

# Simplifying Vascular Access (VA) Selection

Lesley C. Dinwiddie MSN RN FNP CNNe

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## ABSTRACT

- While fistulas are the most successful vascular access in the prevalent HD population not all patients needing HD have the anatomy or physiology for successful fistula creation and use. The literature reflects the populations at risk and suggests alternatives including other kidney replacement therapy (KRT) options such as peritoneal dialysis. However a patient-centered approach to KRT suggests that if HD is the best KRT for the individual then the approach to VA selection should also be patient-centered. This presentation is designed to outline an approach for the assessment of the individual patient's anatomy and physiology to determine the selection of vascular access with highest potential for HD success.

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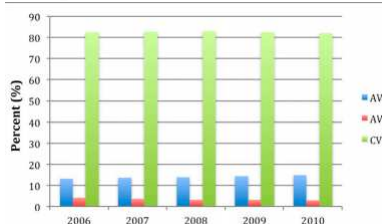
## KDOQI for Vascular Access 2018

- “It shouldn't be Fistula First or Catheter Last. The best approach, if evidence shows it, should be individualized for placing a patient's vascular access.” NNI editor Mark Neuman 6/2016 quoting Lok C. NKF 2016
- “KDOQI and Fistula First have it all wrong - Vascular Access selection is SIMPLE – you just need to know 2 things about the HD patient's vasculature – is there INFLOW and is there OUTFLOW? Then you can choose the best conduit.” Author's interpretation of surgeon, John Ross, 2011.

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## “Vascular access morbidity and mortality: trends of the last decade”

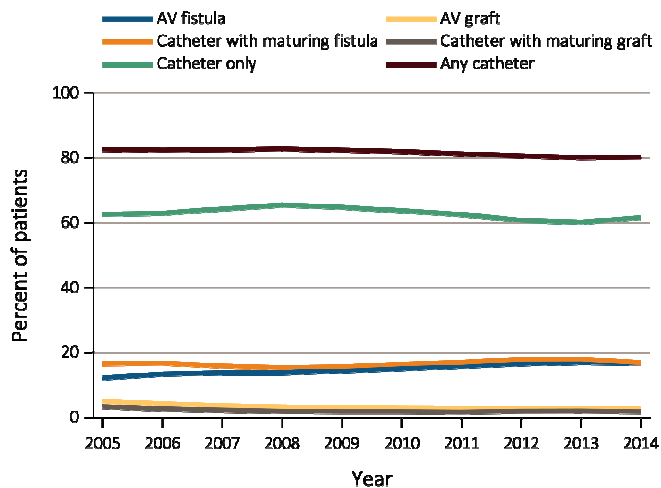
- CVC ~ 80% of all incident accesses in past decade\*
- & steady increase of prevalent AVF to > 50%
- VA morbidity & mortality vary with type of access
- 3-4 fold increase in infection risk with incident CVC vs AVF or AVG
- 7 fold higher for CVC used as prevalent access
- 2-3 fold increase in procedure rates for all accesses
- Significant risk increase in CVC mortality in 1<sup>st</sup> year



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Lok C, Foley R. *CJASN* 2013

**Figure 4.1 Vascular access use at hemodialysis initiation, from the ESRD Medical Evidence form (CMS 2728), 2005-2014**

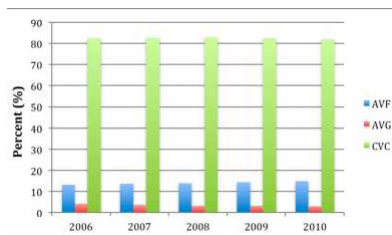


Data Source: Special analyses, USRDS ESRD Database. ESRD patients initiating hemodialysis in 2005-2014. Abbreviations: AV, arteriovenous; CMS, Centers for Medicare & Medicaid; ESRD, end-stage renal disease.

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### “Vascular access morbidity and mortality: trends of the last decade”

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Lok C, Foley R. *CJASN* 2013

## The Challenge of VA Selection

“Attaining the right vascular access in the right patient at the right time in the right circumstances is challenging.” Lok C, Foley R. *CJASN* 2013

“...changes in trends, such as reducing the percentage of patients initiating HD with a catheter, can be made only at the patient level with patient-level information. USRDS cannot inform on some critical variables that may affect change, such as patient preference\*s, expected patient survival or changes\* in clinical practice....”

Lok C, Foley R. *CJASN* 2013

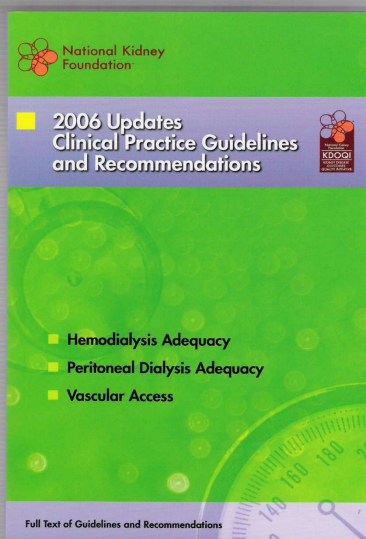
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## How to Simplify Assessment for the Best Access for the Individual

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## CMS Conditions for Coverage 2008

- CMS recognizes the vital importance that vascular access plays on adequacy of dialysis and patient's overall health status.
- "The interdisciplinary team must provide vascular access monitoring and appropriate, timely referrals to achieve and sustain vascular access. The hemodialysis patient must be evaluated for *the appropriate vascular access type*, taking into consideration co-morbid conditions, other risk factors, and whether the patient is a potential candidate for arteriovenous fistula placement".
- "If the patient's vascular access is **NOT** an arteriovenous fistula, the record should indicate **why** the patient was determined to not be a candidate for a fistula".



## The 2006 KDOQI Revisions

## GUIDELINE 2. SELECTION AND PLACEMENT OF HEMODIALYSIS ACCESS

- A structured approach to the type and location of longterm HD accesses should help to optimize *access survival and minimize complications*.
- The access *should be placed distally and in the upper extremities whenever possible*. Options for fistula placement *should be considered* first, followed by prosthetic grafts, if fistula placement is not possible. Catheters should be avoided for HD and used only when other options above are not available.

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## COMPELLING EVIDENCE

### Change In Vascular Access and Mortality in Maintenance Hemodialysis Patients

*“Catheters have the worst associated mortality risk. Changing from a catheter to a fistula or graft is associated with significantly improved survival. The risk for grafts approached that of fistulas, providing an alternative to prolonged catheter exposure and potentially less hazardous bridge toward a fistula.”*

- Lacson, E., et al, Am J Kidney Dis, 2009

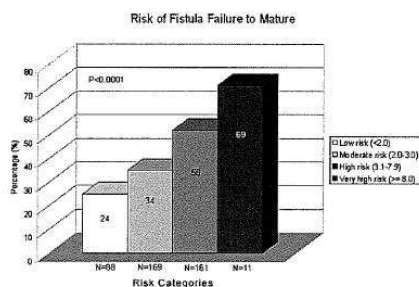
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### Risk Equation Determining Unsuccessful Cannulation Events and Failure to Maturation in Arteriovenous Fistulas (REDUCE FTM I)

Charmaine E. Lok,\* Michael Allon,† Louise Moist,‡ Matthew J. Oliver,§ Hema Shah,\* and Deborah Zimmerman¶

Table 3. Clinical use of the scoring

Variable	Points	Score
Age ≥65 yr	+2	
PVD	+3	
CAD	+2.5	
White	-3	
Baseline score		+3
Total		



CJASN -2006

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### ACCESS STRATIFICATION TOOL

- An adequate arterio-venous access has three components:

1. inflow
2. conduit
3. outflow



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## WHAT IS INFLOW?

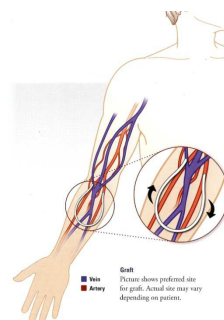
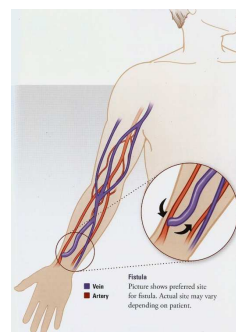
- It starts at the Heart
  - Cardiac output
  - Cardiac ejection fraction
  - Systolic pressure
- And travels through arteries
  - Size matters\*
  - Tissue health
- Flow is volume X speed = mLs/min – sufficient to provide adequate blood flow to and through the access plus the ECC\*



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## WHAT IS A CONDUIT?

- a natural or artificial channel through which something (as a fluid) is conveyed (Merriam-Webster)
- It is the vessel that carries the blood that is accessed for hemodialysis
  - Arterialized fistula vein
  - Interposed graft



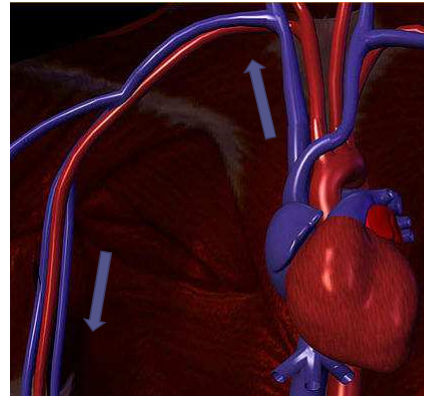
**Not applicable if  
there is insufficient inflow !**

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## WHAT IS OUTFLOW?

- It starts at the Heart
  - Right atrial pressure/  
central venous pressure –  
is it low enough to adequately  
receive increased cardiac output?
- And works backwards  
through the central veins  
to the peripheral veins
  - Size matters
  - Tissue health
    - Distensibility
    - Presence of stenosis and/or occlusion
- Flow is still volume X speed = mLs/min



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## Quality of the Three Components DETERMINES POTENTIAL for Best Access

- Quality in Three Strata:
  - Grade A. good anatomy and physiology
  - Grade B. fair condition of anatomy and/or  
modifiable physiology
  - Grade C. poor anatomy and/or nonmodifiable  
physiology

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### ROSS/DINWIDDIE ACCESS STRATIFICATION TOOL

Inflow	Outflow	Conduit	Indicated Access
No abnormalities in: • Cardiac output or ejection % • Arteries • Artery of sufficient size	No history of central venous access/devices or trauma OR has venography demonstrating no abnormalities in central veins	Adequate-sized peripheral veins that are superficial and free of stenosis	AAA; ABA – Forearm AVFistula AAB; ABB – Brachiocephalic AVF AAC; ABC – Vein transposition; AVG in forearm or upper arm ACC – HeRO graft or leg loop
• Poor cardiac output or ejection % • Some degree of artery disease • Small peripheral arteries	History of central venous access/devices or trauma – venography demonstrates no gross abnormalities in central veins – at least on one side	• Small or inaccessible or stenosed forearm veins • Adequate and accessible cephalic vein	BAA; BBA; BBB – Brachiocephalic AVF BAC; BBC – Vein transposition; AVG in forearm or upper arm on indicated side BCC – HeRO graft or leg loop All these accesses require cardiac monitoring and support
Very poor cardiac output or ejection % • Arteries severely diseased • Only proximal arteries of sufficient size	Bilateral venography demonstrates gross abnormalities in central veins on both sides showing no adequate outflow to RA	Inaccessible or stenosed or occluded upper arm veins	CAC; CBA; CCA; CAB; CBB; CCB; CAC; CBC; CCC – best accessed with a catheter for HD or PD

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### ACCESS ALGORITHM USING THIS 3X3 TOOL

- AAA = good inflow, good outflow, and good conduit (veins) – an arteriovenous fistula
- AAB = good inflow, outflow, fair conduit – could be an AVF or an AVG
- ABC = good inflow, fair outflow, poor conduit veins = AVG
- ACC = .....

Permutations and combinations that must be assessed for potential access -

what about CCC?? **CCC = CVC!!!!**

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### ACCESS ALGORITHM USING THIS 3X3 TOOL

ACC – great inflow, poor outflow = ????

ACA

ACB

C grade for central outflow = ?catheter only or leg graft?

All the peripheral vein preservation and vein mapping in the world will not help this patient get a fistula OR a conventional graft!

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### ACCESS STRATIFICATION MATRIX

Inflow	Outflow	Conduit	Indicated Access
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## VASCULAR ACCESS ALGORITHM ASSESSMENT IS EASY AS 1,2,3

- 1 inflow – starts with the heart
- 2 outflow – starts with the heart
- 3 conduit can be decided when you know you have both inflow and outflow

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## ROLE OF THE HERO GRAFT IN VASCULAR ACCESS ALGORITHM<sup>1</sup>



<sup>1</sup>SCVS, 37th Annual Society for Clinical Vascular Surgery Meeting, Orlando, FL, March 2009, Christopher L. Stout, MD, Jean M. Panneton, MD, and Marc H. Glickman, MD, Division of Vascular Surgery, Eastern Virginia Medical School, Norfolk, VA

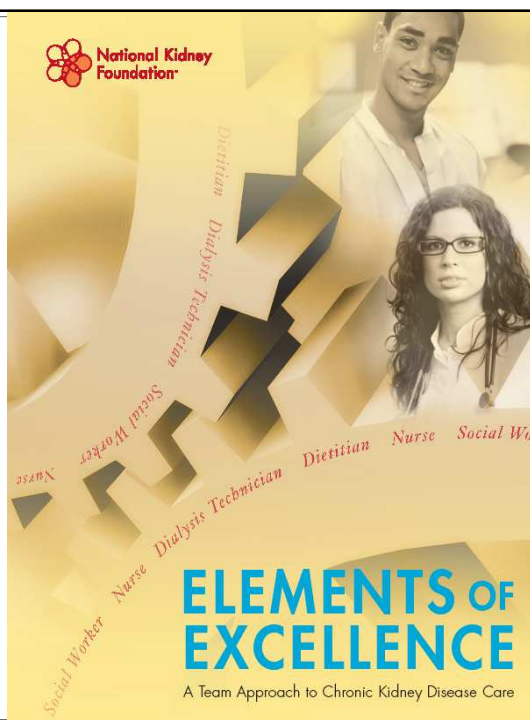
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## TESTING OF THE STRATIFICATION TOOL

- To date just a hypothetical construct as a logical and useful approach to assessment
- Utility for improving catheter reduction efforts
- Utility for CQI in conjunction with active VAT in assuring plan for “next access”

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## THE TEAM APPROACH



## TESTING OF THE STRATIFICATION TOOL

- Choose x # of units that most need improvement assistance (? Power)
- Pair for similarity of data, (demographics, size of facility, # of CVCs, etc )
- Randomize to either:
  - Intervention group (trained to use tool)
  - Control (given standard catheter reduction teaching)
- Collect data for ? 6 months ? 12

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## TRAINING TO USE STRATIFICATION TOOL

- Reviewing pertinent access history as per KDOQI Guideline 1
  - Previous access
  - Previous surgeries (cancers, transplant)/trauma
  - Cardiac history – pacemaker, stents etc
- Teaching physical assessment as it relates to
  - Inflow
  - Outflow
- Create flow diagram using stratification tool

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## KDOQI FOR VASCULAR ACCESS 2018

- “It shouldn't be Fistula First, or Catheter Last. The best approach, if evidence shows it, should be individualized for placing a patient's vascular access.” NNI editor Mark Neuman 6/2016
- “The prior messages were 'Fistula First, Catheter Last, Functioning Fistula First' - we are not going to necessarily do that. What we want is ***individualized care with standardized processes***,” Lok C. NKF 2016 quoted in NNI, 6/2016

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## WHAT IS “PATIENT-CENTERED CARE”?

- In its landmark book, Crossing the Quality Chasm (2001, p. 40), the **Institute of Medicine (IOM)** defined **patient-** ... “providing **care** that is respectful of and responsive to individual **patient** preferences, needs, and values and ensuring that **patient** values guide all clinical decisions.”

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### CASE STUDY – GREAT INFLOW, OUTFLOW, MATURING FOREARM AVF – AAA!

- EL – a white female in her mid 70s – CKD due to vasculitis
- Incident to HD with a RIJ CVC
- And a maturing R forearm AVF
- Quiet, vague lady who slept during HD
- Lived with and cared for by daughter
- Rx to cannulate AVF when mature and remove CVC asap

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### CASE STUDY – GREAT INFLOW, OUTFLOW, MATURING FOREARM AVF – AAA!

- an attempt was made to cannulate with one needle
- the initial cannulation WAS successful - for a matter of minutes!
- became highly agitated and started screaming to “get it out of there”
- no apparent understanding of the purpose of the needle
- a history of “mild alzheimers”
- her daughter sedated her for medical appointments including procedures

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### CASE STUDY – GREAT INFLOW, OUTFLOW, MATURING FOREARM AVF – AAA!

- Daughter concluded from options that she had been given that she “just couldn’t let her Mama die” and she wanted us to keep on using the catheter for now.
- Not long after, EL was transferred to a live-in facility where she received nocturnal PD.
- But her case shows that “one size does not fit all or even most”

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### CASE STUDY – GREAT INFLOW, OUTFLOW, MATURING FOREARM AVF – AAA!

- Access Stratification Tool – AAA – scores a perfect 10!
- Patient outcome? Scores a minus zero!
  - A wasted surgery in all respects especially cruel punishment for a mentally incompetent patient
  - Definitely NOT patient centered care!
- We can and must do better!
- A tool is still just a tool!

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## Remember It's Always about "What is Best for Your Patient"

- "Attaining the right vascular access in the right patient at the right time in the right circumstances is challenging." Lok C, Foley R. *CJASN* 2013
- Thanks – You can email me at [lesleydinwiddie@gmail.com](mailto:lesleydinwiddie@gmail.com)