accesses are a leading cause of morbidity and mortality in dialysis patients. The current combined infection rates for permanent accesses for local and bacteremic infections are 1% to 4% for primary AV fistulae and 11% to 20% for AV grafts.

USRDS 2011—infection rates

- All ESRD
  - Infection (2010: 30.5%)
  - CV (0.8%)
  - All-cause (-2.7%)

- Hemodialysis
  - Infection (43.1%)
  - CV (3.7%)
  - All-cause (-0.7%)
  - Vascular access (-49.7%)

- Peritoneal dialysis
  - Infection (0.5%)

- Transplant
  - All-cause (-17.4%)
  - Cardiovascular (-35.5%)
  - Infection (-9.7%)
  - Dialysis access (since 1999: -23.4%)
Cellulitis
Infected fistula
NHSN Dialysis Event

- Dialysis Event (reportable)

- 1. IV antimicrobial start regardless of reason for treatment

- 2. Positive blood culture collected as outpatient or within 1 calendar day after hospital admission whether or not treated

- 3. Pus, redness, or increased swelling at vascular access site

CDC, NHSN Dialysis Event Protocol (Feb, 2012). nhsn@cdc.gov.
Infection prevention

- Handwashing
- Access washing
- Access assessment
- Access preparation for cannulation (prepping site)
- Proper cannulation technique
Table 2. Skin Preparation Technique for Subcutaneous AV Accesses

- Locate, inspect and palpate the needle cannulation sites prior to skin preparation. Repeat prep if the skin is touched by the patient or staff once the skin prep has been applied, but the cannulation not completed.
- Wash access site using an antibacterial soap or scrub and water.
- Cleanse the skin by applying 2% chlorhexidine gluconate/70% isopropyl alcohol or 70% alcohol and/or 10% povidone iodine as per manufacturer’s instructions for use.

Notes:
- 2% chlorhexidine gluconate/70% isopropyl alcohol antiseptic has a rapid (30 s) and persistent (up to 48 hr) antimicrobial activity on the skin. Apply solution using back and forth friction scrub for 30 seconds. Allow area to dry. Do not blot the solution.
- Alcohol has a short bacteriostatic action time and should be applied in a rubbing motion for 1 minute immediately prior to needle cannulation.
- Povidone iodine needs to be applied for 2-3 minutes for its full bacteriostatic action to take effect and must be allowed to dry prior to needle cannulation.
- Clean gloves should be worn by the dialysis staff for cannulation. Gloves should be changed if contaminated at any time during the cannulation procedure.
- New, clean gloves should be worn by the dialysis staff for each patient with proper infection control measures followed between each patient.
Tourniquet

- Used to increase venous pressure for easier cannulation
Opinion -- tourniquet

- The proper use of a tourniquet is required for all AVF cannulation procedures. This includes large AV fistulae that appear dilated without a tourniquet.

- Tourniquet use ensures uniform dilatation of the vessel prior to needle insertion.

- Apply the tourniquet tight enough to enlarge or engorge the vessel, but not tight enough to cause pain or loss of blood flow to the limb.

- Fistula First: http://fistulafirst.org/LinkClick.aspx?fileticket=iAmmV2TH_gY%3D&tabid=150
Opinion -- tourniquet

- The tourniquet helps firm the access and prevents it from rolling.
  - Allows you to see access better
  - Allows you to feel the access better
  - Allows the correct depth assessment

- Place tourniquet in armpit **lightly**
  - Displaces pressure along entire vein
  - Never leave on during dialysis treatment

ESRD Network 6:
www.esrdnetwork6.org/utils/pdf/pre_Cannulation%20Training%20training%20web%20post.pdf
Use of clamps for hemostasis

- No randomized controlled trials on the use of clamps
- Observational data and intuitive inferences and conclusions
- Fact: if pressure is excessive and prolonged, it can cause thrombosis
- If the pressure applied with clamps is enough to prevent flow, or allows only partial flow for too prolonged a period, the process of thrombosis can be initiated
  - It takes time for a thrombus to propagate to full thrombosis
  - May not be recognized until later or next treatment as bruit and thrill may be initially present.

L. Spergel, MD, Fistula First Work Group
Current use of clamps in U.S.

- Staff does not routinely listen for bruit with stethoscope after applying clamps.
- Clamps are routinely applied tight enough to achieve hemostasis. If intra-access pressures are high from an outflow stenosis, the pressure required to stop bleeding may be enough to occlude the access.
- 2 clamps are routinely used together, increasing the likelihood that the pressure from both clamps is enough to cut off blood flow. If bleeding occurs, clamps are tightened.
- A patient’s BP may drop in the 10 to 15 minutes after blood return, and thus clamp pressure may now be enough to occlude the access that initially had adequate pressure and flow for the pressure applied.
Policy on clamps

- All major dialysis providers discourage clamp use
- Fistula First discourages clamp use
- If clamps are used in a clinic a protocol must be in place and followed carefully to minimize the risk of pressure-induced stenosis
  - Bruit auscultable and thrill palpable on initial placement of clamps and at least every 10 minutes thereafter.
  - Only 1 clamp applied at a time to avoid combined pressure of 2 clamps
  - If breakthrough bleeding has occurred, assess for bruist and thrill every 5 minutes
  - Monitor blood pressure carefully and adjust clamp pressure as BP decreases

Fistula First: tools, Change Concept #8.
Alternative to clamp use

- Most patients or a close family member can be taught to hold pressure.

- The amount of pressure applied is based on the presence or absence of a bruit or thrill.

- The patient should hold **ONLY ONE PUNCTURE SITE AT A TIME** to minimize the risk of pressure-induced stenosis and to prevent bleeding under the skin.

- In reality, only a small number of patients will require staff assistance in holding pressure.

- WIN-WIN: Patients are more involved in their care and knowledgeable about their access and treatment.
Access Infiltrations: background

- Definition: The unintentional leakage of solution into surrounding tissue

- Consequences: from local irritation to amputation

- Major infiltration annual incidence in dialysis is about 5.2%

- Each major infiltration results in an average of 2.4 diagnostic tests or interventions

- Major infiltrations prolong catheter dependence an average additional 97 days (> 3 months)


Access infiltrations

- There is decreased risk of infiltration/hematoma with button-hole cannulation compared to rope ladder cannulation (1 RCT).
  - Rope ladder cannulation incidence of infiltration was 436 infiltrations per 1000 hemodialysis sessions.
  - Buttonhole cannulation incidence if infiltrations was 295 infiltrations per 1000 hemodialysis sessions.

Infiltration contributing factors

- Small size and poor condition of veins
- Larger needle/catheter size relative to vessel size
- Needle site close to joint flexure area
- Poorly secured needle
- Patient activity/movement
- Multiple vein punctures (e.g. a second puncture site above the first attempted site)
- Clot formation above the cannulation site
Infiltration contributing factors

- Flipping needles or lifting needles while in the vein
- Arm edema
- Potential for vasoconstriction
- Lower staffing ratios (greater risk of adverse events with 12:1 or higher RN to patient ratio)
- Inadequate pressure with needle removal post procedure (hence the recommendation to remove 1 needle and hold pressure with 2 fingers until hemostasis, then remove second needle)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Clinical Criteria</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>No signs/symptoms</td>
</tr>
<tr>
<td>1</td>
<td>Skin blanches, edema less than 1 inch in any direction</td>
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<tr>
<td>2</td>
<td>Cool to touch, with or without pain, skin blanches, edema 1-6 inches in any direction</td>
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<tr>
<td>3</td>
<td>Cool to touch, with or without pain, skin blanches, translucent, gross edema over 6 inches in any direction</td>
</tr>
<tr>
<td>4</td>
<td>Cool to touch, mild to moderate pain, possible numbness, skin blanches, translucent, skin tight, leaking, skin discolored, bruised, swollen, gross edema over 6 inches in any direction, deep pitting tissue edema, circulatory impairment.</td>
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</tbody>
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Infiltration management:

- Lack of evidence-based standardization or policies and procedures for care

Barriers to infiltration management

- Failure to identify the problem in a timely manner
- Failure to disseminate or update management plan
- Inadequate staffing
- High staff turnover
- Lack of knowledge about effective treatment due to research limitations

- Cost

Infiltration management—based on anecdotal experience

- Stop administration
- Elevate affected arm 24 to 48 hours after infiltration (one study showed this did not help)
- Intravenous Nursing Society recommends both warm and cold applications for 15 to 20 minutes every 4 hours for 24 to 48 hours
- Fistula First recommends ice for 20 minutes on/20 minutes off for the first 24 hours and warm compresses after 24 hours
- Infiltration may cause ongoing fistula stenosis
An ounce of prevention
Thank you for your attention.

Any questions or comments?