Southern California Renal Disease Council, Inc
ESRD Network 18

FISTULA FIRST
National Vascular Access Improvement Initiative

ESRD Network 18
Tool Kit
Table of Contents

Change Package
- Fistula First Change Package

Change Concept #1
Routine CQI Review of Vascular Access
- Vascular Access Coordinator Role
- Facility-Based Vascular Access Coordinator Role (Independents)
- Pre-ESRD Vascular Access/AVF Plan
- Presentation: Role of a Dialysis Access Coordinator (Vascular Access Manager)
- Related Articles For Vascular Access

Change Concept #2
Timely Referral to Nephrologist
- Draft Letter to PCP From Nephrologist
- Fistula Preservation, Development and Maintenance Policy and Procedure
- Pre-ESRD Vascular Access/AVF Plan

Change Concept #3
Early Referral to Surgeon for “AVF Only” Evaluation and Timely Placement
- Autologous AVF Algorithm
- Hemodialysis Access Referral: Existing Access
- Hemodialysis Access Referral: New Access
- Pre-ESRD Vascular Access/AVF Plan

Change Concept #4
Surgeon Selection Based on Best Outcomes, Willingness, and Ability to Provide Access Services
- Surgeon Questionnaire

Change Concept #5
Full Range of Appropriate Surgical Approaches to AVF Evaluation and Placement
- Duplex of Upper Extremity Vessels Prior to AVF Surgery
- Article: The Initial Creation of Native Arteriovenous Fistulas: Surgical Aspects and Their Impact on the Practice of Nephrology
- Article: Avoidance of Prophylactic Antibiotics in Creation of Native Arteriovenous Fistulas
- Article: Endoscopic Saphenous Vein Harvesting For Hemodialysis Vascular Access Creation in the Forearm: A New Approach For Arteriovenous Bridge Graft
Change Concept #6
Secondary AVF Placement in Patients With AF Grafts
- Secondary AV Fistulae in Patients with AV Grafts

Change Concept #7
AVF Placement in Patients With Catheters Where Indicated
- Facility Catheter Tracking Tool
- Management of Patient with Central Venous Catheter
- Reducing Central Venous Catheter Infections

Change Concept #8
Cannulation Training for AF Fistulas
- Article: Cannulation Camp: Basic Needle Cannulation Training For Dialysis Staff
- Cannulation of New Fistula Policy and Procedure
- Clamp Usage Policy and Procedure
- MEDISYSTEMS Cannulation Video
- Dr. Twardowski’s “Buttonhole Method of Needle Insertion Into an AVF” Video

Change Concept #9
Monitoring and Maintenance to Ensure Adequate Access Function
- Vascular Access Monitoring & Surveillance Flow Chart

Change Concept #10
Education for Care Givers and Patients
- NKF-K/DOQI Vascular Access Clinical Practice Guidelines – 2000 Update; Section II – Monitoring, Surveillance, and Diagnostic Testing
- NKF-K/DOQI Vascular Access Clinical Practice Guidelines – 2000 Update; Section IV – Management of Complications: When to Intervene
- Patient Resources
- Staff Resources
- Presentation: Best Access Procedures From the Dialysis Units’ Viewpoint
- Presentation: Fistulas For Dialysis Access: The Challenge of Preservation, Creation, Maturation, and Cannulation

Change Concept #11
Outcomes Feedback to Guide Practice

Data Collection Tools
- Interventional Radiologists Log Sheet
- Vascular Surgeons Log Sheet
- Implementation Tracking Tool
- Vascular Access Incidence and Prevalence Patient Log (Draft)

Index
Fistula First Change Package

Clinical and organizational recommendations based on best practices for increasing AV fistula use and improving hemodialysis patient outcomes; separated into 11 “Change Concepts”
# Fistula First Change Package

**Clinical and organizational recommendations based on best practices for increasing AV fistula use and improving hemodialysis patient outcomes:**

## 1 Routine CQI review of vascular access

- Designate staff member in dialysis facility responsible for vascular access CQI (RN if feasible but can be any renal care professional). Incorporate vascular access into facility-based CQI process.
- Assemble multi-disciplinary vascular access CQI team in facility or hospital.
  - Minimally: Medical Director and VA CQI Coordinator.
  - Ideally: Representatives of all disciplines, including access surgeons and interventionalists.
- Investigate and track all non-AVF access placements and AVF failures.

## 2 Timely referral to nephrologist

- Primary care physicians utilize pre-ESRD/CKD referral criteria to ensure timely referral of patients to nephrologists, ideally prior to Stage 4 CKD.
  - Establish meaningful criteria for PCPs who may not perform GFR or creatinine clearance testing (i.e. serum creatinine criteria, conversion formula for GFR)
- Nephrologist documents AVF plan for all patients expected to require renal replacement therapy, regardless of RRT being considered.
- Designated nephrology staff person educates patient and family on benefits of AVF and to protect vessels, when possible using bracelet as reminder.

## 3 Early referral to surgeon for “AVF only” evaluation and timely placement

- Nephrologist/skilled nurse performs appropriate evaluation and physical exam prior to surgery referral.
- Nephrologist refers for vessel mapping where feasible, ideally prior to surgery referral.
- Nephrologist refers patients to surgeons for “AVF only” evaluation, no later than Stage 4 CKD (GFR < 30).
  - Surgery scheduled with sufficient lead-time for AVF maturation.
- Nephrologist defines AVF expectations to surgeon, including vessel mapping.
- If pre-ESRD placement of AVF does not occur, nephrologist ensures that patient receives AVF evaluation and placement (if feasible) at the time of initial hospitalization for temporary access (e.g. catheter).

## 4 Surgeon selection based on best outcomes, willingness, and ability to provide access services

- Nephrologists communicate expectations to surgeons regarding AVF placement and training in current AVF surgical techniques, based on K/DOQI Guidelines and best practices.
- Nephrologists refer to surgeons willing and able to meet AVF expectations based on K/DOQI and best practices.
- Surgeons are continuously evaluated on frequency, quality, and patency of access placements. Data collection and outcomes tracking ideally initiated and reported at the dialysis center as part of ongoing CQI process, and can be aggregated at the Network level.

## 5 Full range of appropriate surgical approaches to AVF evaluation and placement

- Surgeons utilize current techniques for AVF placement including vein transpositions.
- Surgeons ensure mapping is performed for any patient candidate not deemed suitable for AVF based solely on physical exam.

Revised 11/03
Secondary AVF placement in patients with AV grafts
- Nephrologists evaluate every AV graft patient for possible secondary AV fistula, including mapping as indicated, and document plan in patient’s record.
- Dialysis facility staff and/or rounding nephrologists examine outflow vein of all forearm graft patients (“sleeves up”) during dialysis treatments (minimum frequency = monthly) to identify patients who may have suitable upper outflow vein for elective secondary AVF conversion in upper arm. Inform nephrologist and surgeon of need to evaluate identified outflow vein for AVF conversion.
- Nephrologist refers to surgeon for evaluation/placement of secondary AVF before failure of AVG.

AVF placement in patients with catheters where indicated
- Regardless of prior access (e.g. AV graft), nephrologists and surgeons evaluate all catheter patients as soon as possible for AVF, including mapping as indicated.
- Facility implements protocol to track all catheter patients for early removal of catheter.
- Nephrologists make every effort not to admit patients to clinic with “catheter only”

Cannulation training for AV fistulas
- Facility identifies and uses best cannulators and best teaching tools (e.g., videos) to teach AVF cannulation to all appropriate dialysis staff.
- Dialysis staff uses specific protocol for initial dialysis treatments with new AVFs and assigns the most skilled staff to such patients.
- Facility offers option of self-cannulation to patients who are interested and able.

Monitoring and maintenance to ensure adequate access function
- Nephrologists and surgeons conduct post-operative physical evaluation of AVFs in 4 weeks to detect early signs of failure and refer for diagnostic study and remedial intervention as indicated.
- Facilities adopt standard procedures for monitoring, surveillance, and timely referral for the failing AVF.
- Nephrologists, interventional radiologists, and surgeons adopt standard criteria, and a plan for each patient, to determine the appropriate extent of intervention on an existing access before evaluating and mapping for an AVF.

Education for caregivers and patients
- Routine facility staff in-servicing and education program in vascular access.
- Continuing education for all caregivers to include periodic inservices by nephrologists, surgeons, and interventionalists.
- Facilities educate patients to improve quality of care and outcomes (e.g., prepping puncture sites, applying proper pressure at needle sites without clamps, AVF brochures, etc.).

Outcomes feedback to guide practice
- Networks work with dialysis providers to provide specific outcomes feedback to all decision-makers, including incident and prevalent rates of AVF, AVG, and catheter use.
- Review data monthly or quarterly in facility staff meetings. Discuss and evaluate data trended over time for incident and prevalent rates of AVF, AVG, and catheter use. Track and disseminate all vascular access-related outcomes.

For further information, contact your ESRD Network. A complete listing of ESRD Networks can be found at: http://www.esrdnetworks.org/. Fistula First is an initiative of the Centers for Medicare and Medicaid Services and the Department of Health and Human Services. Project assistance provided by the Institute for Healthcare Improvement.
Change Concept #1

*Routine CQI Review of Vascular Access*

- Vascular Access Coordinator Role
- Facility-Based Vascular Access Coordinator Role (Independents)
- Pre-ESRD Vascular Access/AVF Plan
- Presentation: Role of a Dialysis Access Coordinator (Vascular Access Manager)
- Related Articles For Vascular Access
Vascular Access Coordinator Role

Reports to: Facility Administrator, Medical Director, VA Team

PURPOSE OF VASCULAR ACCESS COORDINATOR ROLE:

- Primary source of vascular access information and care coordination for designated facility (provider)
- Focus on vascular access care and management to increase access longevity
- Maintain vascular access data to assure tracking and trending of dialysis therapy and outcomes
- Provide leadership and communication among caregivers
- Oversee and direct vascular access planning for current and future accesses

SUMMARY OF BASIC ROLE:

- Collection of accurate and complete vascular access data.
- Coordination of the care and management of patients’ vascular accesses.
- Communication and collaboration with the Multidisciplinary Access Care Team

ROLE QUALIFICATIONS:

- Experienced hemodialysis professional
- Certification in nephrology or hemodialysis preferred
- Demonstrated proficiency in vascular access care and management
- Demonstrated commitment to continuous quality improvement (CQI)
- Excellent communication, writing, and organization skills
- Empowered by the facility administrator, medical director and Multidisciplinary Access Care Team

ESSENTIAL JOB FUNCTIONS:

1. Collaborate with medical director, facility administrator et al to identify and continuously re-evaluate the members of the Multidisciplinary Access Care Team.
2. Proactively collect and report accurate and complete data and assessments of the accesses to facility, teammates, patients and other care providers (the Multidisciplinary Access Care Team) for baseline and ongoing outcomes.
3. Educate teammates, provider partners, and hemodialysis patients in the care and management of vascular accesses, with particular attention to opportunities for improvement.
4. Monitor vascular access and hemodialysis care delivery with particular focus on identifying access dysfunction and opportunities to increase arteriovenous fistulas (AVFs) and reduce catheters.
5. Facilitate process of referral for diagnosis for accesses with dysfunction or other pathology.
6. Support referral for Interventional or surgical treatment appropriate for diagnosed vascular access dysfunction.
7. Ensure documentation of care and outcome, and communicate vascular access-related outcomes and status.
8. Participate in Continuous Quality Improvement of Vascular Access care and management to improve patient and facility outcomes.
9. Facilitate routine Multidisciplinary Access Care Team meetings to identify opportunities for vascular access-related improvements.
10. Complete other vascular access-related tasks as directed.
Fistula First
Facility-Based Vascular Access Coordinator Role (Independents)

ROLE ASSIGNMENT

Each facility has a staff member assigned the duties of Vascular Access Coordinator. This individual should be located either on-site or at least readily available to the facility staff. The role can be part-time or full-time, depending on the hemodialysis patient census, and combined with other job duties.

SUGGESTED DUTIES

- Regularly reviews patient access status and treatment plans
- Reviews dialysis treatment records and adequacy to determine trends
- Acts as main contact in unit for access activities
- Reports VA data at QI meetings
- Attends patient care conferences and dialysis rounds within facility
- Ensures that any vascular access (VA) information in patient records (and on any facility database) is current regarding:
  - Initial VA history/surgeon
  - Ongoing VA surgical/intervention procedures
  - VA infections
  - Routine VA assessment/monitoring/surveillance
  - Hospitalizations related to VA
  - Vein mapping & diagnostic screening test reports

Mission Statement

To provide leadership and assistance to renal dialysis and transplant facilities in a manner that supports continuous improvement in patient care, outcomes, safety and satisfaction.

6255 Sunset Boulevard • Suite 2211 • Los Angeles • California • 90028
(323) 962-2020 • (323) 962-2891/Fax • www.esrdnetwork18.org

### MONTHLY VASCULAR ACCESS MONITORING & SURVEILLANCE
### REFERRAL / INTERVENTION TRACKING LOG

**Patient Name**

<table>
<thead>
<tr>
<th>Last name, 1st initial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATE (MM/DD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ACCESS</th>
<th>REASON FOR REFERRAL</th>
<th>BP @ time of monitoring VP @ 200 Qb (Dynamic) STATIC PRESSURE RATIOS ACCESS FLOW RECIRC. % (if known)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>VP AP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VP AP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FISTULOGRAM or DOPPLER STUDY</th>
<th>INTERVENTION</th>
<th>Dynamic VP @ 200 Qb</th>
<th>STATIC PRESSURE RATIO</th>
<th>ACCESS FLOW</th>
<th>RECIRC. % (if known)</th>
<th>DATE (MM/DD)</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notes:
1. This tracking log is for patients with ABNORMAL monitoring indicators who are to be referred for fistulography or consultation and/or treatment as indicated. Notify nephrologist of plan to refer patient. Make referral appointment. Fax "Intervention.
2. "Y or N" refers to Yes or No. "R or S" refers to Radiology or Surgery.
3. Post-intervention surveillance test should be checked following treatment to be sure it has returned to normal.

### Special Note:

1. Fistulae are to be referred when the access flow is less than the prescribed delivered flow (Rx Qb).
2. Grafts are to be referred when intra-access flow is below 600 ml/min.
3. This tracking log is for patients with ABNORMAL monitoring indicators who are to be referred for fistulography or consultation and/or treatment as indicated. Notify nephrologist of plan to refer patient. Make referral appointment. Fax "Intervention.

---

**MONTHLY VASCULAR ACCESS MONITORING & SURVEILLANCE**

**Dialysis Facility**

**REFERRAL / INTERVENTION TRACKING LOG**

**Month/Year (MM/YY):**

---

**NOTES:**

1. This tracking log is for patients with ABNORMAL monitoring indicators who are to be referred for fistulography or consultation and/or treatment as indicated. Notify nephrologist of plan to refer patient. Make referral appointment. Fax "Intervention.
2. "Y or N" refers to Yes or No. "R or S" refers to Radiology or Surgery.
3. Post-intervention surveillance test should be checked following treatment to be sure it has returned to normal.

### Special Note:

1. Fistulae are to be referred when the access flow is less than the prescribed delivered flow (Rx Qb).
2. Grafts are to be referred when intra-access flow is below 600 ml/min.

---

**ESRD Network 18**

L. Spergel, MD / VAMP Rev. 9/29/03
PRE-ESRD VASCULAR ACCESS/AVF PLAN

GFR < 30 cc/min. (Stage 4 CKD)

Evaluate for RRT
- Counseling/education
- Vessel mapping-all pts.

Choose PD

or

Surgery consult- “AVF Only”
- Vessel Mapping (if not already done)
- Preserve Veins

Choose HD

GFR 30-20

AVF Construction
(ideally 6-12 mos. early)
Role of a Dialysis Access Coordinator (Vascular Access Manager)

Carolyn Barclay, RN, CNN

Introduction

• Goal: Help the Dialysis Community see the value a Vascular Access Manager (VAM) can bring as a member of the team.
**Ideal Renal Team**

- Renal Pharmacist
- Renal Dietician
- Social Worker
- RN Nephrology Care Managers
- Transplant Coordinator
- Dialysis Access Coordinator/VAM

**It Takes a Team**

- Patient/Patient’s Family
- Nephrologist (office staff)
- Vascular Surgeon (office staff)
- Interventional Radiology
- Dialysis Staff
- Dialysis Access Coordinator/VAM
Topics of Discussion

- Role of the Access Coordinator/VAM
- Identifying Pre-ESRD population
- Education key for Early Referral for Dialysis Access
- Saving Veins

Topics

- Tracking Data
- Access Problems: What to report?
- Education Tools for Patients
Role of the VAM

- Provides ongoing patient support, oversight and education related to vascular access.
- Facilitates early access placement with emphasis on fistula placement whenever possible.
- Collaborates with dialysis unit staff, hospital staff, surgical staff.

Role of the VAM (cont.)

- Maintains Access History
- Participates in QA activities related to Access
- Serves as a resource on Access issues
Early Referral to Nephrologist

- Primary Care M.D.’s need education
- Goal is for early fistula creation
- We must get patients referred to Nephrologist before they can be referred to surgeon
- Timing of referrals can improve if Primary Care M.D. knows when to refer

Early Referral to Nephrologist (cont.)

- Screen patients at high risk:
  - Age >60,
  - African-American,
  - Native American,
  - Diabetes,
  - Hypertension
- Refer to nephrologist if stable or rising Creatinine >1.5 female, >2.0 male
- Proteinuria > 2 gm/day
Glomerular Filtration Rate

- Nephrologist should direct when patient gets referred for dialysis access.
- GFR is widely accepted as the best overall measure of kidney function.
- GFR Calculator is on Nephron.com

When to Refer for Hemodialysis Access

- When GFR <30 (CKD Stage 4) and patient chooses hemodialysis, nephrologist should refer to surgeon for AV fistula consultation.
- Best for AV fistula to be created 6 months to 1 year prior to dialysis start to allow for maturation time.
When to Refer for Hemodialysis Access (cont.)

- Goal should be to avoid hemodialysis catheter whenever possible.
- If patient is not a candidate for an AV fistula, nephrologist may want to wait until GFR lower before graft placement.

Education of Pre-ESRD Patients

- Education should start when GFR is <30ml/min (CKD Stage 4).
- Modality choices need to be presented before appropriate access referral can be made.
- Consider AV Fistula creation even if patient chooses peritoneal dialysis.
- Educate patients to “Save Their Veins”
AV Fistulas Need to Be Created Early!

Helpful if patient understands process

- Referral to surgeon
- Ultrasound mapping may be necessary before surgery can be scheduled
- Important patient have follow-up post AV fistula creation to monitor development of AV fistula.
- An AV fistula attempted and not successful should not be considered a failure! An AV fistula attempted is better than a graft.

Provide Realistic Expectations

- Access may take maintenance angiography, angioplasty, thrombectomy, revision.
- Grafts clot much more often than fistulas
- AV Fistulas can be fragile and can infiltrate
- AV Fistulas can clot - and can be successfully de-clotted.
**Referral for Dialysis Access**

- Vascular access coordinator can facilitate referral:
  - Send appropriate patient records, labs, medication lists, allergy list to surgeons office.

**Referral for Access:**

- Call patient to let them know they are being referred.
  - Allow them time to ask questions.
- Follow up: Patients often have difficulty accepting it’s time for an access.
- VAM acts as liaison between nephrologist and surgeon’s office.
Best Outcome:

- Patient starts first dialysis treatment with a functioning AV fistula.

No Access in Place for Dialysis Start - Options

- Tunneled hemo Catheter + AV fistula placed, if possible.
- If patient wants Peritoneal Dialysis an acute hemo catheter + PD Catheter may suffice until PD training can start.
**Next Steps:**

- Vein mapping (as necessary)
- Graft material only if patient not a good candidate for AV fistula.
- Nephrologists could consider use of peritoneal dialysis while AV fistula matures if patient is an appropriate candidate for PD
- Case example

**Reporting Access Problems**

What’s important to report?

- Increase in venous pressure
- Changes in arterial pressure
- Prolonged bleeding
- Decrease in Kt/v and URR
Reporting Access Problems (cont.)

- Change in bruit
- Abnormal transonic/ultrasound flow
- Swelling, redness, pain, problems with cannulation
- Poorly functioning hemodialysis catheter

Reporting Problems

- Be aware that if patient has significant stenosis - access may function but labs can get critically out of balance.
- Case example:
  - Fistula examples
  - Catheter example
**Tracking Information**

- Access history – very helpful if VAM and/or designated staff person can keep an updated history on all access events a patient is having.
- Patient name
- Date of procedure
- Surgeon/radiologist

**What’s Important to Track**

- Needs to be decided by team
- Database is useful to track
- Primary Placement
- Replacement Access
- Thrombectomies
- Infections
What’s Important to Track (cont.)

- Access Incidence and Prevalence
- Angiography/Angioplasty
- Information can be tracked by dialysis unit, surgeon, access type

VA Pt tracking tool
PD tracking tool

Thrombosis by month

<table>
<thead>
<tr>
<th>Health Plan Monthly Total</th>
<th># of Hemo Pts + Pts w/VA</th>
<th># of Thrombosis</th>
<th>Thrombotic Episodes/Pt/Mo</th>
<th>Annualized Episodes/Pt/Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>283</td>
<td>14</td>
<td>0.05</td>
<td>0.88</td>
</tr>
<tr>
<td>Feb</td>
<td>284</td>
<td>7</td>
<td>0.02</td>
<td>0.44</td>
</tr>
<tr>
<td>Mar</td>
<td>288</td>
<td>7</td>
<td>0.02</td>
<td>0.39</td>
</tr>
<tr>
<td>April</td>
<td>271</td>
<td>9</td>
<td>0.03</td>
<td>0.39</td>
</tr>
<tr>
<td>May</td>
<td>274</td>
<td>14</td>
<td>0.05</td>
<td>0.44</td>
</tr>
<tr>
<td>Jun</td>
<td>281</td>
<td>9</td>
<td>0.03</td>
<td>0.43</td>
</tr>
<tr>
<td>July</td>
<td>297</td>
<td>10</td>
<td>0.03</td>
<td>0.42</td>
</tr>
<tr>
<td>Aug</td>
<td>304</td>
<td>4</td>
<td>0.01</td>
<td>0.39</td>
</tr>
<tr>
<td>Sep</td>
<td>306</td>
<td>12</td>
<td>0.04</td>
<td>0.40</td>
</tr>
<tr>
<td>Oct</td>
<td>286</td>
<td>11</td>
<td>0.04</td>
<td>0.41</td>
</tr>
<tr>
<td>Nov</td>
<td>304</td>
<td>11</td>
<td>0.04</td>
<td>0.41</td>
</tr>
<tr>
<td>Dec</td>
<td>308</td>
<td>9</td>
<td>0.03</td>
<td>0.40</td>
</tr>
<tr>
<td>Current Total</td>
<td>2588</td>
<td>117</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>
**Thrombosis**

Thrombotic Episodes - 2000 vs 2001 Summary
AV Fistula versus Graft

![Bar chart showing the comparison of thrombotic episodes between AV Fistula and Graft for 2000 and 2001.](image)

**Primary Access**

Primary Insertions by Non-Catheter Access
Type: AV Fistula vs Graft for 2001

![Bar chart showing the comparison of primary access insertions between AV Fistula and Graft for 2000 and 2001.](image)
**AV Fistula Readiness**

2001-AV Fistula Readiness for 1st Dialysis
N=45 Fistula

- **2000**
  - Fistula: 61%
  - Catheter: 39%

- **2001**
  - Fistula: 87%
  - Catheter: 13%

**Infection Tracking**

- Tracking infections by access type
- Systemic (blood) or local infection
- CDC has dialysis surveillance study that individual units can participate in
- Allows comparison with other participating units in the country
**Infections by Month**

**Infections by Vascular Access Type**

*By Month - 2001*

![Bar chart showing infections by vascular access type and month](chart)

**Tools for Access Management**

- Referral to Surgeon form
- Referral for Evaluating Problem
- Infection Tracking
- Access Procedure Tracking Tool
- “Save Your Veins” card
- Wallet card with Access Care Advice and Important Phone Numbers for dialysis unit, surgeon, nephrologist
Caring for the Hemodialysis Catheter

Educate patient on:
- proper handwashing technique
- taking a shower without getting the catheter wet
- changing the dressing on their own
- clamping the catheter if it starts to bleed
- what to do if the catheter falls out
- who to call if they have a problem with the catheter

Care of the New Dialysis Access AV Fistula/Graft

- Allow enough maturation time (2-6 weeks for AVG and 2-3 months for AVF)
- Carefully assess VA before each dialysis session
- Rotate needles
- Clamp use vs. no clamps
- Educate patients on s/s of infection, clotting, and other complications
**Wallet card**

**Long Term Care of the Hemodialysis Access**

- Routine monitoring and surveillance at the facility level
- Prompt referral and early intervention
- Patient VA history
- Patient education
- Self-cannulation
Conclusion

- Access Manager does play a beneficial role in helping patients, nephrologists, surgeons and dialysis staff in the coordination of access care
Included in this resource are articles that will assist you in improving fistula rates at your facility. For those project partners who are focusing their efforts on specific areas of the Fistula First project, the resources have been categorized according to change concept. Some of these articles will be pertinent to multiple change concepts.

### General References and Resources


**Preventing vascular access dysfunction: which policy to follow**, by Besarab A. *Blood Purification*, 2002;20(1):26-35. Reduction of catheters will automatically result from initiatives that increase the construction of AVFs and preemptive monitoring and surveillance of accesses for dysfunction. Therefore, policies that promote the latter two vascular access aspects are most important to develop and follow.

**Vascular access survival and incidence of revisions: a comparison of prosthetic grafts, simple autogenous fistulas, and venous transposition fistulas from the United States Renal Data System Dialysis Morbidity and Mortality Study.** Gibson KD, Gillen DL, Caps MT, Kohler TR, Sherrard DJ, Stehman-Breen CO. *Journal of Vascular Surgery*, 2001 Oct;34(4):694-700. The preferential placement of autogenous fistulas may increase primary patency and decrease the incidence of revisions. Vein transpositions had similar secondary patency compared with simple fistulas, but required more revisions. The greatest benefit of a vein transposition fistula was seen in women and in patients with a history of access failure.

**How can the use of arteriovenous fistulas be increased? - A series of opinion papers**, by Hayden Hemphill and Michael Allon, Klaus Konner, Jack Work and Joseph A. Vassalotti. From *Seminars in Dialysis*, Vol 16, No 3 (May-June): pp 214-223. Topics discussed include requirements for optimizing fistula success, pre-dialysis evaluation, where to locate the “first” AVF, modified Gracz technique by Konner, and vein mapping.

**The initial creation of native arteriovenous fistula: Surgical aspects and their impact on the practice of nephrology**, by Konner K *Seminars in Dialysis* 2003 July; 16 (4): pp 291-298. The aim of access surgery is a rapidly maturing and well-functioning fistula that can be cannulated easily and repeatedly for adequate hemodialysis therapy. Includes surgical details and a discussion of the importance of the vascular access management team.
Overcoming barriers to AVF creation and use, by Charmaine E. Lok and Matthew J. Oliver. From Seminars in Dialysis, Vol 16, No 3 (May-June): pp 189-196. Discusses key components of a vascular access program, outcome tracking, preoperative vessel evaluation, procedures to facilitate AVF maturation, and transposed brachiobasilic and other tertiary fistula placement.

A Graft-free Hemodialysis Practice is Possible in a Community-Based Dialysis Unit Despite High Patient Co-Morbidities, by Vo Nguyen, Chris Griffith, Kevin Robinson. Abstract presented at the 2001 ASN Annual Meeting.

Creation, cannulation and survival of arteriovenous fistulae: data from the Dialysis Outcomes and Practice Patterns Study. Rayner HC, Pisoni RL, Gillespie BW, Goodkin DA, Akiba T, Akizawa T, Saito A, Young EW, Port FK; Dialysis Outcomes and Practice Patterns Study. Kidney International, 2003 Jan;63(1):323-30. Significant differences in clinical practice currently exist between countries regarding the creation of A-V fistulae prior to starting hemodialysis and the timing of initial cannulation. Cannulation within 14 days of creation is associated with reduced long-term fistula survival. Fistulae ideally should be left to mature for at least 14 days before first cannulation.

Basic steps for increasing the rate of autogenic vascular accesses for hemodialysis, by Salgado OJ. From Therap Apher Dial, 2003 Apr;7(2):238-43. Proactive involvement of nephrologists in the basic steps for AVF creation would substantially contribute to increase AVF rates among HD patients.


The association of initial hemodialysis access type with mortality outcomes in elderly medicare ESRD patients, by Xue JL, Dahl D, Ebben JP, Collins AJ. American Journal of Kidney Diseases, 2003 Nov;42(5):1013-9. In the US Medicare dialysis population, type of initial hemodialysis access was associated with 1-year mortality. Mortality risks were (in ascending order) fistulae, grafts, and catheters.


---

Change Concept #1
Routine CQI Review of Vascular Access


A multidisciplinary team approach to increasing AV fistula creation, by Nguyen VD, Griffith C, Treat L. From Nephrol News Issues, 2003 Jun;17(7):54-6, 58, 60 passim. In 2002, the NW Renal Network led the way with fistula creation seminars, focusing on practicing nephrologists, surgeons, radiologists, and dialysis caregivers. This demonstrated the importance and value of a multidisciplinary vascular access team.


National Kidney Foundation Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification, and Stratification, by A. Levery, J. Coresh, E. Balk, A. Kausz, A. Levin, M. Steffes, R. Hogg, R. Perrone, J Lau, G Eknoyan. From Ann Intern Med. 2003 Jul; Vol 139 (2): pp 137-149. Defines the five-stage classification system of chronic kidney disease (CKD) and summarizes the major recommendations on early detection in adults. This information is particularly important for general internists and specialists


**Strategy for maximizing the use of arteriovenous fistulae**, by Beathard GA. From *Semin Dial*, 2000 Sep-Oct;13(5):291-6. In order to properly select patients for an arteriovenous fistula (AVF), it is essential that the nephrologist become knowledgeable about the subject and that an organized approach be followed. Even if the patient has an arteriovenous graft, they should be evaluated at the time of every graft failure for the possibilities of creating a secondary AVF.


**Tracking the Performance of Access Surgeons and Changing Referral Pattern Accordingly Increase Fistulae Placement**, by Mohamed A. Sekkarie. ASN 2003 Abstract F-PO812. Fistulae placement could be increased when the nephrologist works with access surgeons and monitor their performance. Profiling of access surgeons by policy-makers could be a useful method for the identification of surgeons with better skill.
**Change Concept #3 continued**


**CO2 and gadopentetate dimeglumine as alternative contrast agents for malfunctioning dialysis grafts and fistulas**, by Spinosa DJ, Angle JF, Hagspiel KD, Schenk WG 3rd, Matsumoto AH. From *Kidney Int*, 1998 Sep;54(3):945-50. Gadopentetate dimeglumine is useful as an alternative contrast agent in conjunction with CO2 in patients with malfunctioning hemodialysis grafts and fistulas, who have a contraindication to the administration of iodinated contrast material.


**Obese and non-obese hemodialysis patients have a similar prevalence of functioning arteriovenous fistula using pre-operative vein mapping**, by Vassalotti JA, Falk A, Cohl ED, Urribarri J, Teodosescu V. From *Clin Nephrol*, 2002 Sep;58(3):211-4. Pre-operative vein mapping is associated with a similar prevalence of functioning AVF in obese and lower BMI patients. Pre-operative ultrasound screening is a useful tool to promote AVF placement in obese patients.

**Change Concept #4**

**Surgeon Selection Based on Best Outcomes, Willingness, and Ability to Provide Access Services**


**Tracking the Performance of Access Surgeons and Changing Referral Pattern Accordingly Increase Fistulae Placement**, by Mohamed A. Sekkarie. ASN 2003 Abstract F-PO812. Fistulae placement could be increased when the nephrologist works with access surgeons and monitor their performance. Profiling of access surgeons by policy-makers could be a useful method for the identification of surgeons with better skill.


**K/DOQI Clinical Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification, and Stratification** Full Text from *AJKD* 2002 Feb; Vol 39, No2, Suppl 1: ppS1-S266

Change Concept #5
Surgeons Provide a Full Range of Appropriate Surgical Approaches to AVF Evaluation and Placement

Outcomes of upper arm arteriovenous fistulas for maintenance hemodialysis access, by Fitzgerald JT, Schanzer A, Chin AI, McVicar JP, Perez RV, Troppmann C. *Arch Surg.* 2004 Feb;139 (2):201-8. Results of this study suggest that an upper arm AVF is a reasonable alternative for maintenance hemodialysis access when a radioccephalic AVF is not possible.

The Initial Creation of Native Arteriovenous Fistula: Surgical aspects and Their Impact on the Practice of Nephrology, by Konner K. *Seminars in Dialysis* 2003 July; 16 (4): pp 291-298. The aim of access surgery is a rapidly maturing and well-functioning fistula that can be cannulated easily and repeatedly for adequate hemodialysis therapy. Includes surgical details and a discussion of the importance of the vascular access management team.

Vascular access survival and incidence of revisions: a comparison of prosthetic grafts, simple autogenous fistulas, and venous transposition fistulas from the United States Renal Data System Dialysis Morbidity and Mortality Study. Gibson KD, Gillen DL, Caps MT, Kohler TR, Sherrard DJ, Stehman-Breen CO. *Journal of Vascular Surgery*, 2001 Oct;34(4):694-700. The preferential placement of autogenous fistulas may increase primary patency and decrease the incidence of revisions. Vein transpositions had similar secondary patency compared with simple fistulas, but required more revisions. The greatest benefit of a vein transposition fistula was seen in women and in patients with a history of access failure.


**Proximal radial artery as inflow site for native arteriovenous fistula,** by Bruns SD, Jennings WC. From *J Am Coll Surg,* 2003 Jul;197(1):58-63. The proximal radial artery (PRA) allows for adequate arterial inflow while avoiding the risk of steal syndrome found with brachial artery fistulas. More extensive procedures or use of prosthetic grafts can be avoided.


**Durability and cumulative functional patency of transposed and nontransposed arteriovenous fistulas,** by Choi HM, Lal BK, Cerveira JJ, Padberg FT Jr, Silva MB Jr, Hobson RW 2nd, Pappas PJ. From *J Vasc Surg,* 2003 Dec;38(6):1206-12. Preoperative duplex scanning of upper arm and forearm veins facilitated successful creation of all types of autogenous fistulas at our institution. TAVF cumulative functional patency rates were superior compared with AVGs and AVFs. Furthermore, TAVFs and AVFs were more durable and required fewer revisions than did AVGs. When preoperative duplex criteria indicate that TAVFs can be performed, they should be the initial access of choice, because of their superior long-term patency and durability.


**Comparison of Transposed Brachiobasilic Fistulas to Upper Arm Grafts and Brachiocephalic Fistulas**, by MJ Oliver, RL McCann, OS Indirdason, DW Butterly and SJ Schwab. From *Kidney Int* 2001; 60: pp 1532-1539.


**Superior patency of perforating antecubital vein arteriovenous fistulae for hemodialysis**, by Sparks SR, VanderLinden JL, Gnanadev DA, Smith JW, Bunt TJ. From *Ann Vasc Surg*, 1997 Mar;11(2):165-7. In conclusion, the perforating antecubital vein (PAV) fistula has an excellent patency rate and appears to be a viable option for AV access after a failed B-C fistula or when a B-C fistula is not technically feasible.

**Understanding strategies for the treatment of ischemic steal syndrome after hemodialysis access**, by Wixon CL, Hughes JD, Mills JL. From *J Am Coll Surg*, 2000 Sep;191(3):301-10. It is paramount that surgeons who perform vascular access procedures have a firm understanding of the symptoms, diagnostic maneuvers, and treatment options for the ischemic steal syndrome after hemodialysis access procedures.

---

**Change Concept #6**

**Place Secondary AVF in AV Graft Patients Where Indicated**


**A Graft-free Hemodialysis Practice is Possible in a Community-Based Dialysis Unit Despite High Patient Co-Morbidities**, by Vo Nguyen, Chris Griffith, Kevin Robinson. Abstract presented at the 2001 ASN Annual Meeting.
Strategy for maximizing the use of arteriovenous fistulae, by Beathard GA. From *Semin Dial*, 2000 Sep-Oct;13(5):291-6. In order to properly select patients for an arteriovenous fistula (AVF), it is essential that the nephrologist become knowledgeable about the subject and that an organized approach be followed. Even if the patient has an arteriovenous graft, they should be evaluated at the time of every graft failure for the possibilities of creating a secondary AVF.

**Change Concept #7**

Place AVF in Catheter Patients Where Indicated


Type of vascular access and mortality in U.S. hemodialysis patients, by Dhingra RK, Young EW, Hulbert-Shearon TE, Leavey SF, Port FK. From *Kidney Int*, 2001 Oct;60(4):1443-51. This case-mix adjusted analysis suggests that central venous catheter and arteriovenous graft are correlated with increased mortality risk when compared with AVF, both overall and by major causes of death.

Identifying vascular access complications among ESRD patients in Europe. A prospective, multicenter study, by Elseviers MM, Van Waeleghem JP; European Dialysis and Transplant Nurses Association/European Renal Care Association. From Nephrol News Issues, 2003 Jul;17(8):61-4, 66-8, 99. Catheters presented an eightfold increased risk for patients of developing infections and access flow problems. This study revealed the high complication rate in VA and strengthened the notion that the AV fistula is the superior access.


Vascular access and increased risk of death among hemodialysis patients, by Pastan S, Soucie JM, McClellan WM. From *Kidney Int*, 2002 Aug;62(2):620-6. Venous catheters are associated with an increased risk of all-cause and infection-related mortality among hemodialysis patients.


**Change Concept #8**

Cannulation Training For AV Fistulas


Change Concept #9
Perform Monitoring and Surveillance to Ensure Adequate Access Function

MONITORING:


*Are hemodialysis access flow measurements by ultrasound dilution the standard of care for access surveillance?*, by Garland JS, Moist LM, Lindsay RM. From *Adv Ren Replace Ther*, 2002 Apr;9(2):91-8. Access flow measurements are the best tests currently available to screen for access dysfunction, and as preventative interventions, such as angioplasty and surgery, are successful, they should be regarded as the present standard of care. This would appear to be a cost-effective strategy. Furthermore, the method of choice for access flow measurement is by ultrasound dilution technology.


**MAINTENANCE**


Aggressive treatment of early fistula failure, by Beathard GA, Arnold P, Jackson J, Litchfield T. From *Kidney Int*, 2003 Oct;64(4):1487-94. If correctable pathology is detected in patients with early fistula failure, the incidence of correctable lesions is relatively high and an aggressive therapeutic approach can be expected to have a high yield.


Impact of secondary procedures in autogenous arteriovenous fistula maturation and maintenance, by Berman SS, Gentile AT. From *J Vasc Surg*, 2001 Nov;34(5):866-71. Aggressive assessment of immature or failing autogenous AV fistulas for correctable lesions should be included in any hemodialysis practice to optimize their use and exploit the superiority of the native fistula.


Treatment of "swing point stenoses" in hemodialysis arteriovenous fistulae, by Falk A, Teodorescu V, Lou WY, Uribarri J, Vassalotti JA. From *Clin Nephrol*, 2003 Jul;60(1):35-41. Non-maturing or poorly functioning AVF frequently have stenoses in the outflow vein at the original site of surgical vein mobilization.
Impact of reintervention for failing upper-extremity arteriovenous autogenous access for hemodialysis, by Hingorani A, Ascher E, Kallakuri S, Greenberg S, Khanimov Y. From J Vasc Surg, 2001 Dec;34(6):1004-9. This review suggests that simple and extended salvage procedures may allow maturation and add to the life span of AVFs for hemodialysis. In addition, these data suggest an advantage for open techniques as compared with percutaneous techniques but only in terms of requiring fewer subsequent procedures.


Dilatation and declotting of arteriovenous accesses, by Turmel-Rodrigues L. From Therap Apher Dial, 2003 Apr;7(2):244-51.


Endovascular intervention for the failing vascular access, by Vesely TM. From Adv Ren Replace Ther, 2002 Apr;9(2):99-108. When appropriate lesions are treated, angioplasty is a fast, easy, and safe procedure that can extend to patency of a hemodialysis graft or fistula.


Change Concept #10
Education for Caregivers and Patients


Isometric exercise increases the size of forearm veins in patients with chronic renal failure, by Leaf DA, MacRae HS, Grant E, Kraut J. From Am J Med Sci, 2003 Mar;325(3):115-9. A simple, incremental resistance, exercise-training program can cause a significant increase in the size of the cephalic vein commonly used in the creation of an arteriovenous fistula. The increase in size and resultant probable increase in blood flow might accelerate the maturation of native arteriovenous fistulae, thereby lessening the morbidity associated with vascular access.

Effect of exercise on the diameter of arteriovenous fistulae in hemodialysis patients, by Oder TF, Teodorescu V, Urribari J. From ASAIO J, 2003 Sep-Oct;49(5):554-5. Study suggests that fistulae do dilate acutely after hand squeezing exercise and that this exercise should continue to be recommended.

Assessment of access blood flow after preemptive angioplasty, by Murray BM, Rajczak S, Ali B, Herman A, Mepani B. From Am J Kidney Dis, 2001 May;37(5):1029-38. Preemptive angioplasty of graft stenoses results in an initial doubling of access blood flow (ABF), but the effect is temporary, with the average ABF decreasing to baseline values by 3 months.


Tracking the Performance of Access Surgeons and Changing Referral Pattern Accordingly Increase Fistulae Placement, by Mohamed A. Sekkarie. ASN 2003 Abstract F-PO812. Fistulae placement could be increased when the nephrologist works with access surgeons and monitor their performance. Profiling of access surgeons by policy-makers could be a useful method for the identification of surgeons with better skill.
Change Concept #2

*Timely Referral to Nephrologist*

- Draft Letter to PCP From Nephrologist
- Fistula Preservation, Development and Maintenance Policy and Procedure
- Pre-ESRD Vascular Access/AVF Plan
Dear Colleague:

Caring for patients with chronic kidney disease (CKD) is a great challenge for both primary care providers and for nephrologists. This challenge increases when patients are referred late to a nephrologist, that is, when they require urgent dialysis. Delayed referral leads to emergency dialysis with higher morbidity, mortality and excessive cost. Emergency dialysis jeopardizes the dialysis modality choice, endangers the ability to maintain prolonged vascular access, precludes psychological preparation of patients and family and frequently necessitates hospitalization for a catastrophic complex illness. Mortality associated with acute dialysis can be as high as twenty-five percent.

Striving to provide optimal and cost-effective care to our mutual patients, we urge the early referral of patients to the nephrologist. A nephrologist should see all patients with a GFR below 30 ml/min (see attached CKD Guidelines). We also recommend referral of all diabetic patients with GFR below 60 ml/min. Ideally your laboratory will convert your serum creatinines to GFRs. However, if your laboratory does not do this, please remember that in the small-framed and the elderly a serum creatinine as low as 1.8mg% may indicate severe chronic kidney disease. Should you wish to make your own conversions of serum creatinine to GFR, an online calculator is available at www.kdoqi.org, which can easily be used by your office staff or yourself.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>GFR, mL/min per 1.73m³</th>
<th>Prevalence, n (%)</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>At increased risk</td>
<td>≥60 (with chronic kidney disease risk factors)</td>
<td>-</td>
<td>Screening; chronic kidney disease risk reduction</td>
</tr>
<tr>
<td>1</td>
<td>Kidney damage with normal or increased GFR</td>
<td>≥90</td>
<td>5 900 000 (3.3)</td>
<td>Diagnosis and treatment; treatment of co-morbid conditions; slowing progression; CVD risk reduction</td>
</tr>
<tr>
<td>2</td>
<td>Kidney damage with mild or decreased GFR</td>
<td>60-89</td>
<td>5 300 000 (3.0)</td>
<td>Eliminating progression</td>
</tr>
<tr>
<td>3</td>
<td>Moderately decreased GFR</td>
<td>30-59</td>
<td>7 600 000 (4.3)</td>
<td>Evaluating and treating complications</td>
</tr>
<tr>
<td>4</td>
<td>Severely decreased GFR</td>
<td>15-29</td>
<td>400 000 (0.2)</td>
<td>Preparation for kidney replacement therapy</td>
</tr>
<tr>
<td>5</td>
<td>Kidney Failure</td>
<td>&lt;15 (or dialysis)</td>
<td>300 000 (0.1)</td>
<td>Kidney replacement (if uremia present)</td>
</tr>
</tbody>
</table>

Table taken from the National Kidney Foundation Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification, and Stratification.
Early referral of chronic kidney disease patients offers many advantages. In addition to beginning the process of education and preparation for renal replacement therapy, benefits include the following:

- A diligent search may reveal a potentially reversible cause of renal failure.
- A number of measures may be implemented to preserve the remaining renal function, e.g., good control of blood pressure, glucose control in diabetics, nutritional guidance, and avoidance of nephrotoxic drugs.
- Upper extremity vessels may be preserved for placement of a native arteriovenous fistula, which is the most reliable type of vascular access. Since it may take up to six months for a fistula to mature, it is critical that early surgical referral be made. Dialysis grafts and catheters are sub-optimal because of recurrent thrombosis and infection. In addition, central venous catheters may irreversibly damage proximal veins precluding future use of that extremity for vascular access. The cost of these complications in the U.S. amounts to over one hundred million dollars annually.
- Treatment of anemia with erythropoietin may significantly improve life quality.
- Secondary hyperthyroidism may be treated with phosphate binders and calcitriol.
- Referral to a team consisting of a nephrologist, renal dietitian, dialysis nurse, social worker and financial counselor allows time to establish the best treatment modality for the patient, develop financial support if needed and to allay the fears of both patient and family.

After referral to our office for consultation, your patient will be referred back to you as his (her) primary care physician for further care. We will develop a long-term management plan together to assist you in optimizing your patient’s care until there is further progression toward end-stage renal failure. I wish to thank you for your help in providing better care for our mutual patients. Please feel free to contact me with any questions or suggestions.

Cordially,

Nephrologist’s Name
Fistula Preservation, Development and Maintenance Policy and Procedure

**PURPOSE**
To preserve vessels for future placement of a native AV fistula. To promote the development and maintenance of AV fistula by giving patients strategies to help increase the diameter of the vessel, prevent infection, prevent thrombosis and maintain function.

**BACKGROUND INFORMATION**
Evidence based NKF-K/DOQI guidelines state that “patients and healthcare professionals should be educated about the need to preserve veins to avoid loss of potential access sites in the arms and to maximize chances for successful AV fistula placement and maturation.”

**POLICY**
Fistula Preservation and development shall be accomplished according to NKF-K/DOQI Guidelines #7-Preservation of Veins for AV Access and Guideline #9-Access Maturation. Preservation of veins and maturation of AV-fistulas shall be a collaborative effort among surgeons, nephrologists and dialysis staff.

**Preservation of Veins**

**PROCEDURE**
- Catheterization of the subclavian vein and use of PICC lines shall be avoided for venous access in all patients with kidney failure due to the risk of central and peripheral venous stenosis and thrombosis.

- Preservation of arm veins that are suitable for vascular access regardless of arm dominance shall be emphasized.

- Education of patients and staff regarding the need to protect potential access vessels shall include:
  - Prohibiting placement of IV’s or blood draws from the cephalic veins of the non-dominant arm. IV’s should be placed in the dorsum of the hand if at all possible.
  - Encouraging the patient to wear a Medic Alert bracelet prohibiting IV placement in essential veins unless it is an emergency.
  - Posting a sign to remind hospital staff not to draw blood or place IV’s in the potential access arm.
Access Maturation

**PROCEDURE**

- Instruct the patient to begin fistula exercises after the suture line has healed, the stitches have been removed and the nephrologist has given the OK. Patient shall receive a copy of the brochure titled, “Fistula Exercises- Building Your New Vascular Access”. Upon recommendation by the surgeon these exercises may be started prior to access placement to aid in vein development.

- Access maturation will be different for each individual. The following guidance is provided:
  - A primary AVF is mature and suitable for use when the vein’s diameter and position is adequate to allow for successful and safe cannulation. This should not be sooner than one month and preferably 3-4 months after construction.
  - The following may enhance the maturation of the native AVF:
    - Hand-arm exercises
    - Selective obliteration of major venous side branches
    - Resting the access after an infiltration
  - Patients with persistent edema two weeks after access placement should receive a venogram or non-contrast study to evaluate for central venous obstruction.

This guideline is supported primarily by opinion-based consensus information.

**Maintenance**

- Facility will provide guidance to the patient on maintenance of their AVF, consistent with their own policies and procedures, and with the K-DOQI recommended practices.
PRE-ESRD VASCULAR ACCESS/AVF PLAN

GFR < 30 cc/min. (Stage 4 CKD)

Evaluate for RRT
- Counseling/education
- Vessel mapping-all pts.

Choose PD

or

Surgery consult- “AVF Only”
- Vessel Mapping (if not already done)
- Preserve Veins

Choose HD

GFR 30-20

AVF Construction (ideally 6-12 mos. early)
Change Concept #3

*Early Referral to Surgeon for “AVF Only” Evaluation and Timely Placement*

- Autologous AVF Algorithm
- Hemodialysis Access Referral: Existing Access
- Hemodialysis Access Referral: New Access
- Pre-ESRD Vascular Access/AVF Plan
**AUTOLOGOUS AVF ALGORITHM**

**Patient requiring chronic renal replacement therapy (RRT)/possible Hemodialysis**

AVF assessment/surgical consult—ideally prior to stage 4 CKD (GFR<30) - or stage 3 CKD (GFR<60) in diabetics:
- **History**
- **Physical exam**
- **Vessel mapping if suitable AVF vessels not identified on P.E. (see “mapping protocol”)**

**Suitable vessels for AVF on P.E. or mapping? (and AVF not medically contra-indicated)**

- **YES**
- **NO** → AVG or Tunneled Cuffed Cath or PD

**AVF Construction Options:**

1. **Forearm**
   - Distal: radio-cephalic, transposed radio-basilic
   - Proximal:
     - radial-(or brachial)-cephalic (simple direct or transposed loop)
     - radial-(or brachial)-basilic (simple direct or transposed loop)
     - radial-median antebrachial (retro-and/or antegrade flow)
   - Antecubital: Gracz, other

2. **Arm**
   - brachial-cephalic (simple direct or transposed)
   - brachial-basilic (transposed only/1- or 2-stage)

3. **Thigh**
   - femoro-saphenous (transposed or translocated), other

4. **Other**
   - Translocations
   - Retrograde constructions: arterial anastomosis proximal/AVF flow distal (retrograde)
   - Composite/creative constructions
   - “Blind” constructions (planned 2-stage procedure where no definable AVF vein conduit identified at 1st stage)

**Mandatory 4-week post-op assessment**

**Is AVF maturing adequately?**

- **NO** → Doppler study or fistulogram/remedial action as indicated
- **YES**

**Notes to Algorithm**

Ideally, regardless of RRT modality contemplated, patient would be referred for autologous AVF unless patient not considered a candidate for HD of AVF based on medical/other reasons.

- **History:** diabetes, catheters, PICC lines, pacemaker, PVD, extremity swelling, surgery, trauma,...
- **P.E.:**
  - **Artery:** pulses, BP, status of peripheral circ./Allen test
  - **Vein** (with tourniquet): soft, straight, superficial; >2.5 mm

- **Mapping:**
  - **Artery:** >2.0 mm I.D., no calcifications or stenosis, normal flow & velocity wave forms.
  - **Vein:** (exam with & w/o tourniquet)> 2.5 mm I.D. with tourniquet, compliant, distensible>50%, continuity with deep system, no stenosis/webs, no C.V. stenosis.

**Note:**

1. Mapping ideally performed by Doppler ultrasound in pre-ESRD patients, but alternate options in specific cases can be considered (i.e. dilute contrast, gadolinium and/or CO2).
2. Most patients are AVF if mapping performed.
   - AVF selection based on upper extremity with best vessels, regardless of dominance/distal-to-proximal planning
   - If upper extremity AVF not feasible, AVG may be considered (with plan for future 2nd AVF conversion evaluation) before considering lower extremity AVF (due to higher complication rate and limb threat related to latter)

**Note:** special attention given to limiting size of arterial anastomosis (>5mm) in pts. at high risk (esp. diabetics) of developing significant ischemia/steal-esp. with high-flow AVF's.

- **Category 4/“Other” procedures reserved for patients with limited options, depleted access sites or extenuating/complex medical issues.

Most failing AVF’s can be identified on physical exam alone by 4 wks.

**Note:** Also assess post-op and weekly for ischemia/steal

Most early AVF failures can be salvaged if identified before thrombosis occurs.

Some AVF’s, esp. transposed, may take considerably longer to mature.

**Alert:**

1. Only experienced AVF cannulators perform initial cannulations
2. AVF may be cannulated earlier than 8 weeks per MD orders

Attempt Cannulation @ 8-12 wks based on exam & MD orders

Proceed to “Protocol for Initial Cannulation”

L. Spergel MD, VAMP © FistulaFirst 2004
HEMODIALYSIS ACCESS REFERRAL: EXISTING ACCESS

Date: ___/___/____ Referred to: ☐ Intervventional radiologist/nephrologist ☐ Surgeon
Dr.: ___ Phone: ___ Fax: ___

HEMODIALYSIS UNIT CONTACTS

Referring Nephrologist: ____________________ Phone: ___ Fax: ___
Referring Dialysis Unit: ____________________ Contact Person: ____________________ Phone: ___ Fax: ___

PATIENT DEMOGRAPHICS

Patient’s Name: ____________________ SS#: ____________________ DOB: ___/___/____
Address: ____________________ City: ____________________ State: ___ Zip: ___
Patient’s Phone: ____________________ Emergency Contact: ____________________ Phone: ___
Insurance: ____________________

REASON FOR REFERRAL AND PROCEDURE REQUESTED

Reason: ____________________
Procedure/Evaluation Requested: ____________________
Desired Access: ____________________
Date of Scheduled Procedure (If known): ___/___/____ Location: ____________________

CURRENT ACCESS

Type: ☐ Fistula ☐ Graft ☐ Catheter ☐ Port
Location: ☐ Upper ☐ Lower ☐ IJ ☐ Other
Side: ☐ Left ☐ Right
Extremity: ☐ Arm ☐ Leg
Access Insertion Date: ___/___/____ Surgeon: ____________________ Hospital: ____________________

Most Recent Access Blood Flow Rates/Pressures: (Check all that apply)
☐ Most recent Blood Flow Rate ____ cc/min.
☐ Most recent Static Venous Pressure (SVP) ____
☐ Most recent Dynamic Venous Pressure ____
☐ Most recent Arterial Pressure ____

Recent Surgical/Radiologic Interventions to Access:
1. ____________________ Date: ___/___/____ Physician: ____________________
2. ____________________ Date: ___/___/____ Physician: ____________________

Recent Access Problems/Complication - Check all that apply:
☐ Difficult cannulation ☐ Hematoma/Infiltration ☐ Change in bruit or thrill ☐ Pseudoaneurysm
☐ Pain in extremity ☐ Infected Access ☐ URR or Kt/V ☐ Prolonged bleeding during/after dialysis
☐ Severe swelling/extremity ☐ High venous pressure ☐ Possible Steal Syndrome ☐ Problems with arterial flow
☐ Other (Specify) ____________________

SYNOPSIS OF MEDICAL HISTORY

SEAFOOD OR DYE ALLERGIES * - if yes, fistulagram may be contraindicated ➔ contact Nephrologist
☐ Yes ☐ No

☐ Diabetes ☐ Peripheral Vascular Disease ☐ History of Clotted Access
☐ Anticoagulation Medicines - If yes ☑ specific medicine(s) below
☐ Coumadin ☐ Ticlid ☐ ASA ☐ Plavix ☐ Other-list:

☐ Recent PT/PTT – if yes, results:
☐ Recent CBC
☐ Recent Chest x-ray
☐ Recent EKG
☐ Other pertinent medical history:

DIALYSIS TREATMENT INFORMATION

Patient’s Dialysis Schedule: ☐ M-W-F ☐ T-Th-S Shift: am / midday / pm Date of Last Dialysis: ___/___/____
Weight today: _____________ Estimated Dry Weight: _____________ Last time patient ate or drank: _____________
Stat K+ drawn @ ___ am/pm on ___/___/____ ➔ _________meq/dl.
Transportation Service: ____________________ Phone: ____________________

Comments:
VASCULAR ACCESS DIAGRAM

FAX to Dialysis Facility and/or Nephrologist

Patient Name: ___________________________
Procedure Date: _________________________

Diagram Completed by: [ ] Surgeon [ ] Interventional Radiologist [ ] Interventional Nephrologist

Name (Surgeon or Interventionalist): ___________________________

Phone: ___________________________

FAX to: [ ] Nephrologist Name: ___________________________
Facility Name: ___________________________
Fax: ___________________________

Procedure(s): (Check all that apply)

[ ] Surgery
[ ] New Access
[ ] Thrombectomy
[ ] Revision
[ ] Other - specify:

[ ] Interventional (Endovascular)
[ ] Thrombolysis / Thrombectomy
[ ] PTCA
[ ] Stent
[ ] Catheter insertion or revision
[ ] Diagnostic fistulogram only
[ ] Other - specify:

Access Type
[ ] A/V Graft
[ ] A/V Fistula
[ ] Port device
[ ] Central venous Catheter
[ ] If new catheter, priming volume: __________ ml
[ ] Cuffed
[ ] Non-cuffed

Configuration
[ ] Graft (if applicable)
[ ] Loop
[ ] Straight
[ ] Curved

Location
[ ] Right
[ ] Left
[ ] Forearm
[ ] Upper arm
[ ] Leg/Thigh
[ ] Other - specify:

Fistula Construction (if applicable)
[ ] Radio-cephalic
[ ] Brachio-cephalic
[ ] Transposed

Type: __________

Graft Material (if applicable)
[ ] PTFE
[ ] Other - specify:

NOTE: Please show Configuration of access, Vessels Involved, and Direction of Access Flow

NOTES:

Were diagnostic evaluations performed prior to procedure? If yes, describe: ___________________________

Brief description of procedure (if preferred access not placed, explain reason): ___________________________

Procedure findings (if relevant): ___________________________

Was procedure successful? Yes No (circle one)

Recommendations/Comments: ___________________________

Additional care information/instructions: ___________________________

Special cannulation instructions: ___________________________

Patient follow-up:
1. Patient to schedule appointment with Surgeon/Nephrologist (circle one) in ___ days/weeks (circle one).
2. Patient appointment has been scheduled ________ (date) with Dr. ___________________________

Other Notes: ___________________________

__________________________

__________________________

HEMODIALYSIS ACCESS REFERRAL: NEW ACCESS

Date: ____________

Referred to (Surgeon): ___________________________ Phone: ____________ Fax: ____________

Referred by (Nephrologist): ___________________________ Phone: ____________ Fax: ____________

### PATIENT DEMOGRAPHICS

<table>
<thead>
<tr>
<th>Patient’s Name:</th>
<th>SS#:</th>
<th>DOB: <em><strong>/</strong></em>/___</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address:</td>
<td>City:</td>
<td>State:</td>
</tr>
</tbody>
</table>

| Patient’s Phone: | Emergency Contact: | Phone: |

| Insurance: | Phone: |

### TO BE COMPLETED BY NEPHROLOGIST (attach med list / labs if applicable)

Our patient is being referred to you for access placement. The desired access for this patient is:

- [ ] fistula
- [ ] graft
- [ ] central cath
- [ ] other: ____________

In the event you are not planning to place the desired access, please call the referring physician prior to placing any other access.

#### Site preference:

- [ ] Right
- [ ] Left

#### If AV fistula:

- [ ] radial-cephalic
- [ ] brachial-cephalic
- [ ] transposed: Vein type: ____________

#### If Catheter:

- [ ] IJ vein
- [ ] SC vein
- [ ] Femoral vein
- [ ] other: ____________

Diagnostic evals pre-referral: [ ] No  [ ] Yes  date/result: ____________________________ (attach)

The anticipated dialysis start date is: ____________________________

Most recent GFR or serum creatinine: _________ mg/dl  Date: ____________________________

Most recent creatinine clearance: _________ ml/min  Date: ____________________________

Taking Coumadin or other Anti-Coagulant?  [ ] Yes  [ ] No

#### Allergy Alert:

If patient has any dye or seafood allergies, fistulagram may be contraindicated. Contact Nephrologist for orders re: patient’s plan of care.

- [ ] Yes  [ ] No  List all Allergies: ____________________________

#### Comments / Additional information:

__________________________________________________________________________

---

**SURGEON:**

- PLEASE FILL OUT THE “VASCULAR ACCESS DIAGRAM” AND FAX TO NEPHROLOGIST and/or DIALYSIS FACILITY

**NEPHROLOGIST:**

- PLEASE FAX THIS FORM, ALONG WITH THE COMPLETED “VASCULAR ACCESS DIAGRAM” TO THE DIALYSIS FACILITY.
Patient Name: ____________________________ Procedure Date: ____________________________

Diagram Completed by: □ Surgeon □ Interventional Radiologist □ Interventional Nephrologist

Name (Surgeon or Interventionalist): ____________________________ Phone: (______) _______ _______

FAX to: □ Nephrologist Name: ____________________________ Fax: (______) _______ _______
□ Facility Name: ____________________________ Fax: (______) _______ _______

**NOTES:**

Were diagnostic evaluations performed prior to procedure? If yes, describe: ____________________________

Brief description of procedure (if preferred access not placed, explain reason): ____________________________

Procedure findings (if relevant): ____________________________

Was procedure successful? Yes  No  (circle one)

Recommendations/Comments: ____________________________

Additional care information/instructions: ____________________________

Special cannulation instructions: ____________________________

Patient follow-up:
1. Patient to schedule appointment with Surgeon/Nephrologist (circle one) in ___ days/weeks (circle one).
2. Patient appointment has been scheduled ________(date) with Dr. ____________________________

Other Notes: ____________________________

**NOTE:** Please show Configuration of access, Vessels Involved, and Direction of Access Flow
Date: ______________________

I, ______________________ Date of Birth: _____________
(type or print name of patient)
do hereby consent that you release to:

☐ Nephrologist: ______________________
☐ Surgeon: ______________________
☐ Radiologist: ______________________
☐ Dialysis Facility: ______________________
(Name or title of the person(s) or organization(s) to which disclosure is to be made)

confidential medical, psychiatric, and/or psychological records in the custody of:

☐ Nephrologist: ______________________
☐ Surgeon: ______________________
☐ Radiologist: ______________________
☐ Dialysis Facility: ______________________
☐ Hospital: ______________________
(Name or title of the person(s) or organization(s) from which disclosure is to be made)

General nature of information to be released and dates:
Any and all information pertaining to dialysis access placement, dialysis treatments during hospitalization and general hospitalization records requested e.g., interventional radiological reports, operative reports, discharge / follow-up information, lab work, x-rays, Additional: ______________________

This consent shall be in effect for ninety (90) days from the date recorded on this consent. I understand that this consent is subject to revocation at any time, upon written notification by me, except to the extent that action has been taken in reliance thereon. A photocopy or facsimile of this consent is as valid as the original.

_____________________________ Signature of Patient (or guardian) ______________________ Date

_____________________________ Signature of Witness ______________________ Date

In the event that the patient is a minor (has not attained the age of eighteen [18] years), the above consent must be executed by the patient’s parent or legal guardian.
PRE-ESRD VASCULAR ACCESS/AVF PLAN

GFR < 30 cc/min. (Stage 4 CKD)

Evaluate for RRT
- Counseling/education
- Vessel mapping-all pts.

Choose PD

or

Surgery consult- “AVF Only”
- Vessel Mapping (if not already done)
- Preserve Veins

Choose HD

GFR 30-20

AVF Construction (ideally 6-12 mos. early)
Change Concept #4

*Surgeon Selection Based on Best Outcomes, Willingness, and Ability to Provide Access Services*

- Surgeon Questionnaire
Surgeon Questionnaire

Surgeon name: ____________________________________________
E-mail Address: ____________________________________________ Office Phone: __________________________
Hospital Affiliation(s): ____________________________________

1. What is your surgical specialty?
   - General
   - Transplant
   - Vascular
   - Urology
   - Other __________

2. How many years have you been in practice? ______

3. How many years have you been doing hemodialysis vascular access procedures? ______

4. How many of the following do you perform per year?
   a. AV Fistulas
      i. Radial-cephalic (wrist) fistulas ______
      ii. Brachial-cephalic fistulas ______
      iii. Transposed (brachial-basilic or other) fistulas ______
   b. AV Grafts ______
   c. Access Ports ______
   d. Implanted/cuffed catheters ______
   e. Revised and/or open thrombectomies ______
   f. Other hemodialysis access procedures ______

5. What percent of time do you see patients for access placement before initiation of dialysis?
   - <25%
   - 25-50%
   - 50-75%
   - >75%

6. What is the average waiting period for a new patient to be seen by you for initial evaluation? ______

7. After evaluation, how much time do your patients wait (on average) for definitive surgery? ______

8. What percent of your patients have had vessel mapping done prior to seeing you? ______ %
   If no mapping has been done, do you obtain this prior to making an access decision?
   - Routinely
   - Only if suitable vessels cannot be found on physical exam
   - Only under the following circumstances __________________________

9. For urgent/emergent problems, can the patient be seen by you within 24 hours?
   - Always
   - Usually
   - Sometimes
   - Never

10. Do you track patients with an access or other operative registry?
    - Yes
    - No

11. The patients you see have already been educated regarding:
    a. Modality options for management of renal failure:
       - Always
       - Usually
       - Sometimes
       - Never
    b. Access options for hemodialysis:
       - Always
       - Usually
       - Sometimes
       - Never
    c. Advantages, limitations, and risks of hemodialysis options:
       - Always
       - Usually
       - Sometimes
       - Never
12. Do you offer any formal education to patients regarding:
   a. Modality options for management of renal failure:
      □ Always  □ Usually  □ Sometimes  □ Never
   b. Access options for hemodialysis:
      □ Always  □ Usually  □ Sometimes  □ Never
   c. Advantages, limitations, and risks of hemodialysis options
      □ Always  □ Usually  □ Sometimes  □ Never

13. Which methods do you use for patient education?
   □ Written education materials
   □ Videos
   □ Informal discussion in your office: Average length of discussion ____________________________
   □ Formalized education program
   □ Other __________________________________________________________

14. What do you do when intervention after AV access placement is required?
   □ Manage the problem, whether operative or interventional
   □ Handle only operative intervention and refer interventional
   □ Take care of straightforward problems and refer complex ones out

15. Do you do interventional procedures in the management of AV access?  □ Yes  □ No
    If yes, where?
    □ Operating Room  □ Cardiac Cath Lab  □ Procedure Room  □ Radiology
    □ Other __________________________________________________________

16. When constructing or revising an AV access in the operating room you are able to do:
    □ An on table fistulogram if indicated
    □ A balloon outflow venoplasty if needed
    □ A complete endovascular exam and intervention, including central studies, retrograde arterial
      studies, and stenting if needed

17. Which of the following are available to you?
    □ Portable Ultrasound Machine
    □ Vascular-Capable (Subtraction) C-arm Fluoroscope
    □ Endovascular equipment/supplies if relevant: __________________________

18. Which of the following do you view as important in a Vascular Access (CQI) Management Program
    (please check all that apply):
    □ Experienced Mentor
    □ Educational Programs and Resources
    □ Regular Case and Literature Review
    □ Other: __________________________

19. Which of the following education options/formats do you prefer?
    Educational Sessions:
    □ Grand rounds at your facility
    □ Off-site workshop with others in your city
    □ Other: __________________________
    □ Online information
    □ Other: __________________________

20. How likely is it that you would attend a regional educational course regarding current dialysis access
    surgical techniques and troubleshooting strategies?
    □ Very likely  □ Not likely  □ Only if_____________________________

Please Return This Form to: ____________________________
At: ____________________________
Change Concept #5

*Full Range of Appropriate Surgical Approaches to AVF Evaluation and Placement*

- Duplex of Upper Extremity Vessels Prior to AVF Surgery
- Article: The Initial Creation of Native Arteriovenous Fistulas: Surgical Aspects and Their Impact on the Practice of Nephrology
- Article: Avoidance of Prophylactic Antibiotics in Creation of Native Arteriovenous Fistulas
- Article: Endoscopic Saphenous Vein Harvesting For Hemodialysis Vascular Access Creation in the Forearm: A New Approach For Arteriovenous Bridge Graft
Purpose:
To assess the patency and suitability of the arteries and veins for use as a dialysis arterio-venous fistula (AVF). The cephalic and basilic veins are preferred AVF conduits for hemodialysis. The patient is usually first referred from the nephrologist to the surgeon for AVF evaluation. After examining the patient, the surgeon selects the preferred extremity for the pre-op mapping study. If suitable vessels are identified, the necessity of performing a bilateral study can be avoided; if suitable vessels are not identified in the preferred extremity, then the contralateral extremity will need to be studied as well.

Indication:
Patients in renal failure who require an arterio-venous fistula for hemodialysis.

Contraindications and Limitations:
A. The following conditions limit the areas accessible to the ultrasound beam:
   1. Open wound, fresh incision, ulceration, or skin staples
   2. Bandages and casts
   3. Trauma.
B. Patient position and inability to move (e.g., surgical procedure, traction, paralysis) may limit ability to perform adequate arm vessel mapping.

Equipment and Supplies:
A. High-resolution B-mode duplex with color flow imager.
B. Standard supplies for ultrasonic exam: acoustic coupling gel, gloves and skin wipes.
C. Tourniquet for re-measuring vein size after initial diameter and depth measurements are performed.
D. Although not absolutely necessary, heating pads and warm room help facilitate the exam and give a more accurate representation of vessel size.
E. Liquid marking ink (gentian violet) if skin mapping is required.
F. Pillow(s) or foam pad to position the patient comfortably.
G. Material for hard copy documentation (i.e., Video tape, PAC, or MO Disc).

Patient Preparation:
A. Explain the procedure to the patient and answer any questions.
B. Document the pertinent history and appropriate indications.
C. The patient may be sitting, resting supine with the arms dependent, placed in the reverse Trendelenburg position, or placed in a Trendelenburg position with hands over head. Patient position should be optimized so that gravity helps dilate the veins.
D. Room and Patient should be warm and comfortable.
E. A heating pad or hot water bottle can be used (with caution) around the hand during forearm or upper arm imaging or around the forearm during upper arm imaging. The pad temperature should be below 44 C.
F. After initial measurements (diameter and depth) and especially if the veins are of small size (< 2.5cm, Silva), a tourniquet **MUST ALWAYS** be placed around the upper arm and/or the forearm to dilate the veins and optimize the procedure.

G. Hand exercise may help dilate the veins.

H. Tapping the veins may be helpful by inducing reactive dilatation.

**PROCEDURE - GENERAL CONSIDERATIONS:**

A. Before beginning, make sure that both the Vascular Technologist and the patient are comfortable. Complex and small venous systems can take as long as 1 hour to map.

B. Use enough gel to facilitate visualization.

C. Marking the skin may not be needed; check with the appropriate physician. During excision, the surgeon usually traces the pathway of the vein under direct vision. Marking may help in cases of unusual anatomy or double channels or for the design of dialysis fistulas. Make sure to keep the probe perpendicular to the surface of the skin so that the line marked on the surface is directly over the vein. Use a short straw or coffee stirrer to mark the skin through the gel. After completing a section, wipe the area dry and mark with gentian violet.

D. Identify venous branches and follow, if they are large, to their completion to avoid missing variant anatomy.

E. Location of valve sinuses need not be noted unless stenotic or otherwise abnormal.

F. Confirm patency of vein with pulsed Doppler or color flow imaging. If any question, position Doppler cursor within segment of vein in question and tap vein distally. Color flow examination may speed the entire examination. This only needs to be done when the vein does not co-apt with compression or if there is any question of patency.

G. The veins should be dilated as much as possible. Gravity, heating, occlusion, tapping, and hand exercise can help. However, stagnant flow forced by the application of a tourniquet may make differentiating vein walls from surrounding tissues difficult.

H. The diameter and depth of the veins (anteroposterior and/or lateral), measured in a transverse plane without any probe compression, should be noted approximately every 2 inches or when a significant change in size is seen. Vein diameter should be measured without and then with a tourniquet. An increase of vein diameter by 50% with tourniquet is indicative of a suitable vein. If depth of vein is more than 8-10 mm (and depending on diameter of vein), the surgeon will need to consider vein transposition to a more superficial position.

I. Thrombosed, phlebitic and sclerotic segments of the vein should be noted.

J. Identification of the length of basilic vein is mandatory. If the basilic vein is too short, it may be unsuitable for transposition.

K. Detailed identification of branches is not essential; however, identification of the particular variants at the median antecubital fossa is mandatory.

**PROCEDURE – TEST PROTOCOL:**

**Note:** Although one may choose to perform study distal-to-proximal, this protocol calls for study to be performed proximal (central)-to-distal (peripheral). In this way, if a central venous stenosis is identified at the outset, further exam of the extremity is avoided and attention can be immediately directed to the contralateral extremity.

**VENOUS STUDY:**

Arm is scanned from proximal to distal, without and then with, tourniquet. If there is a significant proximal arterial or venous narrowing or an abnormality that will jeopardize the success of the AVF, the exam is discontinued. Following the upper arm study, the forearm is studied. Avoid prolonged application of the tourniquet—repeatedly release and re-apply the tourniquet during the study. Essential parameters to be measured include: vessel depth, internal diameter (I.D.) with and without tourniquet, compliance/ability to dilate, continuity with deep system, presence of stenosis/thrombosis, flow rate. Veins should dilate by 50% with use of tourniquet. Veins should be thin walled, vary in size with respiration (the closer to the chest, the greater the variation), collapse completely with compression by transducer and augment with distal compression.
A. Start at the Internal Jugular vein. Check for patency by identification of flow and changes in vessel size with respiration.

B. Document flow in both the subclavian artery and vein (arterial flow should be Triphasic). Normal change of the signal during deep Inspiration and Expiration (Respiratory filling of the vein) indicates patency of the Superior Vena Cava.

C. Locate cephalic vein junction and measure diameter and depth.

D. Follow the cephalic vein in cross-section with intermittent probe compressions to the antecubital fossa, taking both diameter and depth measurements. Note the presence of, and map, double cephalic systems.

E. If the upper arm cephalic vein is absent, note if a forearm cephalic vein–upper arm basilic vein connection is present.

F. Bend arm up and out to expose axilla and confirm patency of axillary artery and vein.

G. Measure diameter and depth of axillary vein.

H. Locate the basilic vein as it joins the brachial vein and note length of the basilic vein.

I. Follow the basilic vein to the antecubital fossa. Repeat same probe compression maneuvers, diameter measurements, and flow determination for the basilic vein. Compression maneuvers to increase flow can be performed manually.

J. Determine the anatomy of the median antecubital vein and note potential anomalies. Most common:
   1. Predominant forearm cephalic upper arm basilic vein
   2. Dual upper arm cephalic veins
   3. Y-shaped connection between the cephalic and basilic veins
   4. Other less common and unusual variations.

K. Follow the cephalic vein from the antecubital fossa to the "snuffbox" (the hollow depressed area on the radial aspect of the wrist when the thumb is extended fully).

L. Follow the basilic vein postero-medially in the forearm as far as possible.

**ARTERIAL STUDY:**

**Note:** This may be accomplished at the same time as the venous portion of the exam.
Standard arterial Doppler protocol should be used, with Doppler angle correct of less than or equal to 60 degrees, and parallel to vessel walls. Measured arterial parameters should include internal diameter, presence of calcifications, thickness/disease of vessel wall, peak systolic velocity (psv) and end-diastolic velocity (edv), pre- and post-reactive hyperemia psv and edv of distal radial and ulnar arteries, flow rate. Doppler-assisted Allen test may be helpful.

A. Measure internal diameter of arm arteries (brachial & radial) at different levels: ante-cubital, wrist and or any site where a change in size is seen. Optimal internal diameter for AVF is > 2mm (Silva)

B. Document any arterial calcification or stenosis. A small calcified vessel may be determined by the surgeon to be unusable.

C. Reactive Hyperemic maneuvers can be used to help determine whether a borderline artery will function. Have patient clench fist for about 60 sec. Reactive Hyperemia is induced with opening of the clenched fist. This maneuver should change a triphasic high-resistance flow to a bi-phasic low-resistance flow. The same reaction is expected after AVF creation when the peripheral resistance in the artery is suddenly decreased after arterio-venous anastomosis. A positive reactive hyperemia maneuver indicates good arterial function post-AVF placement.

**DOCUMENTATION:**

A. Document representative diameters of the veins on hard copy, MO Disc, videotape or other forms of image acquisition.

B. A drawing of the arm veins that can be taken to the operating room should document:
   1. Venous diameters and depth (first without tourniquet) from Internal Jugular to the wrist
   2. Venous diameter with a tourniquet around the proximal upper arm.
   3. Intermediary measurements according to the lack of uniformity of the vein (significant changes in diameter).
   4. All abnormal findings.
   5. Overall assessment of venous system and any problems with procedure.
C. A drawing of the arm arteries that can be taken to the operating room should document the following:
   1. Arterial diameters.
   2. Presence of plaque, calcification, bifid arteries, aberrant anatomy.
   3. Peak systolic velocities (psv) and end diastolic velocities (edv) from SCA to distal radial and ulnar arteries.
   4. Pre- and post-reactive hyperemia at distal radial and ulnar arteries.

**INTERPRETATION:**
A. Patent veins greater than 2 mm in diameter usually will result in a fistula greater than 4 mm in diameter. Veins should dilate by at least 50% with use of tourniquet.
B. Anatomic configuration alone should not be used to interpret an examination as normal or abnormal; also consider venous flow, wall and valve leaflet appearances.
C. Phasicity with breathing and augmentation with distal compression indicate normal flow.
D. Lack of flow or diminished augmentation on compression indicate thrombosis and/or obstruction in the same manner as in studies for deep venous thrombosis.
E. Tortuous flow channels suggest recanalization of previous thrombosis.
F. A good vein appears thin-walled and is easily compressible. A poor-quality vein appears thick-walled and has a residue under compression.
G. If valve leaflets are visualized, they should appear thin and freely moving within the lumen. If the valve leaflet is rigid and fixed, report it as an abnormality.
H. The interpretation should include specific statements regarding the forearm and upper arm cephalic and basilic veins and comments about anatomic variances.
I. A copy of the arm vein mapping report, including the drawing of the veins, is sent or given to the referring physician and/or surgeon.
J. The surgeon should be notified of any serious abnormalities such as vein absence, thrombosis, inadequate length of Basilic vein, or unusual anatomic variants.
K. A final report is mailed or faxed to the Surgeon and the patient’s Nephrologist after medical interpretation and signature. Original copy is filed in the Vascular Lab chart and a copy is also filed in the office chart.

**CLEANING AND CARE OF EQUIPMENT:**
A. Transducers and equipment are cleaned with appropriate cleaner per the manufacturer.
B. Heating blankets, tourniquets etc. are wiped clean after use. Alcohol or stronger disinfectant is used as appropriate.
C. General vascular laboratory routine should be followed as in any other test.

**REFERENCES:**

(Revised 12/16/03, edited by L. Spergel MD)
Venous Map (example)

Venous Mapping
* Diameter/depth in cm
* With tourniquet (in Bold)

Arterial Map (example)

Arterial Mapping
* Velocities in m/s
* Post reactive hyperemia
* Diameter/depth in cm
The Initial Creation of Native Arteriovenous Fistulas: Surgical Aspects and Their Impact on the Practice of Nephrology

By: Klaus Konner
Department of Internal Medicine I, Merheim Hospital, Cologne, Germany

Sorry this article is not available online.
To request copy, call Network 18 at 323-962-2020
Avoidance of Prophylactic Antibiotics in Creation of Native Arteriovenous Fistulas

By: Christopher G. Lewis, Do; Matthew K. Wells, MD; Jennings, MD, FACS
Department of Surgery, The University of Oklahoma College of Medicine, Tulsa, Oklahoma

Sorry this article is not available online.
To request copy, call Network 18 at 323-962-2020
Endoscopic Saphenous Vein Harvesting for Hemodialysis
Vascular Access Creation in the Forearm: A New Approach for
Arteriovenous Bridge Graft

By: T. Oto
Department of Cancer and Thoracic Surgery
Okayama University School of Medicine, Okayama - Japan

Sorry this article is not available online.
To request copy, call Network 18 at 323-962-2020
Change Concept #6

Secondary AVF Placement in Patients With AF Grafts

- Secondary AV Fistulae in Patients with AV Grafts
Secondary AV Fistulae in Patients With AV Grafts

An effective strategy for increasing AV fistula prevalence in AV graft patients is the planning and construction of AVF’s in existing graft patients prior to graft failure. Although the patient’s primary access may currently be a graft, all graft patients should be evaluated and considered (where feasible) for an AVF as their next permanent access (secondary AVF).

Although evaluation for a secondary AVF may require bilateral vessel mapping to identify a suitable vein and artery for AVF construction, the simplest opportunity to convert a graft patient to a fistula patient, when present, is the conversion of an arterialized (mature) upper arm outflow vein of a forearm graft to a direct upper arm AV fistula. Such a conversion opportunity should be looked for and considered in all forearm graft patients (see “Sleeves Up” protocol below). AVF evaluation of graft patients should include an updated history relevant to vascular access, physical exam with tourniquet and vessel mapping if suitable vessels are not identified on physical exam. A secondary AVF plan should be documented in the chart and discussed with patient, family, staff, and nephrologists and surgeon in anticipation of AVF construction on the earliest evidence of graft failure.

“SLEEVES UP” PROTOCOL FOR CONVERSION OF FOREARM AV GRAFT TO UPPER ARM AV FISTULA

Purpose: to identify a suitable outflow vein for conversion from an AV graft to an AV fistula, in anticipation of secondary AVF construction by the surgeon.

1. Once a month, clinic rounds to include examination of the AV graft extremity to the shoulder, by rolling sleeves up (or removing shirt if necessary).

2. After upper arm is exposed to the shoulder, the hand or a tourniquet is used for light compression just below the shoulder, to see if the outflow vein of the forearm graft appears suitable for immediate use as an AVF. If this appears to be the case, (often this is the case if the cephalic vein is the outflow vein), the vein is evaluated by:
   • Referring patient for fistulogram (or Doppler study) to confirm that the outflow vein and draining system back to the heart is normal.
   • If fistulogram is normal, the vein is “tested” by cannulating the outflow vein with the venous needle only, for 2 consecutive dialysis sessions.
   • If both cannulation sessions are uneventful, the plan for surgical conversion from graft to upper arm fistula is discussed with patient, staff, nephrologists and surgeon—and documented in chart.
   • Staff follows patient until AVF conversion is performed.
It is recommended that the timing for AVF conversion be no later than the first signs of graft failure by monitoring and surveillance—and in no case later than following the first intervention for stenosis or thrombosis. Any delay in conversion beyond this point is likely to result in loss of the window of opportunity for this AVF option, since further graft interventions, especially if done as an emergency, are likely to damage or utilize the outflow vein, or the graft will eventually be abandoned (usually after a failed intervention), resulting in a catheter and a new graft in a different location.

If “sleeves up” evaluation does not identify a vein as clearly suitable for conversion to an AVF, a fistulogram should be ordered at the first signs of graft failure, both for diagnostic purposes as well as to check for suitability of the outflow vein (check to see if patient has already had a recent study, as many graft patients with evidence of failure will already have had a fistulogram that can be used as a mapping study). If a suitable basilic or cephalic outflow vein is identified but is too deep for safe cannulation, the plan for a transposition AVF should be discussed and documented—with the timing of the procedure to be based on evidence of graft failure and patient condition.

**Note:** The Work Group recognizes that not all patients are candidates for an AVF. However, in the absence of medical contra-indications, a patient who would otherwise be considered a candidate for an AVF should not be excluded unless a complete examination, including vessel mapping, has been performed, and all available AVF surgical options have been considered.

LS: VAMP
Change Concept #7

*AVF Placement in Patients With Catheters Where Indicated*

- Facility Catheter Tracking Tool
- Management of Patient with Central Venous Catheter
- Reducing Central Venous Catheter Infections
Facility Name: ________________________________ Date: __________________

Instructions: Fill in “YES”-Y, “NO”-N and/or a specific date where appropriate in each column.

<table>
<thead>
<tr>
<th>Patient Name or ID</th>
<th>AVF or graft feasible?</th>
<th>Scheduled. for surgical appt? (Date)</th>
<th>Patient. kept appt?</th>
<th>Permanent access placed? (Date &amp; Type: AVF; G)</th>
<th>Permanent access used? (Date)</th>
<th>Catheter removed? (Date)</th>
<th>Comments/Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Pt. presents with Central Venous Catheter

Access Plan?

Permanent Internal Access Maturing?

Contact Nephrologist for Plan & orders for vein mapping & surgery consult

Schedule vein mapping & app’t. with Surgeon

F/U weekly until access is placed (unless Cath is permanent access)

Permanent Internal Access is in place

Patient refuses

Request orders to use new access

Confirm adequate function of new access

Request orders to schedule CVC removal

Schedule CVC removal

F/U each dialysis visit until CVC removed

CVC removed

YES

YES

NO

NO
Reducing Central Venous Catheter Infections

**Patient**
- Poor hygiene
- Perspiration under dressing
- Nasal carriage of Staph Aureus
- Manipulates catheter at exit site
- Removes dressing at home
- Showers and gets dressing wet
- Sneezes on exposed site or opens ports
- Dressing comes off due to activity or sleep

**Equipment**
- Surgical procedure
- Cracked caps
- Improperly fitted caps
- Contaminated supplies

**Caregiver**
- Contamination of ports during treatment on/off
- Not changing gloves during dressing change
- Poor site cleansing during dressing change
- Nasal carriage of Staph Aureus
- Improper handwashing
- Failure to wear gloves
- Not wearing a mask

**Environment**
- Air draft on open ports
- Airborne pathogens
- Pets at home
- Unclean home

Catheter Infections

ESRD Network 18
Change Concept #8

*Cannulation Training for AV Fistulas*

- Article: Cannulation Camp: Basic Needle Cannulation Training For Dialysis Staff
- Cannulation of New Fistula Policy and Procedure
- Clamp Usage Policy and Procedure
- MEDISYSTEMS Cannulation Video
- Dr. Twardowski’s “Buttonhole Method of Needle Insertion Into an AVF” Video
Deborah J. Brouwer, RN, CNN

Cannulation Camp: Basic Needle Cannulation Training for Dialysis Staff

This article reviews the basic skills needed by all dialysis staff to correctly cannulate an AV fistula or PTFE graft. Ways to identify the two types of accesses and to determine the direction of bloodflow are described. Access site determination and preparation, needle placement and direction, and various cannulation techniques are explained and supported by illustrations. Complications are examined, as are possible treatments and ways to prevent recurrences.

How did you learn to cannulate a dialysis access? Most practicing nephrology nurses and technicians - myself included - had on-the-job training. We observed our preceptor cannulate different patients who had either grafts or fistulas, and then were handed the needles for our first cannulation attempt.

Very little nursing research and/or literature is available for a preceptor to use when teaching the art of needle cannulation. The purpose of this article is to provide current nephrology staff with a basic knowledge of needle cannulation, information which may then be passed on to new staff entering the nephrology field.

Step I: Identify the Type of Access and Direction of Bloodflow

The preferred dialysis access is the arteriovenous (AV) fistula. This is due to its high patency rate and the strong ability of the puncture sites to heal. However, due to vascular limitations, only about 30% of all dialysis patients have working AV fistulas. The most common AV fistula is one connecting the radial artery to the cephalic vein, created at the patient's wrist. A fistula can also be created in the upper arm, connecting the brachial artery with the axillary vein or another upper arm vein, all of which lead to the subclavian vein. A leg fistula can also be created in patients with limited access options.

The flow direction of either a fistula or graft must be correctly identified in order to ensure proper needle cannulation. Most fistulas flow from the distal end of the limb toward the venous return. The direction of flow of a particular fistula can be easily identified by locating the arterial anastomosis engorgement prior to placement of a tourniquet. Another method is to listen for the bruit and feel for the thrill, which should be noticeably stronger at the arterial end of the fistula.

Figure 1. Regular or “blue thumb” graft.
Cannulation Camp

Unfortunately, the flow direction within an implanted polytetrafluoroethylene (PTFE) graft cannot be so easily identified. This is because a graft can be placed in any location where an artery and vein can be connected. The traditional graft sites - i.e., the lower arm (loop graft) and upper arm (straight graft) - have now been supplemented by straight or loop grafts in the leg, groin, abdomen, chest, or neck. As such, the direction of the bloodflow may not be apparent by visual inspection alone.

Cooperation with the vascular surgeon in obtaining a drawing or description of the bloodflow direction is the best way to ensure proper use of the access. In the absence of such records, several techniques can be used to determine bloodflow direction. As previously mentioned, the most commonly used technique is to listen to the bruit and feel for the thrill at both ends of the graft; the end with the stronger bruit and thrill is assumed to be the arterial limb. To confirm this assumption, the mid-graft area can be lightly compressed to impede the bloodflow; again, the end with the stronger bruit and thrill can be considered to be the arterial limb.

Next, the graft can be cannulated with two needles and the blood flashback observed. When the mid-graft area is compressed, the arterial needle flashback should remain visible, while the venous needle flashback should greatly diminish or disappear.

If a graft is to be used prior to the clearance of all residual operative edema, it may be difficult to palpate the graft or to compress the mid-graft segment in order to show a difference in blood flashback within the arterial and venous needles. In this case, noting the venous pressure and pre-pump arterial pressure may assist in determining the bloodflow direction. To accomplish this, the needles are connected to the dialysis circuit, a 200 ml/min bloodflow is achieved, and the mid-graft region is lightly compressed. If the needles have been correctly connected arterial-to-arterial and venous-to-venous, the venous pressure will fall due to the decrease in bloodflow to the venous limb when the mid-graft region is compressed. If the arterial bloodline has been incorrectly connected to the needle in the venous limb of the graft and the venous bloodline to the needle in the arterial limb, the pre-pump arterial pressure will change to a more negative number and the venous pressure will increase. This is a result of the mid-graft compression causing the arterial bloodline connected to the venous limb of the graft to work harder in order to receive the inflowing blood; the venous pressure increases due to the compression of the venous outflow track. If this occurs, the bloodlines should be reversed, the mid-graft compression repeated, and a fall in the venous pressure should then be observed.

Once the direction of the bloodflow is determined, the patient’s chart should be marked with the flow direction. In this regard, grafts can be described as being either a regular or “blue thumb” graft, or a reverse or “red thumb” graft. A “blue thumb” graft is when the arterial inflow is on the limb of the graft medial to the midline of the body or heart (see Figure 1). A reverse or “red thumb” graft is one in which the arterial inflow is on the limb of the graft distal to the body midline or heart (see Figure 2). Of all dialysis loop grafts, approximately 80% are regular, with the remaining 20% being reverse. The red or blue thumb concept can be easily taught to patients so that they may understand the bloodflow direction within their own access.
Step II: Needle Site Selection

Since the placement and direction of the access needles can vary, needle site selection should be determined before skin preparation and needle cannulation are performed.

It is the direction of the bloodstream that determines the needle placement. This is because the venous needle must always point toward the venous return. The arterial needle, on the other hand, may point in either direction (see Figures 3 and 4).

The terms antegrade and retrograde are used to describe the direction of the arterial needle. Antegrade cannulation has the arterial needle pointing in the direction of the bloodstream, that is, toward the venous limb. Retrograde cannulation has the arterial needle pointing toward the arterial anastomosis. Either of these cannulation techniques can be used, with the choice being based on unit practice.

When complications such as infection or recent surgical revision dictate that only one limb of a loop graft can be used, the needles may be placed on the same side of the graft, with one needle placed upward and the other downward, as shown in Figure 5. When that is the case, the needles must always be at least 1" apart, as measured from hub to hub, in order to prevent recirculation (see Figure 6).

Care should be taken in those cases where the needles are placed in the same direction on the same limb, for if they are placed too close, such as less than 3" apart as measured from hub to hub, the needle bevels may touch or be too close and lead to recirculation (see Figure 7).

Both antegrade and retrograde cannulation can be used with AV fistulas, as well. Antegrade cannulation can be used to cannulate near the arterial anastomosis of an access without the needles entering the anastomosis site. This is particularly helpful with newly created AV fistulas that are not fully matured, as the antegrade cannulation can sometimes provide a higher bloodflow with less bloodstream collapse or line sucking, and a better pre-pump arterial pressure.

Needle site placement must always take into account needle site rotation. This is true for both AV fistulas and grafts. Proper needle site rotation will extend the life span of the access by preventing pseudoaneurysm formation, or “one-site-itis” (see Figures 8 and 9). Additionally, fistulas that are cannulated throughout the entire fistula will mature more evenly, and grafts so cannulated will not develop flat, mushy areas caused by repeated cannulation in the same spots, which do not allow for fibrous tissue formation and, subsequently, lead to the development of large holes (Figure 9).

A patient record of the cannulation sites—such as an illustrated bedside cannulation chart and a cannulation rating chart—can be used to help ensure full needle site rotation (see Figures 10 and 11).

Step III: Skin Preparation

The needle sites selected for cannulation must be properly prepped in order to prevent infection. Proper washing of the patient’s access area with water and an antibacterial soap should be done prior to cannulation. If the patient is unable to wash his or her own access area, the dialysis staff can use a washcloth soaked with antibacterial soap to cleanse the area. A ready-to-use antibacterial towel or prep pad can also be used.

After cleansing, the sites should then be prepped with either Betadine or alcohol. Once applied, Betadine must be allowed to dry before it is an effective antiseptic, whereas alcohol must be used in a liquid state to be effective. During the preparation of the access sites, universal precautions, including the wearing of gloves, must always be used to prevent the spread of infection.

Step IV: Local Anesthesia

If the patient experiences discomfort during cannulation, the administration of an intradermal injection of lidocaine may be used immediately prior to the needle cannulation. Other agents, such as Chloroethane (ethyl chloride) spray, or lidocaine 2.5% with prilocaine 2.5% (Emla Cream), can also be used to prevent discomfort from the cannulation. Because of the potential for further discomfort brought on by additional needle sticks, the choice of using lidocaine as a local anesthetic for needle cannulation should be at the request of the patient; however, its use should be avoided in the case of a deep or edematous graft—which may occur with newly created fistulas, as well. Antegrade cannulation can be used with AV fistulas, as well. Antegrade cannulation can be used to cannulate near the arterial anastomosis of an access without the needles entering the anastomosis site. This is particularly helpful with newly created AV fistulas that are not fully matured, as the antegrade cannulation can sometimes provide a higher bloodflow with less bloodstream collapse or line sucking, and a better pre-pump arterial pressure.

Needle site placement must always take into account needle site rotation. This is true for both AV fistulas and grafts. Proper needle site rotation will extend the life span of the access by preventing pseudoaneurysm formation, or “one-site-itis” (see Figures 8 and 9). Additionally, fistulas that are cannulated throughout the entire fistula will mature more evenly, and grafts so cannulated will not develop flat, mushy areas caused by repeated cannulation in the same spots, which do not allow for fibrous tissue formation and, subsequently, lead to the development of large holes (Figure 9).

A patient record of the cannulation sites—such as an illustrated bedside cannulation chart and a cannulation rating chart—can be used to help ensure full needle site rotation (see Figures 10 and 11).
Figure 8. “One-site-itis” due to repeated needle puncture in the same location, the result of poor needle site rotation.

PTFE grafts—where the injection of lidocaine prevents palpation and easy cannulation.

When using lidocaine, the minimal amount (0.2 cc) should be used, and the patient should be warned that the injection might burn or sting. Care must always be taken to ensure that the lidocaine is injected only into the tissue on top of the access and never into the graft or fistula itself.

Step V: Needle Selection
The specific gauge of the needles used for cannulation should always be ordered by the nephrologist in order to ensure that an adequate bloodflow rate is achieved for the proper delivery of the dialysis prescription. The length of the needles, on the other hand, may be altered by the dialysis staff in order to reach, for instance, deep grafts such as those found in the upper arm of an obese patient, where a 1" needle may not be long enough to cannulate the graft or advance far enough into the graft to prevent movement. In that case, a 1 1/4" needle may be helpful.

The needles used should always have a back eye to ensure that the optimal flow is achieved. Additionally, the standard 16-gauge needle may need to be increased to a 15- or 14-gauge in order to achieve bloodflows greater than 300 ml/min (bloodflow rates of 350 to 500 ml/min are now standard in many dialysis units).

Pre-pump arterial pressure monitoring can help determine if the needle gauge needs to be increased. If the arterial pressure falls lower than -200 to -250 mmHg, the needle size should be increased (i.e., a smaller gauge number should be used). However, this decision should first be discussed with the dialysis staff and the nephrologist.

Step VI: Cannulation Technique
The needle should be held by the wings, with the bevel of the needle facing upward for the cannulation (see Figure 12). This places the cutting edge of the needle on the skin, which facilitates cannulation through the skin, subcutaneous tissue, and the graft wall or fistula vessel wall.

The needle should be held at a 20- to 35-degree angle for AV fistulas, and at approximately a 45-degree angle for grafts. Once the needle has been advanced through the skin, subcutaneous tissue, and graft or fistula wall, the blood flashback should be visible. Continue to advance the needle no greater than 1/8 of an inch and then rotate the needle 180 degrees (see Figure 13). The needle bevel is rotated to help prevent a “back wall” or posterior wall infiltration, which can occur if the needle’s bevel tip accidentally punctures the bottom of the graft or fistula (see the discussion under “Cannulation Problem-Solving”).

The needle should then be leveled out (i.e., placed flat against the skin) and then advanced slowly up to the needle hub (see Figure 14).

Step VII: Securing the Needle
The wings of the fistula needle can be secured by using a butterfly tape technique. A piece of 1"-wide adhesive tape 6" or greater in length is carefully placed under the fistula needle wings and then folded so that it crosses over the or

Figure 9. A pseudoaneurysm caused by “one-site-itis,” which can lead to graft failure.
needle site. An adhesive bandage or a 2x2 gauze pad is then placed over the needle and secured by another 6”-long piece of tape.

The needles must be secured in place in order to prevent accidental dislodgment or movement of the needles within the access, and care must be taken to monitor the needles for inadvertent movement during the dialysis treatment. This movement within the graft or fistula can result from the patient rotating or bending his or her access limb, which may lead to poor bloodflow and/or needle infiltration.

Special care must be taken with deep or edematous grafts because the needles are more prone to shift after the cannulation. With edematous grafts, this results from the edema being displaced following the application of pressure during the palpation and cannulation of the graft, with the edema subsequently returning to the subcutaneous tissue surrounding the cannulation sites and causing the movement of the needles. With deep grafts, movement can occur simply because of the amount of tissue pressing against the needle.

Should any movement of the needles occur during the dialysis procedure, a 2x2 gauze pad may be placed under the needle wings to correct the needle angle. Care must be taken with any change to the needle position so that infiltration into the back or side wall of the graft or fistula is avoided.

Step VIII: Cannulation Problem-Solving

If resistance is felt at any time during needle advancement or needle position change, the needle should be pulled back and the angle redirected. When in doubt, always ask a colleague for help.

A back or side wall infiltration can occur with any needle cannulation. If an infiltration does occur prior to the patient receiving heparin, the needle should be pulled out and digital pressure applied to the exit site by placing two fingers along the access extending over a minimum of a 1” span-in the area of the infiltration. Unfortunately, it is difficult to control back or side wall bleeding because direct pressure to the puncture site is not possible.

If the patient has already received heparin, the infiltration site must be carefully assessed to see if the needle should be pulled out or left in place with ice applied over the site until the dialysis treatment is completed. If the infiltration site remains stable with no increase in the size of the hematoma, the needle can be safely left in place and pulled out at the end of the treatment. If, however, the hematoma increases in size, the needle should be removed and digital pressure applied. Never apply pressure to an infiltration site while the needle is still in the vessel, as this could cause further damage to the vessel wall.

Should an infiltration occur, cannulation with another needle should be performed at a spot as far away from the infiltration site as possible. If the infiltration has been caused by a venous needle, the second needle should be placed above the infiltration site. However, this is not always possible, and if the venous needle must be placed below the infiltration site, it should be placed 1 1/2” to 2” away from the site to prevent the needle tip from dislodging the clot formation at the site of the vessel wall infiltration. Following the second cannulation, careful flushing of the venous needle, along with a slow restart of the dialysis blood pump, should be performed in order to monitor the infiltration site for an increase in hematoma size.

Care must be taken with all needle cannulations in order to prevent infiltrations. A severe infiltration, such as a posterior or back wall infiltration in a PTFE graft, can lead to the formation of a large hematoma and subsequent graft compression and/or graft thrombosis. While the use of the 180-degree needle rotation, or “flip,” discussed earlier is not necessary to correctly cannulate a PTFE graft or fistula, it may help decrease the chance of a severe infiltration. When training new staff,
Cannulation Camp

this technique may be particularly helpful in preventing the staff member from advancing the needle into and through the vessel in one smooth, uncontrolled movement.

In a recent article by Hartigan, the question is raised as to whether flipping the needle may, in fact, actually cause additional trauma to the intimal of the access. However, Hartigan acknowledges that no controlled studies have been performed to address the risks and benefits of flipping or not flipping the needle during cannulation. Dialysis staff, therefore, should evaluate the infiltration problems that occur within their own practice and appropriately adjust cannulation techniques in order to decrease the number of infiltrations.

Step IX: Removal of the Needles

Proper needle removal is as important as is proper needle cannulation, for if the needles are improperly removed, damage to the vessel wall can occur, whether with PTFE grafts or AV fistulas.

The tape should be carefully removed post-dialysis to prevent movement of the needles. Each needle is then withdrawn slowly, at a 20-degree angle, until the entire needle has been removed. To prevent damage to the vessel wall, digital pressure should not be applied during needle removal. If the needle bevel has been rotated 180 degrees during insertion, there is no clinical evidence or research that supports the re-flip or re-rotation of the needle before it is withdrawn.

Once the needle has been removed, mild digital pressure should be applied to the needle exit sites of both the skin and graft or vessel wall (see Figure 15). A gauze pad should be held over the sites with constant pressure, without peeking, for 10 to 15 minutes. To ensure that both the skin and vessel needle exit sites are being compressed, the patient should place both the index and middle fingers over the gauze pad, with the thumb wrapped around the limb like a "C" clamp. This will keep the patient from shifting the compression off of the exit sites, which would permit bleeding. The bruit and thrill should continue to be discernible above and below the compression sites, an indication that bloodflow occlusion (which could possibly cause thrombosis of the access) has been averted. A family member can be trained to assist patients who are unable to maintain compression of their own needle sites.

Figure 15. Correct application of pressure to the needle exit site.

When using topical clotting agents, care must be taken to ensure that the cannulation site has clotted and not just the needle exit site of the skin, for if hemostasis is not achieved, blood may leak out into the subcutaneous tissue surrounding the graft. This often happens when the patient stands up to exit the dialysis unit, at which time the cannulation site can begin re-bleeding if the clot over the skin puncture site is dislodged. If re-bleeding is not visible from the skin puncture site but has occurred subcutaneously, ecchymotic areas will be present when the patient returns for his or her next dialysis treatment.

Step X: Discharge Dressing and Assessment

Always discharge the patient from the unit with an adhesive bandage or gauze pad over the cannulation sites. Tape may be used to secure the pad but should not be so tight that it compresses the lumen of the access.

Before the patient leaves the unit, assess and document the quality of the bruit and thrill. If the bruit or thrill is greatly decreased or absent, the patient must not be discharged until the nephrologist has been notified. And remember, a Doppler-positive bruit does not...
Cannulation Camp

always equate with a positive bruit and thrill.

CONCLUSION
Nursing research is needed to better evaluate all cannulation procedures. Our goal should be to safely cannulate any access without causing unnecessary damage to the patient's lifeline. As such, the basics of needle cannulation must be openly discussed among all patient care staff members. We must work toward having all dialysis staff members understand and master the basics of vascular access.

The fundamental principles of vascular access should be used to help train future dialysis staff members in order to improve the quality of care that future dialysis patients will receive. We must continue to gain knowledge in this important area through nursing research and education.

References
Cannulation of New Fistula Policy and Procedure

PURPOSE:
To successfully cannulate new arteriovenous fistulas and to prevent infiltration.

POLICY:
Newly created primary AV fistulas shall be allowed to develop for at least 8-12 weeks prior to cannulation. Initial attempts to perform dialysis via new fistulas shall proceed with caution. Without exception, fistulas shall not be progressed faster than these guidelines without MD order. All patient care personnel are responsible for implementing this policy.

PROCEDURE:
1. Obtain order from vascular surgeon or nephrologist to begin cannulation of fistula 8 to 12 weeks after creation. All new fistulas should be examined by surgeon, nephrologist and designated staff member before cannulation is initiated.
2. Only staff identified as demonstrating best cannulation practice techniques should be assigned to cannulate NEWLY developing fistulas.
3. ALWAYS USE A TOURNIQUET, even with well-developed fistulas. NO EXCEPTIONS!
4. Explain procedure to patient.
5. Educate patient on:
   - Checking the access daily for a thrill and for signs and symptoms of infection.
   - Performing fistula exercises to promote maturation process.
   - Understanding that hematoma could occur most likely during the first two weeks of using the access.
   - For infiltrations, provide written materials about icing, elevation, and heat application.

WEEK ONE:
- Check with charge nurse for heparinization changes. Heparin prime and hourly should be decreased by half of the ordered dose for the first week to prevent bleeding into the surrounding tissue. It may be necessary to initiate saline flushes during this week of decreased heparin.
- If no other access present, use two 17-gauge needles. ALWAYS stay at least 1.5-2” from the anastomosis.
- If catheter present, use 17-gauge needle as the arterial, and use catheter for venous return.
- Using a 25° angle, cannulate the fistula.
- Stabilize the butterfly with tape. Secure the access with a chevron.
- Instruct patient not to move access extremity, in order to prevent infiltration.
- Remove needles at the same angle as the angle of insertion. Never apply pressure before the needle is completely out. Apply pressure for 10 minutes, without peeking – no exceptions.
- Clamps are NOT to be used.
For week one:
- Use 17 gauge needles at a blood flow rate (BFR) of 250 ml/min. If BFR not tolerated, reduce to 200 ml/min.
- Blood flow rates are recommendations and can be modified based on center-specific guidelines.
- Only increase BFR rates if no evidence of infiltration or other problems noted.
- Report any cannulation or BFR problems to the charge nurse.

WEEK TWO:
- If the first week is successful, cannulate with 16 gauge needles, rotating cannulation sites.
- Blood flow rate recommended: 300 ml/min.

WEEK THREE:
- Either repeat procedure for Week 2, or may attempt to progress to prescribed BFR and Needle gauge. When increasing BFR, recommend matching needle gauge to BFR as shown in chart below
- Recommended needle placement: arterial retrograde (toward the arterial anastomosis), venous antegrade (toward the venous anastomosis).
  (this policy may vary based on policies and procedures of specific Provider)

INfiltration INSTRUCTIONS:
- If the fistula infiltrates, let it “rest” for one week and then go back to smaller gauge needles. Notify nephrologist.
- If the fistula infiltrates a second time, wait another two weeks and then go back to smaller gauge needles. Notify nephrologist.
- If the fistula infiltrates a third time, notify surgeon and nephrologist.

CATHETER REMOVAL INSTRUCTIONS:
The patient’s catheter is not to be removed until the patient has had SIX CONSECUTIVE SUCCESSFUL arterial/venous needle cannulations at the prescribed BFR and needle gauge.

  RECOMMENDED: It is important to match needle gauge to blood flow rate.

<table>
<thead>
<tr>
<th>BLOOD FLOW RATE</th>
<th>RECOMMENDED NEEDLE GAUGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;300 ml/min</td>
<td>17 gauge</td>
</tr>
<tr>
<td>300 – 350 ml/min</td>
<td>16 gauge</td>
</tr>
<tr>
<td>&gt;350-450 ml/min</td>
<td>15 gauge</td>
</tr>
<tr>
<td>&gt; 450 ml/min</td>
<td>14 gauge</td>
</tr>
</tbody>
</table>

Note: These are minimum recommended gauges for the stated BFR settings. Larger needles, when feasible, will reduce (make less negative) pre-pump arterial pressure and increase delivered blood flow.
Clamp Usage Policy and Procedure

PURPOSE:
Clamps are not recommended on hemodialysis accesses because of damage and/or thrombosis that can occur by applying too much pressure. New and developing arteriovenous fistulae are particularly vulnerable to hematoma formation, infiltration, and bruising - clamps should never be used on these accesses.

POLICY:
Using clamps on new or underdeveloped fistulas is prohibited.
The use of clamps post-dialysis to hold sites for mature fistulas and grafts should be restricted. If and when clamps are used on a mature fistula or graft, use one clamp at a time to prevent excessive pressure/thrombosis. Patients and/or family members should be instructed to hold sites, and if this is not possible, staff should hold access sites.

PROCEDURE:
1. Following blood return and prior to removing needles, check blood pressure and ensure that the patient has achieved homeostasis.
2. After clamping lines and access needle tubing, disconnect machine tubing from the access needle tubing.
3. Carefully remove tape from one needle.
4. Using a sterile 4 x 4, place over needle site. Remove the needle at the same angle as the insertion angle, and once the needle is completely removed, apply pressure with two fingers.
5. Open the clamp and carefully position the clamp directly over your fingers.
6. Roll your fingers away as the clamp presses down over the needle site.
7. Make sure there is no bleeding through on the gauze around the clamp.
8. Check access for the presence of a thrill/bruit. If not present, adjust the clamp until you can feel the thrill and hear a bruit.
9. Leave clamp on for at least 10 minutes, or until bleeding has subsided - NOT TO EXCEED 20 MINUTES. Check for thrill and bruit every 10 minutes.
10. After bleeding has stopped, dress the site with new gauze and tape or with a band-aid.
11. Repeat Steps 3-10 for the second needle.
12. Instruct the patient to remove the dressing 3-4 hours following treatment.
13. Notify the charge nurse if the patient has prolonged bleeding or other abnormal symptoms.
MEDISYSTEMS Cannulation Video

Video “Introduction to Cannulation – Steps to Optimal Cannulation”. This 11 minutes-long video addresses basic concerns and proper cannulation techniques. This video also demonstrates how to perform optimal cannulation consistently through careful preparation, and teaches viewers to identify situations that can compromise cannulation.

This video is a part of free educational videos and training materials developed by MEDISYSTEMS to support the NVAII’s goal of increasing the appropriate use of AV fistulas for hemodialysis access.

Free educational materials are:
- “Introduction to Cannulation – Steps to Optimal Cannulation” video.

Free Constant-Site Cannulation Training Materials:
- ButtonHole Starter Kit. This kit includes clinical literature on constant-site cannulation, instructions for use, frequently asked questions, and a laminated procedure card. The two articles included in this kit are:
- Network-wide Train the Trainers Presentations.

To order materials or obtain more information:

Call 1-800-369-MEDI

Or

Visit www.medisystems.com
Video demonstrates a patient self-cannulating his AVF using the Buttonhole (constant-site) technique.

**To Purchase:**

- Cost $50 per each video for providers; $15 per each video for patients.
- No credit cards accepted, payment can be paid by money order or check, made out to: *Division of Nephrology, University of Missouri*

**Send payment to:**
Buttonhole Video  
Judy McDowell  
Division of Nephrology MA 436, DC 0.43  
University of Missouri  
1 Hospital Drive  
Columbia, MO 65212

Phone: 573.882.7991  
Fax: 573.884.4820  
e-mail: mcdowellju@health.missouri.edu
Change Concept #9

*Monitoring and Maintenance to Ensure Adequate Access Function*

- Vascular Access Monitoring & Surveillance Flow Chart
1. For Static Pressures, see attached protocol for measuring both venous and arterial intra-access pressure ratios.
2. If AVG access blood flow falls by 20% in 1 mo., and flow is below 1000, repeat next session and if still lower by 20%, refer for fistulogram.
Change Concept #10

Education for Care Givers and Patients

- NKF-K/DOQI Vascular Access Clinical Practice Guidelines – 2000 Update; Section II – Monitoring, Surveillance, and Diagnostic Testing
- NKF-K/DOQI Vascular Access Clinical Practice Guidelines – 2000 Update; Section IV – Management of Complications: When to Intervene
- Patient Resources
- Staff Resources
- Presentation: Best Access Procedures From the Dialysis Units’ Viewpoint
- Presentation: Fistulas For Dialysis Access: The Challenge of Preservation, Creation, Maturation, and Cannulation
Section I – Patient Evaluation Prior to Access Placement

Guideline 1: Patient History and Physical Exam

A comprehensive evaluation of the patient’s peripheral vascular system and cardiovascular system are imperative for successful access intervention. The outcome of this evaluation will influence the type and placement of the dialysis access. History and physical exam should include:

**History**
- Previous central venous or peripheral arterial or venous catheter
- History of anticoagulant therapy of coagulation disorder
- History of cardiovascular disease, heart valve disease or prosthesis
- History of co-morbid conditions limiting patient’s life expectancy
- History of previous arm, neck or chest surgery/truma
- Dominant arm
- History of previous dialysis access
- History of diabetes mellitus
- Anticipated living related transplant

**Physical**
- Physical exam of the arterial system (peripheral pulses, Allen test, bilateral upper extremity B/Ps)
- Physical exam of the venous system (edema, arm size comparability, collateral veins, tourniquet venous palpation with vein mapping, examination for previous central or peripheral venous catheters, evidence of arm, neck or chest surgery/truma
- Cardiovascular examination for evidence of heart failure
**Guideline 2: Diagnostic Evaluation Prior to Permanent Access Selection**

The following methods of diagnostic evaluation are recommended prior to the selection of a permanent hemodialysis vascular access:

- Venography is indicated for patients with the following: edema in the proposed access site extremity, collateral vein development in the proposed access site, differences in extremity size, any subclavian catheter placement, any transvenous pacemaker placement, arm, neck or chest trauma/surgery, or multiple accesses in the extremity in which the access is planned.
- Doppler ultrasound (evidence) or MRI (opinion) studies in cases where multiple vascular accesses have been placed or when contrast studies are not desirable due to residual renal function.
- Arteriography or Doppler examination may be indicated when arterial pulses in the desired access location are markedly diminished.

**Guideline 3: Selection of Permanent Vascular Access and Order of Preference for Placement of AVF**

The order of preference for AVF placement is:

- Radial-cephalic primary AVF
- Brachial-cephalic primary AVF

If either of these options is not viable, the following access may be created:

- AVG of synthetic material
- Transposed brachial-basilic vein fistula

Cuffed tunneled central venous catheters should be discouraged as permanent vascular access.

**Guideline 7: Preservation of Veins for AV Access**

Subclavian vein catheterization should be avoided for temporary access in all patients with kidney failure due to the risk of central venous stenosis. Significant stenosis will generally preclude the use of the entire ipsilateral arm for vascular access.

Although opinion-based, it is widely recognized that arm veins suitable for vascular access placement should be preserved, regardless of arm dominance. The following may assist in this preservation:

- Educate patients in the need to protect their vessels
- Educate the health care team on the importance of vessel preservation
- Medic alert bracelets have been found to be helpful

**Guideline 8: Timing of Access Placement**

All items referenced in this guideline are opinion-based, but were included by consensus of the K/DOQI Vascular Access Work Group:

- It is generally accepted that patients should be referred for surgery to attempt a primary AVF when their CrCl is <25 mL/min, their serum creatinine is >4mg/dl or within 1 year of an anticipated need for dialysis.
- Patients should be referred to a nephrologist prior to the need for access to receive educational intervention regarding modalities of treatment.
- A new primary AVF should be placed 1-4 months before hemodialysis is anticipated (see Guideline 9-Access Maturation)
- Hemodialysis catheters should not be inserted until hemodialysis is needed.

**Guideline 9: Access Maturation**

This guideline is supported primarily by opinion-based consensus information. Access maturation will be different for each individual. The following guidance is provided:

- A primary AVF is mature and suitable for use when the vein’s diameter is sufficient to allow for successful cannulation. This should not be sooner than one month and preferably 3-4 months after construction.
- The following may enhance the maturation of the native AVF:
  - Hand-arm exercises
  - Selective obliteration of major venous side branches
  - Resting the access after an infiltration
- Patients with persistent edema two weeks after access placement should receive a venogram or non-contrast study to evaluate central veins
- Cuffed and non-cuffed central venous catheters do not require any maturation time and may be used immediately for hemodialysis.
Abbreviated Introduction:
“Adequate care of an ESRD hemodialysis dependent patient requires constant attention to the need to maintain vascular access patency. An ideal access delivers a flow rate adequate for the dialysis prescription, has a long use-life and has a low rate of complications. Although no current access type fulfills all of these criteria, the native arteriovenous fistula (AVF) comes the closest to doing so. The substitution of synthetic grafts for native AVFs has increased patient care costs in part due to the increased number of procedures needed to maintain patency of grafts compared to AVFs. After evaluating all of the available data on vascular access, the Vascular Access Work Group concluded that quality of life and overall outcomes for hemodialysis patients could be improved significantly by achieving two primary goals: increasing the placement of native AVFs and detecting access dysfunction prior to access thrombosis” (National Kidney Foundation, K/DOQI Clinical Practice Guidelines for Vascular Access, 2000).

Summary of Monitoring and Surveillance Tools:

**MONITORING (PHYSICAL) INDICATORS**
- Inspection
- Palpation
- Auscultation
- Bleeding/Swelling/Clotting/Cannulation Problems

**SURVEILLANCE (TEST) INDICATORS**
- Intra-Access Blood Flow
- Static Venous Dialysis Pressure
- Dynamic Venous Dialysis Pressure
- Recirculation
- Arterial Dialysis Pressure (pre-pump)
- KT/V (URR)
- Doppler Ultrasound

K/DOQI Preferred
Section II: Monitoring, Surveillance, and Diagnostic Testing (Guidelines 10-12)

Guideline 10: Definition of terms, monitoring, surveillance, and diagnostic testing of AV grafts

- Physical exam of vascular access should be performed weekly and include, but not be limited to, inspection and palpation for pulse and thrill at the arterial, mid, and venous sections of the access. (Opinion)
- Available techniques that can be used to monitor for stenosis in AV grafts include:
  - Intra-Access Flow (Evidence)
  - Static venous pressures (Evidence)
  - Dynamic Venous Pressures (Evidence)
  - Access recirculation (Evidence)
  - Decreases in KT/V or URR (Evidence)
  - Physical findings: arm swelling, graft clotting, prolonged bleeding after needle removal, change in thrill or bruit (Evidence/Opinion)
  - Elevated negative arterial pump pressures limiting blood flow rates (Evidence/Opinion)
  - Doppler ultrasound (Evidence/Opinion)
- Persistent abnormalities in any of these parameters should prompt referral for venography. (Evidence)

Guideline 11: Monitoring primary AV fistula for stenosis

- Primary AV fistulae should be monitored for stenosis as outlined for dialysis AV grafts. (Opinion)
- Direct flow measurements are preferable, if available, compared to more indirect measures. (Evidence)
- Indirect measurement methods (i.e., dynamic and static venous pressures) are not as accurate for monitoring AV fistulae. (Evidence)
- Recirculation and Doppler analyses are both of possible benefit. (Opinion)

Guideline 12: Recirculation methodology, limits, evaluation, and follow-up

- Recirculation should be measured using a nonurea-based dilutional method or the two needle urea-based method. (Evidence)
- The three-needle peripheral vein method of measuring recirculation should not be used. (Evidence)
- If access recirculation is >20%, correct needle placement should be confirmed before further testing (Evidence/Opinion)
- Elevated levels of access recirculation should be evaluated using angiography (fistulography) to determine stenosis (Evidence).
Section IV – Management of Complications: When to Intervene

Note: For the purpose of this Summary Paper, evidence- and opinion-based guideline information related to the arteriovenous fistula will be addressed. For the complete text of the K/DOQI Vascular Access Clinical Practice Guideline Update, please refer to the American Journal of Kidney Diseases, Volume 37, Number 1 (January), pages S141-S149, or visit the National Kidney Foundation K/DOQI Website at http://www.kidney.org/professionals/kdoqi/index.cfm.

Abbreviated Introduction:
“Adequate care of an ESRD hemodialysis dependent patient requires constant attention to the need to maintain vascular access patency. An ideal access delivers a flow rate adequate for the dialysis prescription, has a long use-life and has a low rate of complications. Although no current access type fulfills all of these criteria, the native arteriovenous fistula (AVF) comes the closest to doing so. The substitution of synthetic grafts for native AVFs has increased patient care costs in part due to the increased number of procedures needed to maintain patency of grafts compared to AVFs. After evaluating all of the available data on vascular access, the Vascular Access Work Group concluded that quality of life and overall outcomes for hemodialysis patients could be improved significantly by achieving two primary goals: increasing the placement of native AVFs and detecting access dysfunction prior to access thrombosis” (National Kidney Foundation, K/DOQI Clinical Practice Guidelines for Vascular Access, 2000).

Section IV: Management of Complications: When to Intervene (Guidelines 16-18)

Guideline 16: Managing Potential Ischemia in a Limb Bearing an AV Access
- After AV access surgery, all patients should be monitored for development of limb ischemia (Opinion).
- High-risk group (the elderly, those with diabetes and multiple access attempts in an extremity) should be monitored for the first 24 hours post-op (Opinion).
- Patients with an established fistula should be assessed monthly for ischemia (Opinion).
- Refer patients with new findings suggestive of ischemia to a vascular access surgeon emergently (Opinion).

Guideline 17: When to Intervene – Dialysis AV Grafts for Venous Stenosis, Infection, Graft Degeneration and Pseudoaneurysm Formation
- Hemodynamically significant stenosis (Evidence).
- Infection (Evidence).
- Graft degeneration and pseudoaneurysm formation when severe degenerative changes of the graft or overlying skin are present; the skin above the graft is compromised; there is a risk of graft rupture or spontaneous bleeding; limited puncture sites are available (Opinion).

Guideline 18: When to Intervene – Primary AV Fistulae
- For primary AV fistulae appropriate intervention should be initiated upon identification:
  1. Inadequate flow to support the prescribed dialysis blood flow (Evidence/Opinion).
  2. Hemodynamically significant venous stenosis (Evidence).
  3. Aneurysm formation when the skin overlying the fistula is compromised; there is risk of a fistula rupture; available puncture sites are limited (Opinion).
## Patient Resources

<table>
<thead>
<tr>
<th>Resource Material/Description</th>
<th>Brief Description</th>
<th>Media Type</th>
<th>To Obtain More Information</th>
<th>Available On-Line @</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AAKP Access Booklet and Patient Plan</strong></td>
<td>Brochure describes permanent and temporary access placements, how accesses are placed, when they are used, and strengths and limitations of each.</td>
<td>Booklet</td>
<td>American Association of Kidney Patients (800) 749-2257</td>
<td>[<a href="http://www.aakp.org/Access">http://www.aakp.org/Access</a> Booklet5.pdf](<a href="http://www.aakp.org/Access">http://www.aakp.org/Access</a> Booklet5.pdf)</td>
</tr>
<tr>
<td><strong>Access Management-The Native AV Fistula</strong></td>
<td>Keys to successful creation, maturation and maintenance of the Native AV Fistula. 10 minutes</td>
<td>Video</td>
<td>Medisystems Corporation P.O. Box 960 Elizabeth, CO 80107-0960 Tel: (800) 369-MEDI / (303) 646-5212</td>
<td><a href="http://www.medisystems.com/">http://www.medisystems.com/</a></td>
</tr>
<tr>
<td><strong>American Association of Kidney Patients</strong></td>
<td>Organization for kidney patients that provides educational material to patients about treatment options and resources</td>
<td>Website</td>
<td>3505 E Frontage Rd. Suite 315 Tampa, FL 33607 (800) 749-2257</td>
<td><a href="http://www.aakp.org">www.aakp.org</a></td>
</tr>
<tr>
<td><strong>BE Active Website</strong></td>
<td>Comprehensive management of early renal insufficiency including working with multidisciplinary team, communication, timing of access placement as it relates to CKD</td>
<td>Website</td>
<td>Ortho Biotech P.O. Box 6914 430 Rt. 22 East Bridgewater, NJ 08807-0914</td>
<td><a href="http://www.beactive.com/">http://www.beactive.com/</a></td>
</tr>
<tr>
<td><strong>Dr. Twardowski's Buttonhole Method of Needle Insertion into AV Fistulas</strong></td>
<td>Discussion of technique of buttonhole cannulation of AV Fistulas</td>
<td>Video</td>
<td>Judy McDowell Division of Nephrology University of Missouri 1 Hospital Drive Columbia, MO 65212 Phone: 573.882.7991 Fax: 573.884.4820 e-mail: <a href="mailto:mcdowellju@health.missouri.edu">mcdowellju@health.missouri.edu</a></td>
<td></td>
</tr>
<tr>
<td>Resource Title</td>
<td>Description</td>
<td>Type</td>
<td>Publisher</td>
<td>Website</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
<td>------</td>
<td>-----------</td>
<td>---------</td>
</tr>
<tr>
<td>Inserting Your Own Needles</td>
<td>Article written to encourage patients to cannulate themselves</td>
<td>Handout</td>
<td>Life Options</td>
<td><a href="http://www.lifeoptions.org/patient/showcase/inserting.shtml">http://www.lifeoptions.org/patient/showcase/inserting.shtml</a></td>
</tr>
<tr>
<td>Introduction to Cannulation: Steps to Optimal Cannulation</td>
<td>Addresses the basic concerns and techniques necessary to achieve optimal cannulation</td>
<td>Video</td>
<td>Medisystems Corporation</td>
<td><a href="http://www.medisystems.com/">http://www.medisystems.com/</a></td>
</tr>
<tr>
<td>Life Options</td>
<td>Provides free materials to kidney patients about treatment options, rehabilitation, and maintaining active lifestyle</td>
<td>Website</td>
<td>Life Options Rehabilitation Program</td>
<td><a href="http://www.lifeoptions.org">www.lifeoptions.org</a></td>
</tr>
<tr>
<td>National Kidney Foundation</td>
<td>Provides information for kidney patients about kidney disease, treatment options, and resources</td>
<td>Website</td>
<td>National Kidney Foundation</td>
<td><a href="http://www.kidney.org">www.kidney.org</a></td>
</tr>
<tr>
<td><strong>Reducing Rates of Vascular Access Infections in Patients Undergoing Hemodialysis</strong></td>
<td>Demonstrates techniques for initiating and discontinuing Hemodialysis through all access types, as well as infection control methods to prevent or reduce access site infections</td>
<td>Video</td>
<td>Contact your local ESRD Network</td>
<td></td>
</tr>
<tr>
<td><strong>Squeeze ball Songs for Fistula Development</strong></td>
<td>Humorous songs for to sing while exercising fistulas</td>
<td>Handout</td>
<td>Life Options</td>
<td><a href="http://www.lifeoptions.org/patient/showcase/squeezeball.shtml">http://www.lifeoptions.org/patient/showcase/squeezeball.shtml</a></td>
</tr>
<tr>
<td><strong>Vascular Access For Hemodialysis</strong></td>
<td>Provides comprehensive information on all access types, what to expect during hemodialysis, possible complications, and taking care of your access</td>
<td>Booklet</td>
<td>NIDDK National Kidney and Urologic Diseases Information Clearinghouse 3 Information Way Bethesda, MD 20892-3580 Phone: (800) 891-5390 or (301) 654-4415</td>
<td><a href="http://kidney.niddk.nih.gov/">http://kidney.niddk.nih.gov/</a></td>
</tr>
<tr>
<td><strong>Vascular Access For Hemodialysis</strong></td>
<td>Designed to introduce patients to the types of hemodialysis access available. Available in Spanish (approx. $15.00) 15 minutes</td>
<td>Brochure/Video</td>
<td>Southeast Kidney Council NW6. Contact Network 6 (919) 855-0882. Cost approx $20 with brochure</td>
<td><a href="http://www.esrdnetwork6.org">www.esrdnetwork6.org</a></td>
</tr>
<tr>
<td><strong>Vascular Access For Hemodialysis, Part 1-Learning About Your Vascular Access</strong></td>
<td>Video 1 highlights importance of vein preservation pros cons of access options. How to determine most appropriate access type. Video 2 has commonly asked questions about surgery and access, preparing for the day of surgery, and post opt long-term access care.</td>
<td>Video</td>
<td>Kaiser Permanente Southern CA Vascular Access QI Committee. Cost approx. $25. Call (323) 259-4771. Available free from Amgen Contact: Dr. Sandy Garofolo, Senior Manager of Nephrology Professional Services</td>
<td>Not available on-line</td>
</tr>
<tr>
<td>Resource Material/ Description</td>
<td>Brief Description</td>
<td>Media Type</td>
<td>To Obtain More Information</td>
<td>Available On-Line @</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------</td>
<td>------------</td>
<td>-----------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td><strong>Access Management: The Native AV Fistula, and workbook</strong></td>
<td>Keys to successful creation, maturation, and maintenance of the native AVF. Discusses role of surgeon caregiver, patient in establishing and caring for AVF</td>
<td>Video</td>
<td>Medisystems Corporation P.O. Box 960 Elizabeth, CO 80107-0960 Tel: (800) 369-MEDI / (303) 646-5212</td>
<td><a href="http://www.medisystems.com/">http://www.medisystems.com/</a></td>
</tr>
<tr>
<td><strong>Access Management: The Native AV Fistula, and workbook</strong></td>
<td>Historical and practical considerations; soft study module, history of VA, explanation of AVF, Allen's Test, circulation, complications of AVF, graft section</td>
<td>Workbook</td>
<td>Medisystems Corporation P.O. Box 960 Elizabeth, CO 80107-0960 Tel: (800) 369-MEDI / (303) 646-5212</td>
<td><a href="http://www.medisystems.com/">http://www.medisystems.com/</a></td>
</tr>
<tr>
<td><strong>BE Active Website</strong></td>
<td>Comprehensive management of early renal insufficiency including working with multidisciplinary team, communication, timing of access placement as it relates to CKD</td>
<td>Website</td>
<td>Ortho Biotech P.O. Box 6914 430 Rt. 22 East Bridgewater, NJ 08807-0914</td>
<td><a href="http://www.beactive.com/">http://www.beactive.com/</a></td>
</tr>
<tr>
<td><strong>Best Access Procedures from the Dialysis Units' Viewpoint</strong></td>
<td>PowerPoint presentation for educating dialysis facility staff, hospital staff or surgeons.</td>
<td>PowerPoint</td>
<td>Contact your local ESRD Network</td>
<td></td>
</tr>
<tr>
<td><strong>Dr. Twardowski's Buttonhole Method of Needle Insertion into AV Fistulas</strong></td>
<td>Discussion of technique of buttonhole cannulation of AV Fistulas</td>
<td>Video</td>
<td>Judy McDowell Division of Nephrology University of Missouri 1 Hospital Drive Columbia, MO 65212 Phone: (573) 882-7991 Fax: (573) 884-4820 e-mail: <a href="mailto:mcdowellju@health.missouri.edu">mcdowellju@health.missouri.edu</a></td>
<td></td>
</tr>
<tr>
<td>Resource Material/Description</td>
<td>Brief Description</td>
<td>Media Type</td>
<td>To Obtain More Information</td>
<td>Available On-Line @</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------------------</td>
<td>------------</td>
<td>---------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td><strong>Chronic Kidney Disease (CKD): Evaluation, Classification, Stratification</strong></td>
<td>Poster details K/DOQI guidelines for CKD. Poster includes information on risk factors associated with increased risk of CKD, defines KD, Assessment of Proteinuria, GFR and association of CKD with cardiovascular disease. Correlates kidney function/glomerular filtration rate (GFR) with the stages of kidney failure, as well as lists the actions to take at each stage of kidney function.</td>
<td>Wall Chart</td>
<td>National Kidney Foundation 30 E. 33rd St. New York, NY 10016 (800) 622-9010 Order No.K/DOQI-157 $14.00+ shipping and handling</td>
<td><a href="http://www.kidney.org">www.kidney.org</a></td>
</tr>
<tr>
<td><strong>Early Intervention Strategies for Pre-ESRD</strong></td>
<td>Program to assist in managing Pre-ESRD patients</td>
<td>Website</td>
<td>Amgen One Amgen Ctr Dr. Thousand Oaks, CA 91320-1799 (800) 77-AMGEN</td>
<td><a href="http://www.renaladvances.com/">http://www.renaladvances.com/</a></td>
</tr>
<tr>
<td><strong>Early Renal Insufficiency Program</strong></td>
<td>Education for PCPs and other physicians caring for ERI/CKD patients</td>
<td>Handout</td>
<td>Ortho Biotech P.O. Box 6914 430 Rt. 22 East Bridgewater, NJ 08807-0914</td>
<td><a href="http://www.orthobiotech.com/">http://www.orthobiotech.com/</a></td>
</tr>
<tr>
<td><strong>Hemodialysis Vascular Access-Historical and Practical Considerations Module 16</strong></td>
<td>Reviews the 40-year history of hemodialysis vascular access. Contents include key historical developments, guidelines for vascular access placement and selection, and recommended pre-operative assessment for Native AV Fistulae and AV Grafts. Approved for 4.0 contact hours.</td>
<td>On-line presentation</td>
<td>Medisystems Corporation P.O. Box 960 Elizabeth, CO 80107-0960 Tel: (800) 369-MEDI / (303) 646-5212</td>
<td><a href="http://www.medisystems.com/">http://www.medisystems.com/</a></td>
</tr>
<tr>
<td>Resource Material/Description</td>
<td>Brief Description</td>
<td>Media Type</td>
<td>To Obtain More Information</td>
<td>Available On-Line @</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------</td>
<td>-----------</td>
<td>---------------------------</td>
<td>---------------------</td>
</tr>
</tbody>
</table>
| **Introduction to Cannulation** | Addresses basic concerns and technique necessary to achieve optimal cannulation | Video | Medisystems Corporation  
P.O. Box 960  
Elizabeth, CO 80107-0960  
Tel: (800) 369-MEDI / (303) 646-5212 | [http://www.medisystems.com/](http://www.medisystems.com/) |
30 E. 33rd St.  
New York, NY 10016  
| **Practice Arms for Cannulation** | Venipuncture practice arm for cannulation | Practice Arm | Electro Assemblies Co.  
522 NW Sixth Ave.  
Rochester, MN 55901  
(800) 533-1558 |  |
| **Practice Arms for Cannulation** | Venipuncture practice arm for cannulation | Practice Arm | Health Edco  
| **Reducing Rates of Vascular Access Infections in Patients Undergoing Hemodialysis** | Demonstrates techniques for initiating and discontinuing Hemodialysis through all access types, as well as infection control methods to prevent or reduce access site infections | Video | Contact your local ESRD Network |  |
| **What Professionals Can Do to Maximize AVF as Primary Access** | Describes role of nephrologist, internist, nurse, technician, surgeon, interventionalist and acute nurse in vascular access | Handout | Contact your local ESRD Network |  |
Objectives

The participant will be able to:

1. Compare and contrast the benefits (and deficits) of each dialysis access type
2. List the attributes of dialysis access that facilitate cannulation
The Goal of Dialysis

- Enables you to “do what you want to do with the rest of your life” (rehabilitation)
- Basic requirement for this tall order is physiological adequacy of RRT
- Adequacy of hemodialysis is a minimum URR of 65% (preferably > 70%)
- Basic requirement of adequacy is blood flow to and through the dialyzer

Access = Adequacy = Access

- Adequacy is URR > 65% (pre-post/pre x 100)
  - And is the product of
    - Time on dialysis
    - Size (clearance) of the dialyzer and needles
    - Qb - blood flow
- Blood flow in the access result of
  - Cardiac output (stroke vol x heart rate)
  - Blood pressure
  - Size and integrity of access
Outline

• Today’s vascular access challenges
• The ideal vascular access
• Compare and contrast the benefits of
  - Catheters; AV fistulae; PTFE grafts: ports
• The attributes of the surgical access that facilitate cannulation

Today’s Challenges in Vascular Access

• Leading cause of hospitalization in the ESRD population (Feldman et al., 1993)
• Annual cost approaching $1 billion (Feldman et al., 1996)
• Aging population with diabetes as the leading cause of ESRD
• Our patients need an access that works better and lasts longer
• WITH LESS PAIN AND SUFFERING!!!
Today’s Challenges in Vascular Access (cont.)

- Cannulation
  - Increased # of fistulae
  - Marginal outflow veins
  - Variability of staff experience
  - Limited area for cannulation
- Monitoring
  - Needs to be effective
  - Affordable
  - User friendly

The Ideal Vascular Access

- Requires minimal surgical intervention
- Causes minimal physical or psychological dysfunction
- Is consistently adequate
- Is amenable to reliable, routine monitoring
- Receives consistent, effective cannulation
- Requires, average maintenance intervention
**Pros and Cons of Access Types**

- **Catheters:**
  - **Pro** - no cannulation
  - **Con** - high risk of bacteremia, less flow volume (through dialyzer ml/min)
    - high potential for central vessel occlusion
    - cannot shower/swim

**Pros and Cons of Access Types (cont.)**

- **Fistulae**
  - **Pro** - Minor surgery with little dysfunction attributable
    - Very low risk of infection
    - Longest average patency of all access types
    - Seals and heals post cannulation
  - **Con** - High initial failure rate
    - Flows initially not better than catheter
    - Initially difficult to cannulate
    - Difficult to declot
Pros and Cons of Access Types (cont.)

- PTFE grafts
  Pro - Moderately low risk of infection
  - Can be used in 3-4 weeks
  - Low initial failure rate
  - Flows reliably high
  - Can be declotted
  - Initially easier to cannulate & monitor
  Con - More traumatic surgery c edema/pain
  - Life patency mean 18mths-2yrs

The Reality of Vascular Access

- There is no single access that meets even most of the ideal criteria
- Surgically created accesses, fistulae and PTFE grafts, do however yield more reliable flows for adequacy with much less risk of bacteremia
- DOQI guidelines make fistulae the access of choice
Meeting the Challenges

• NKF-DOQI guidelines - the result of expert opinion and literature evidence
• Clinical Standards of Practice
• Experience and commitment of the interdisciplinary team collaborating for each individual patient

Attributes to facilitate cannulation

• Placed or transposed in an accessible body part
• Superficiality of graft or vein - easily palpated and visualized
• Tunneled in an even plane
• Tunneled with gradual curves
• Should provide reasonable amount of accessible surface area to allow rotation of needle sites
Collaborative Care of Vascular Access

• Nurses have a pivotal role that involves coordination and continuity of care through:
  - Early detection of complications
  - Risk assessment
  - Timely referrals
  - Appropriate referrals
  - Post procedure follow-up

Collaborative Care of Vascular Access (cont.)

• Nurses have a pivotal role as vascular access advocates through:
  - Assertive preservation of existing access
    • Patient & staff education
    • Interaction with radiologists and surgeons
    • Promoting expert cannulation & self-cannulation
  - Persistent preservation of remaining access sites
    • Minimizing central catheter access
    • Minimizing venous cannulation in “virgin” limbs
**Who is the Cannulator?**

- Will just anyone do?
- Would you let that person stick you or yours?
- What training should you look for?
- Is there a role for dedicated cannulators?
- Has the time for self-cannulation arrived?

**Lesley’s Sticking Tips**

- Carefully inspect, feel, and listen to access
- Thoughtfully choose BOTH needle sites before sticking - take your time
  - Which side/end is arterial?
  - Where was the previous stick?
  - Is there room above to stick again should it blow?
  - Where will the tip of the needle be?
  - How deep is the graft?
  - Needs local - lidocaine versus Emla cream?
Lesley’s Sticking Tips (cont.)

- Remember
  - Needles don’t bend - accesses do
  - Rotate sites
  - Take your time
  - Listen to your patient - he’s seen the best and the worst and knows his access best
  - Flip needles ONLY if flow is poor
  - Tape needles securely not tightly

Lesley’s Sticking Tips (cont.)

- Remember
  - Take your time
  - Fistulas and grafts are of different composition
  - ALWAYS use a tourniquet for a fistula
  - Use a tourniquet for a “mushy” graft
  - Fistulas not as tough as PTFE - be gentle!
  - If at first you don’t succeed - get expert help
  - Stick unto others as you would have them stick you
Care of the Edematous Graft

- Is it reactive cellulitis or infection?
- Elevating the arm and encouraging use of the hand
- When to cannulate
- How to cannulate

The Marginal Outflow Vein

- Use a single needle to return blood initially
- Aggressively treat infiltrations
- Conservatively recannulate
- Get ultrasound mapping for depth and size
- Get fistulagram if generalized swelling occurs
- Refer back to surgeon for revision options
Collaborative Care of Vascular Access

- Surgeons have a role as vascular access advocates through:
  - Diagramming new accesses & labelling arterial limb
  - Communicating specific access orders directly to the nurses
  - Visiting the dialysis units to do patient & staff education and to familiarize staff with surgeon’s point of view
  - Be readily accessible for consultation

The End
Fistulas for Dialysis Access: The Challenge of Preservation, Creation, Maturation, and Cannulation

Lesley C. Dinwiddie, MSN, RN, FNP, CNN
William Marston, MD

Outline

• The mandate for more fistulae
• Guideline for vein preservation
• Who can have a fistula?
• Screening diagnostics
• Surgical techniques for fistula creation
• Post-op education and care
• Maturation
Outline

- Cannulation
  - Who - the case for expert cannulators or self-cannulation
  - How - sticking tips
- Troubleshooting complications
  - Diagnostics - mapping by ultrasound & venogram
  - Interventions
    - Angioplasty
    - Surgical revision (tying off collaterals, revising inflow)

Vein Preservation for AV Access - G7

- Arm veins should be preserved regardless of arm dominance - dorsum of the hand should be used whenever possible in CRF patients
- CRF = Scr>3 mg/dl
- Patient and staff education re preservation & medic alert bracelet worn
- AVOID subclavian vein catheterization
Selection of Access Type and Site - G3

- Order of preference
  1. Radial-cephalic primary AV fistula
  2. Brachial-cephalic primary AV fistula
  3. Transposed brachial-basilic vein fistula (or popliteal-saphenous)
  4. PTFE graft

Timing of Access Placement - G8

- Primary AV fistula
  - CrCL < 25 ml/min
  - Scr > 4 mg/dl
  - Or within 1 year of anticipated need
- PTFE grafts should be placed 3-6 weeks prior to anticipated need for dialysis
- Catheters should not be placed till dialysis is needed
Vascular Access Selection

- Goal of Vascular Access
- Demographic variables affecting access selection
  - Age
  - Race
  - Sex
- Comorbidities &
- Access History

Arterio-Venous Fistulae

- Criteria for fistula creation
  - Adequate, palpable veins
  - Healthy arteries - Allen’s test or Doppler studies to assure adequacy of flow to hand
  - Good cardiac output
- Sites of creation
  - Wrist
  - Elbow
  - Thigh
Types of Fistulas

- Simple
- Vein transposition
- Two step - simple then transposition
- Superficialization of veins by surgical removal of tissue between skin and vein

Arterio-Venous Fistulae

- Basic care
  - Maturation exercises
  - Protecting the access
    - No IV sticks
    - No BP cuff
    - No tight clothing or jewelry that “binds”
  - Washes arm predialysis
  - Holds own sticks
  - Removes pressure dressings ASAP
Arterio-Venous Fistulae

- Complications
  - Inadequate maturation
  - Repeated infiltration
  - Steal syndrome or nerve damage
  - Pseudo aneurysms/one site-itis
  - Thrombosis
  - Infection

Cannulation Challenges - Fistulas

- Anyone can have a fistula - but will there be an outflow vein that is reasonable to cannulate?
  - Reports of vessels that bleed excessively post-cannulation - ? Increased fragility from long term steroid use?
  - Straight as a dog’s hind leg?
  - Deep! Deep! As the ocean?
  - Now you see it - now you don’t!
  - I can see it but can’t get to it - the ulna-basilic!
The Marginal Outflow Vein

- Use a single needle to return blood initially
- Aggressively treat infiltrations
- Conservatively recannulate
- Get ultrasound mapping for depth and size
- Get fistulagram if generalized swelling occurs
- Refer back to surgeon for revision options

Limited Cannulation Sites

- Can result from:
  - Tortuous outflow vein
  - Brachio-cephalic fistula short/deep outflow
  - Less than optimal graft placement
  - Port placement
- Can be optimized with:
  - Button hole technique
  - Good skin care
**Who is the Cannulator?**

- Will just anyone do?
- Would you let that person stick you or yours?
- What training should you look for?
- Is there a role for dedicated cannulators?
- Has the time for self-cannulation arrived?

**Variability of Staff Experience**

- High staff turnover with many new staff having NO cannulation experience!
- Do technical staff being trained to cannulate have a basic understanding of anatomy & physiology?
- Many staff trained to cannulate PTFE try to cannulate outflow veins with same technique
- Are cannulation challenges assigned to appropriate expertise?
Lesley’s Sticking Tips

- Carefully inspect, feel, and listen to access
- Thoughtfully choose BOTH needle sites before sticking - take your time
  - Which side/end is arterial?
  - Where was the previous stick?
  - Is there room above to stick again should it blow?
  - Where will the tip of the needle be?
  - How deep is the graft?
  - Needs local - lidocaine versus Emla cream?

Lesley’s Sticking Tips (cont.)

- Remember
  - Needles don’t bend - accesses do
  - Rotate sites
  - Take your time
  - Listen to your patient - he’s seen the best and the worst and knows his access best
  - Flip needles ONLY if flow is poor
  - Tape needles securely not tightly
Lesley’s Sticking Tips (cont.)

• Remember
  - Take your time
  - Fistulas and grafts are of different composition
  - ALWAYS use a tourniquet for a fistula
  - Use a tourniquet for a “mushy” graft
  - Fistulas not as tough as PTFE - be gentle!
  - If at first you don’t succeed - get expert help
  - Stick unto others as you would have them stick you

The End
Change Concept #11

*Outcomes Feedback to Guide Practice*

No documents currently available for this Change Concept.
Data Collection Tools

- Interventional Radiologists Log Sheet
- Vascular Surgeons Log Sheet
- Implementation Tracking Tool
- Vascular Access Incidence and Prevalence Patient Log (Draft)
<table>
<thead>
<tr>
<th>NAME (please type or print)</th>
<th>Address</th>
<th>City, State</th>
<th>Zip</th>
<th>Phone</th>
<th>Phone Ext.</th>
<th>Fax</th>
<th>E-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name (please type or print)</td>
<td>Address</td>
<td>City, State</td>
<td>Zip</td>
<td>Phone</td>
<td>Phone Ext.</td>
<td>Fax</td>
<td>E-mail</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------</td>
<td>-------------</td>
<td>-----</td>
<td>-------</td>
<td>------------</td>
<td>-----</td>
<td>--------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Implementation Tracking Tool

<table>
<thead>
<tr>
<th>Information About Facilities</th>
<th>Rating*</th>
<th>Comments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>All non-AVF accesses are investigated as part of CQI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Routine in-servicing of staff in AVF cannulation techniques</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screening of AV graft patients for possible 2° AVF; documenting and communicating with nephrologist/surgeon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screening all catheter patients for AVF options; documenting and communicating with nephrologist/surgeon</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Rating: Select the score that best matches the current situation:**
- 1 = Not under consideration
- 2 = Under consideration, not started
- 3 = In start-up process
- 4 = Working, at least in part
- 5 = Working well

<table>
<thead>
<tr>
<th>Information About Nephrologists</th>
<th>Subtotal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nephrologists document AVF plans for all potentially eligible patients</td>
<td></td>
</tr>
<tr>
<td>Nephrologists specify “AVF only” in referrals to surgeons for evaluation and placement</td>
<td></td>
</tr>
<tr>
<td>Nephrologists select surgeons based on willingness, skill, and outcomes with AVFs</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Information about surgeons and interventional radiologists/interventional nephrologists</th>
<th>Subtotal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgeons receive and track data on their vascular access rates and outcomes</td>
<td></td>
</tr>
<tr>
<td>Interventional radiologists/interventional radiologists and surgeons utilize specific criteria to determine allowable degree of intervention before referring for new access</td>
<td></td>
</tr>
<tr>
<td>Surgeons are supportive and skilled in placing 2° AVFs</td>
<td></td>
</tr>
</tbody>
</table>
WHICH ACCESS WAS USED FOR DIALYSIS? Report data as of the last day of the month. Determine which type of access was in use as of the last day/treatment of the month. Under the appropriate access type, indicate with an "X" the description that best matches the patient.

<table>
<thead>
<tr>
<th>PATIENT</th>
<th>AVF</th>
<th>AV GRAFT</th>
<th>CATHETER (Includes port devices)</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All Patients

- **#**: 8
- **%**: 38% 13% 13% 13% 0% 13% 13% 0%

New Patients

- **#**: 4
- **%**: 25% 25% 25% 0% 0% 0% 25% 0%

Notes:

1. Also includes cases where an AVF is present but temporarily not being used.
2. For purposes of internal CQI, it is recommended that facilities track patients with an AVF that still require catheter access longer than 90 days post-placement of AVF. Extended fistula maturation time indicates that further evaluation may be needed.

Error messages:

Error 1: A patient has more than one access type checked. Each patient should have only one selection

Error 2: The number of patients and number of accesses is not the same. Make sure there is a patient name for every access

Expanding Form: If adding rows to this form, you will need to make adjustments in hidden columns M-T which allow for automatic calculations for new patients. Widen columns so you can see them. Then, copy contents from an existing row to your new rows.
### Vascular Access Incidence and Prevalence: Facility Summary

<table>
<thead>
<tr>
<th>Facility Name:</th>
<th>Provider #</th>
<th>Reporting Month/Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### AVF In Use

<table>
<thead>
<tr>
<th>In Use &lt; 90 days</th>
<th>In Use &gt; 90 days</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>13%</td>
<td>13%</td>
<td>26%</td>
</tr>
<tr>
<td>38%</td>
<td>38%</td>
<td>100%</td>
</tr>
</tbody>
</table>

#### AVF New Patients

<table>
<thead>
<tr>
<th>AVF Incidence I</th>
<th>AVF Incidence II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>25%</td>
<td>50%</td>
</tr>
</tbody>
</table>

#### AVF Prevalence

<table>
<thead>
<tr>
<th>AVF Prevalence</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>38%</td>
</tr>
</tbody>
</table>

#### AVF Incidence Summary

- **AVF Prevalence**: The total number of patients using AV fistulas during the reporting month.
- **AVF Incidence**: The number of new patients with AV fistulas being used for dialysis.
- **AVF Incidence II**: All new patients with AV fistula in place, whether or not it is being used for dialysis.

#### AVGraft Prevalence and Incidence Summary

- **AVGraft Prevalence**: The total number of patients using AV grafts during the reporting month.
- **AVGraft Incidence I**: All new patients with AV graft being used for dialysis.
- **AVGraft Incidence II**: All new patients with AV graft in place, whether or not it is being used for dialysis.

#### Catheter Prevalence and Incidence Summary

- **Catheter Prevalence**: The total number of patients using catheters in the reporting month regardless of duration of catheter use.
- **Catheter Incidence I**: All new patients with catheter being used for dialysis.

DCT-Vascular Access Incidence and Prevalence Patient Log (Draft)
<table>
<thead>
<tr>
<th>Article</th>
<th>Change Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Article: Avoidance of Prophylactic Antibiotics in Creation of Native Arteriovenous Fistulas</td>
<td>#5</td>
</tr>
<tr>
<td>Article: Cannulation Camp: Basic Needle Cannulation Training for Dialysis Staff</td>
<td>#8</td>
</tr>
<tr>
<td>Article: Endoscopic Saphenous Vein Harvesting For Hemodialysis Vascular Access Creation in the Forearm: A New Approach For Arteriovenous Bridge Graft</td>
<td>#5</td>
</tr>
<tr>
<td>Article: The Initial Creation of Native Arteriovenous Fistulas: Surgical Aspects and Their Impact on the Practice of Nephrology</td>
<td>#5</td>
</tr>
<tr>
<td>Autologous AVF Algorithm</td>
<td>#3</td>
</tr>
<tr>
<td>Cannulation of New Fistula Policy and Procedure</td>
<td>#8</td>
</tr>
<tr>
<td>Clamp Usage Policy and Procedure</td>
<td>#8</td>
</tr>
<tr>
<td>Dr. Twardowski’s “Buttonhole Method of Needle Insertion Into an AVF” Video</td>
<td>#8</td>
</tr>
<tr>
<td>Draft Letter to PCP From Nephrologist</td>
<td>#2</td>
</tr>
<tr>
<td>Duplex of Upper Extremity Vessels Prior to AVF Surgery</td>
<td>#5</td>
</tr>
<tr>
<td>Facility-Based Vascular Access Coordinator Role (Independents)</td>
<td>#1</td>
</tr>
<tr>
<td>Facility Catheter Tracking Tool</td>
<td>#7</td>
</tr>
<tr>
<td>Fistula First Change Package</td>
<td>Change Package</td>
</tr>
<tr>
<td>Fistula Preservation, Development and Maintenance Policy and Procedure</td>
<td>#2</td>
</tr>
<tr>
<td>Hemodialysis Access Referral: Existing Access</td>
<td>#3</td>
</tr>
<tr>
<td>Hemodialysis Access Referral: New Access</td>
<td>#3</td>
</tr>
<tr>
<td>Implementation Tracking Tool</td>
<td>Data Collection Tools</td>
</tr>
<tr>
<td>Interventional Radiologists Log Sheet</td>
<td>Data Collection Tools</td>
</tr>
<tr>
<td>Management of Patient with Central Venous Catheter</td>
<td>#7</td>
</tr>
<tr>
<td>MEDISYSTEMS Cannulation Video</td>
<td>#8</td>
</tr>
</tbody>
</table>
Index, cont.

- Monthly Vascular Access Monitoring & Surveillance
  Referral/Intervention Tracking Log
  Change Concept #1

- NKF-K/DOQI Vascular Access Clinical
  Practice Guidelines – 2000 Update; Section I – Patient
  Evaluation Prior to Access Placement
  Change Concept #10

- NKF-K/DOQI Vascular Access Clinical
  Practice Guidelines – 2000 Update; Section II – Monitoring,
  Surveillance, and Diagnostic Testing
  Change Concept #10

- NKF-K/DOQI Vascular Access Clinical
  Practice Guidelines – 2000 Update; Section IV – Management
  of Complications: When to Intervene
  Change Concept #10

- Patient Resources
  Change Concept #10

- Pre-ESRD Vascular Access/AVF Plan
  Change Concept #1, #2, #3

- Presentation: Best Access Procedures From the Dialysis Units’
  Viewpoint
  Change Concept #10

- Presentation: Fistulas For Dialysis Access: The Challenge
  of Preservation, Creation, Maturation, and Cannulation
  Change Concept #10

- Presentation: Role of a Dialysis Access
  Coordinator (Vascular Access Manager)
  Change Concept #1

- Reducing Central Venous Catheter Infections
  Change Concept #7

- Related Articles For Vascular Access
  Change Concept #1

- Secondary AV Fistulae in Patients with AV Grafts
  Change Concept #6

- Staff Resources
  Change Concept #10

- Surgeon Questionnaire
  Change Concept #4

- Vascular Access Coordinator Role
  Change Concept #1

- Vascular Access Incidence and Prevalence Patient Log
  Data Collection Tools

- Vascular Access Monitoring & Surveillance Flow Chart
  Change Concept #9

- Vascular Surgeons Log Sheet
  Data Collection Tools