

ASN DIALYSIS ADVISORY GROUP

ASN DIALYSIS CURRICULUM

Medical Management of Home Hemodialysis Patients

Brent W. Miller, MD

- Professor of Medicine
- Washington University School of Medicine
- Saint Louis, Missouri

Outline

- **Medical issues during the initial training period**
- **Vascular access**
 - Constant site (“Buttonhole”) or Rotating-site (“Rope-ladder”)?
 - Clinical monitoring and exam
 - Evaluating potential infection with blood cultures
- **Management of ultrafiltration, hypertension and hypotension**
- **Dialysis-related medication administration**
 - Erythropoietic Stimulating Agents
 - Iron
 - Active Vitamin D
 - Antibiotics
- **Routine laboratory tests**
- **The outpatient clinic visit**

Medical issues to address during training

- **Prescription and patient selection for home dialysis covered in other presentations**
- **Any areas of safety concerns or treatment instability**
- **Ensure vascular access is well-functioning**
- **Correct “dry weight”**
- **Control of blood pressure and order of discontinuation of medications**
- **Optimization of iron stores and hemoglobin prior to completion of training**
- **Adjustment of medications to the simplest effective regimen and schedule**

Vascular Access

Key points for vascular access at home

- **Aseptic Technique**
- **Ergonomics of access**
 - Cannulation
 - Hemostasis
- **Anchoring of needles and dialysis lines**
 - Taping should be done to minimize risk of needle infiltration or dislodgement
 - No anchoring to stationary objects
- **Constant site (“buttonhole”) or rotating-site (“rope-ladder”) technique?**
- **Clinical monitoring of vascular access**

Aseptic Technique

- **Povidone-Iodine (Betadine®)**
 - Allow to dry—approximately 3-5 minutes
- **Chlorhexidine Gluconate 2% and Isopropyl Alcohol 70% (Chloraprep®)**
 - Allow to dry—approximately 3 minutes
- **Chlorhexidine Gluconate 0.5% and Isopropyl Alcohol 70% (Hibistat®)**
 - Allow to dry—approximately 3 minutes
- **Sodium Hypochlorite 0.114% (Exsept Plus® Solution)**
 - Approximately 2 minutes
- **Alcohol**
 - 60 seconds, allow to completely dry

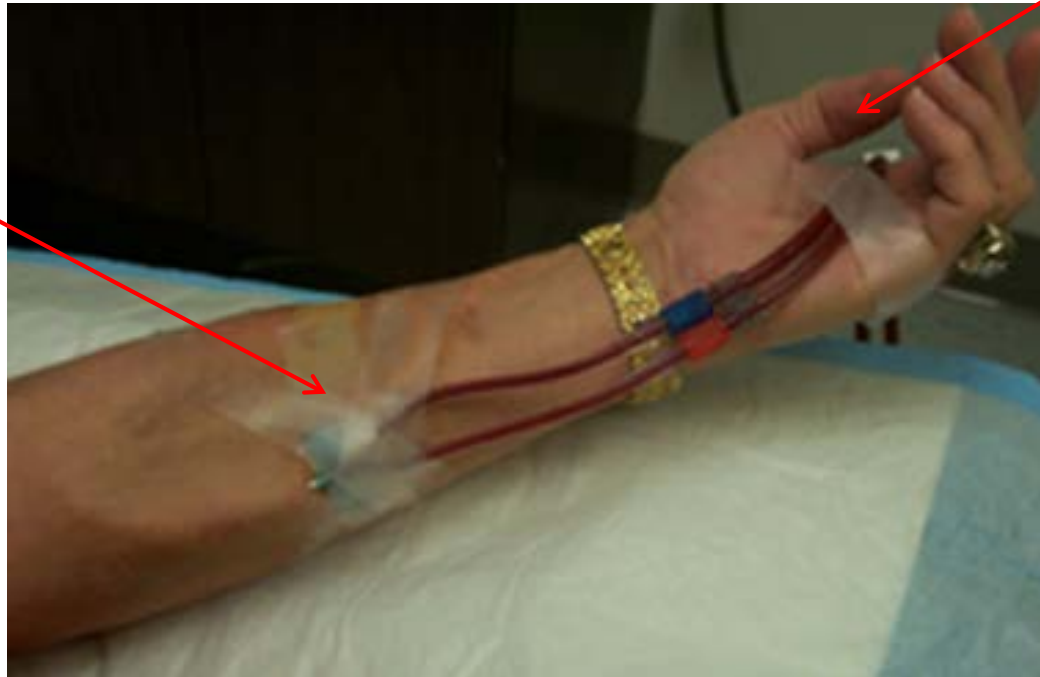
Ergonomics of vascular access

- **Patients must be able to see and comfortably insert needles**
 - Most patients choose to place *both* needles antegrade
 - Because needles are both antegrade, insertion sites should be at least 3 inches apart
 - Cannulation sites should be chosen by a collaboration of training nurse and patient
- **All supplies for cannulation should be within reach before beginning**
- **All supplies for hemostasis, including the discarded needle container should be placed within reach before starting needle removal**

Anchoring of Dialysis Needles and Lines

- Assume patient will move arm significantly during treatment
- No anchoring to stationary objects

Needle
secured at
cannulation
site

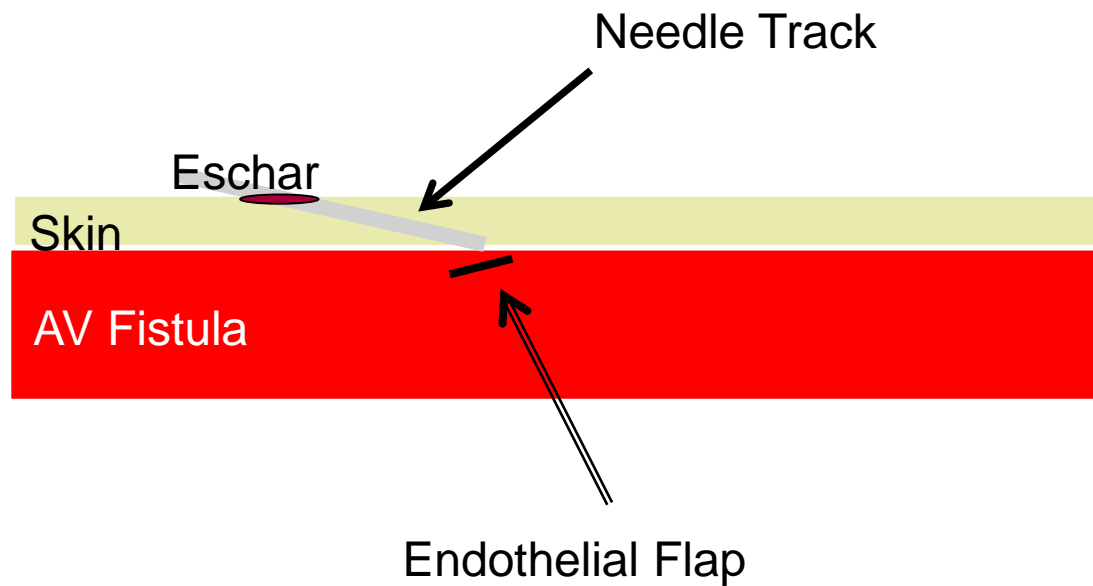


Lines secured
in hand with
ability for
movement

Constant-Site or Rotating-Site Cannulation?

	Potential Pros	Potential Cons
Rotating-Site	<ul style="list-style-type: none">-Lower risk of infection-Can move site easily with difficult cannulation-Less training time	<ul style="list-style-type: none">-Infiltration-Must have several sites to rotate along segment-Aneurysm development
Constant-Site	<ul style="list-style-type: none">-Less aneurysm formation-Some patients find less pain-Some patients find less difficulty-Patient acceptance	<ul style="list-style-type: none">-Higher risk of infection-Damage to track with mis-cannulation-Longer training time-Must also learn rotating site technique for back-up

Diagram of Buttonhole Site for AV Fistulas



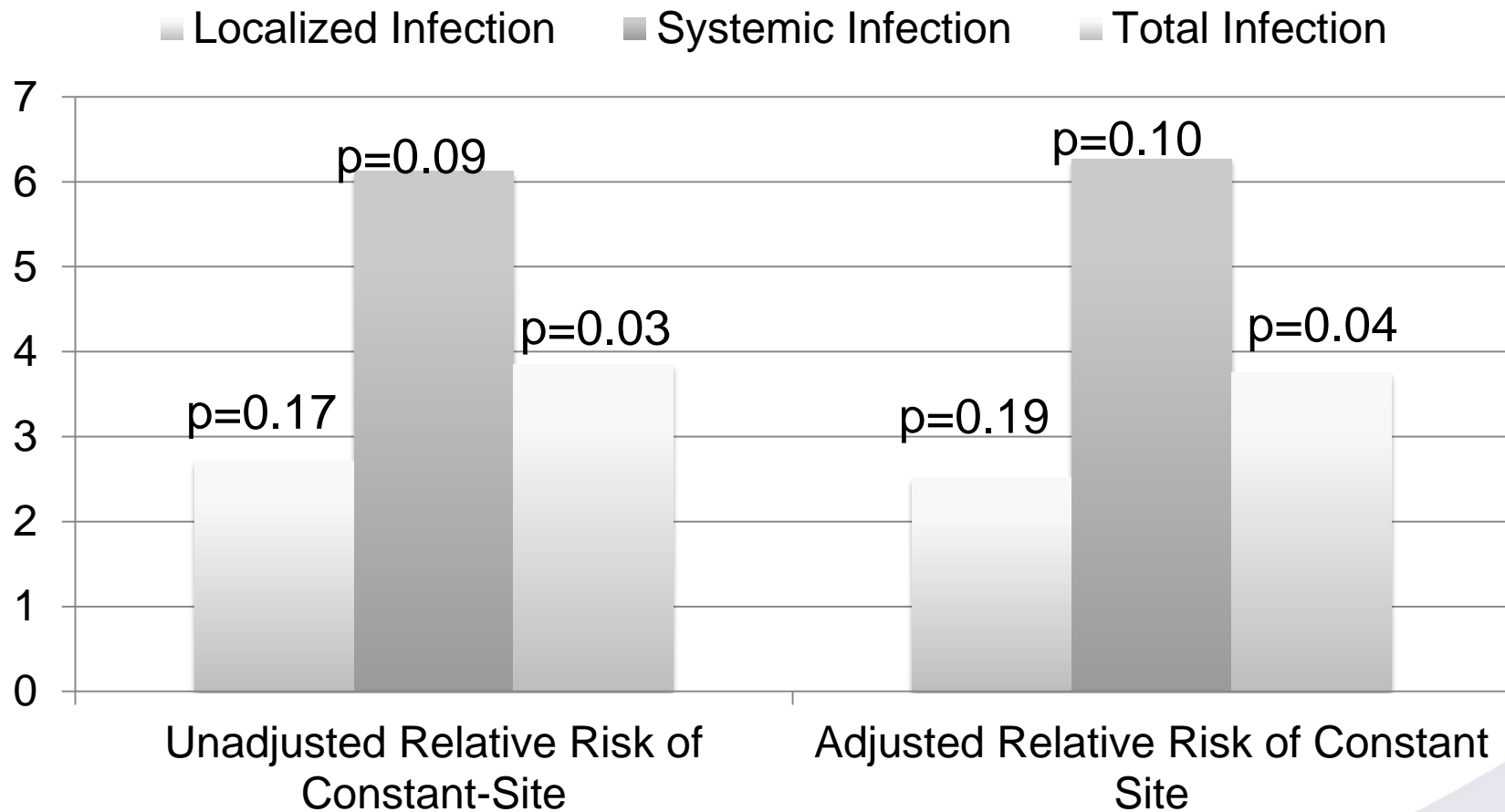
Removal of the Eschar for Buttonhole Cannulation

- **Inappropriate technique may contribute to increase infection risk**
- **Although physical removal of the eschar with a sterile instrument has been common practice, many practitioners now recommend removal of the eschar as part of the cleansing of the access to minimize trauma to the site and risk of infection**
 - Aseptic cleansing of sites before attempted removal with chlorhexidine, povidone iodine or other agent
 - Soften eschar with alcohol pads, alcohol gel, warm compresses or similar for approximately 5 minutes
 - Remove eschar with scrubbing action of subsequent aseptic technique
 - Re-prep sites immediately before cannulation after removal of eschar

Appearance of Buttonhole Sites



Risk of Infection in Home Hemodialysis with Constant-Site Cannulation



Clinical Monitoring of Vascular Access

- **Unexplained decrease in urea clearance or solute removal (e.g. hyperkalemia)**
- **Unexplained uremic symptoms**
- **New difficulty in cannulation**
- **Bleeding around needles during therapy**
- **Reports of increased bleeding after removal of needles**
- **Increase in venous pressures during therapy**
 - At beginning of therapy with blood flow rate of 200 ml/min, venous pressures should not exceed approximately 100 mm
 - During final blood flow rate, venous pressures should not consistently exceed approximately 250 mm

Evaluation of the Vascular Access during the Monthly Outpatient Visit

- **Discuss any changes or difficulty with cannulation**
- **Note any changes in the appearance of the access**
- **If access is a fistula, assess augmentation of the fistula with changes in position and gravity**
- **Assess the thrill of the fistula and any changes from prior month**
- **Review and emphasize aseptic technique**
- **Assess and discuss appropriate choice of cannulation sites with the patient and the dialysis nurse together**

Dialysis-related medication administration

Management of Hypertension, Ultrafiltration and Hypotension

- **Approximately half of patients starting more frequent dialysis will be able to discontinue BP medications**
- **Incorrect weighing or calculation of ultrafiltration is a common error in home hemodialysis**
- **Ultrafiltration rate limits are useful to promote hemodynamic stability in the home environment**
- **Avoidance and treatment of intradialytic hypotension is a key safety factor for home hemodialysis**

Kraus M et al. Hemodialysis Int . 11:468-477, 2007
FHN Trial Group N Engl J Med 2010:2287-2300, 2010

Discontinuation of Blood Pressure Medications

- **A significant number of patients will experience a decrease in the need for antihypertensive medications with home hemodialysis, particularly if performed more than thrice weekly**
- **Ideally, this adjustment should be accomplished while the patient is being supervised by nursing staff during the typical 3-4 week (15-20 treatments) training period**
- **Since the typical dialysis patient is on 3 antihypertensive medications, it is reasonable to instruct the training nurse and the patient to reduce or discontinue one medication each week**
- **The nephrologist should choose the order of medications to reduce based on each patient's individual characteristics.**

Anemia Management

- **Erythropoietic Stimulating Agents**

- Most data shows no difference in ESA dosing or hemoglobin for home hemodialysis patients
- Some observational and anecdotal reports show:
 - Patients on nocturnal hemodialysis with minimal or no ESA
 - Patients requiring more ESA and iron during the first several months at home presumably from blood loss (access and extracorporeal circuit)
- Administration should be simplified from incenter hemodialysis
 - Once weekly by patient
 - Once or twice monthly in clinic by staff

- **Iron**

- Parenteral administration by patient similar to incenter hemodialysis
- Parenteral administration monthly by clinic staff
- Oral iron daily

Discontinuation of Blood Pressure Medications

A significant number of patients will experience a reduction in the need for antihypertensive agents with home hemodialysis, particularly if performing more than thrice weekly hemodialysis

Vitamin D Analogs

- **No studies have shown significant differences in vitamin D analogs with home dialysis**
- **For patients on nocturnal dialysis (>5 hours), secondary hyperparathyroidism can be caused by negative calcium balance during dialysis**

Parenteral Antibiotic Dosing

- **Antibiotic dosing for patients on more frequent dialysis or lower volume dialysate have not been extensively studied. Comparison to dosing with Continuous Veno-venous Hemodialysis may be most appropriate**
- **Location of administration of antibiotics is not simple**
 - Transfer to incenter HD during antibiotic dosing
 - Antibiotic dosing given in home training center
 - Patient-administered antibiotic dosing in the home
 - Home health administered antibiotic dosing in the home

Routine Laboratory Tests

- **Testing frequency and specific tests are the same as center-based hemodialysis except hepatitis B surface antigen and water testing (see below)**
 - Some dialysis centers will require a hepatitis B surface antigen within 30 days for a back up hemodialysis treatment, so consider routine measurement versus on-demand measurement
- **Patients draw blood at home (need pre and post BUN measurement for kinetics calculation)**
 - Provide small blood vials and small centrifuge to patient
 - Can bring to clinic for processing
 - Can ship samples directly to laboratory from patient's home
- **Urea Kinetics (discussed at length in separate presentation)**
 - Utilization of a standardized Kt/V_{urea} (recommended target ≥ 2.0) to compare differing dialysis schedules
 - Residual renal function can be included in the kinetic calculation similar to PD, with equal frequency of measuring residual renal function (every 2-3 months)
- **Water and dialysate testing for home hemodialysis**
 - Chlorine/Chloramine testing every treatment
 - Product water and dialysate testing quarterly for bacteriological standards
 - Tap water AAMI water analysis prior to installation

The Outpatient Clinic Visit

- **Once a home program has more than 20-30 patients, efficient management of the monthly visit becomes critical**
- **Visit with all multidisciplinary team members**
- **Processing of laboratory tests**
- **Collection and review of dialysis flow sheets and data**
- **Supply distribution**
- **Administration of medication**
- **Review of procedures**