Technical and Clinical Barriers to Implementing an Optimal Case Mix of Vascular Access

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Barriers (*clinical*) to achieving optimal case mix for VA in 2011

✓ **Patients**
  - Case mix effects
  - Delay in decision making
  - Preferences, Values, Beliefs and Perceptions

✓ **Health Care Provider**
  - Late referral
  - Variation in patient eligibility criteria
  - Surgical skills
  - Cannulation skills

✓ **Environment**
  - Resource limitation
    - Access to Nephrologists, Surgeons, Radiologists
    - OR, Radiology time
  - Lack of standardized process of care
  - Culture of VA in dialysis
    - Influence of guidelines
  - Prediction of the future
    - Timing of referrals for VA
### Patient Variables do influence type of access used

#### OR for CVC Versus Permanent Access Use at Hemodialysis Start

<table>
<thead>
<tr>
<th>Patient factors</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female sex</td>
<td>1.95 (1.22-3.11)°</td>
</tr>
<tr>
<td>Age (/10-y increase)</td>
<td>0.99 (0.87-1.12)</td>
</tr>
<tr>
<td>Current smoking</td>
<td>0.70 (0.45-1.09)</td>
</tr>
<tr>
<td>Racial origin</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>1.00 (reference)</td>
</tr>
<tr>
<td>Aboriginal/Maori/Pacific Islander</td>
<td>3.11 (2.35-4.13)°</td>
</tr>
<tr>
<td>Asian</td>
<td>1.53 (0.72-3.22)</td>
</tr>
<tr>
<td>Other/unknown</td>
<td>2.76 (1.34-5.68)°</td>
</tr>
<tr>
<td>Cause of ESKD</td>
<td></td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1.00 (reference)</td>
</tr>
<tr>
<td>Glomerulonephritis</td>
<td>0.44 (0.31-0.61)°</td>
</tr>
<tr>
<td>Hypertension/vascular</td>
<td>0.34 (0.10-1.22)</td>
</tr>
<tr>
<td>Adult PKD</td>
<td>0.17 (0.04-0.69)°</td>
</tr>
<tr>
<td>Other/unknown</td>
<td>0.85 (0.44-1.66)</td>
</tr>
</tbody>
</table>

High Failure to Mature Rates and ↑ procedure rates influence the appropriate choice of access for each patient

<table>
<thead>
<tr>
<th>Reason for loss</th>
<th>Age &lt;65</th>
<th>Age 65</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thrombosis/stenosis</td>
<td>34 (55.7%)</td>
<td>25 (43.9%)</td>
<td>0.71</td>
</tr>
<tr>
<td>Failure to mature</td>
<td>21 (34.4%)</td>
<td>28 (49.0%)</td>
<td>0.05</td>
</tr>
<tr>
<td>Radiocephalic</td>
<td>11</td>
<td>16</td>
<td>0.02</td>
</tr>
<tr>
<td>Brachiocephalic</td>
<td>8</td>
<td>9</td>
<td>0.80</td>
</tr>
<tr>
<td>Brachiobasilic</td>
<td>1</td>
<td>3</td>
<td>0.19</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table IV. Procedure to treat arteriovenous fistula failure

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Group A (≥65)</th>
<th>Group B (&lt;65)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fistuloplasty</td>
<td>26</td>
<td>16</td>
<td>.09</td>
</tr>
<tr>
<td>Thrombectomy</td>
<td>15</td>
<td>8</td>
<td>.34</td>
</tr>
<tr>
<td>Surgical revisiona</td>
<td>11</td>
<td>7</td>
<td>.27</td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
<td>31</td>
<td>.01</td>
</tr>
</tbody>
</table>

aIncludes repeat anastomosis, transposition/superficialization, and ligation of tributaries.
Influence of Patient Mix

“*Our CVC rate is high because...*”

My patients are sicker...

My patients are older

I have more late referrals

My patients are more challenging
Variability of Catheter Use is not only determined by patient characteristics

Model adjusted for patient age, sex, late referral, race, cause of ESKD, cigarette smoking, PVD, presentation type (predialysis chronic kidney disease, PD rest, failed PD, failed transplant), and dialysis education

The \textit{adjusted} Odds of starting with a CVC by center compared to cohort mean
This variability in type of VA also seen among countries.
Barriers to Achieving Appropriate Access

Patient characteristics

Facility level barriers
Perception, Values and Beliefs
Patient preference was found to be a barrier for optimal VA: survey of Nephrologists in Canada /US

Although we have CKD clinics and provide education

Patients are not making or refusing “optimal access”

CKD patient education is important ... must ensure knowledge transfer

- Patients who scored 20% higher on post education test
- 25% more likely to use an AVF or AVG at initiation of dialysis compared with use of a catheter for dialysis access
- Stresses the need to ensure patients understand the information given
And it is in a language they can understand...

¿Qué es su ACCESO-ABILIDAD?
por Michele Leder, RN

¿Puede describir la dureza de acceso de síntomas que tiene?
¿Puede describir la dureza de acceso que tiene la sangre en su cuerpo?
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FISTULA
El acceso vascular es el lugar en su cuerpo donde se hace el acceso y se realiza el tratamiento de la diabetes. Mientras se hace el tratamiento de la diabetes, se debe hacer una parada de acceso para hacer el tratamiento de la diabetes. Mientras se hace el tratamiento de la diabetes, se debe hacer una parada de acceso para hacer el tratamiento de la diabetes. Mientras se hace el tratamiento de la diabetes, se debe hacer una parada de acceso para hacer el tratamiento de la diabetes. Mientras se hace el tratamiento de la diabetes, se debe hacer una parada de acceso para hacer el tratamiento de la diabetes. Mientras se hace el tratamiento de la diabetes, se debe hacer una parada de acceso para hacer el tratamiento de la diabetes.

¡Mucho Cuidado!

Las fistulas son el acceso vascular preferido para el tratamiento de la diabetes. Hay pocas complicaciones con el uso de las fistulas. La incidencia de infecciones es menor en las fistulas. Son menos las hospitalizaciones relacionadas a problemas con las fistulas. Las fistulas son más duraderas. ¡Fistulas PRIMERO!

El Cuidado de su Fistula Después de la Cirugía
Ahora es lo que su cuerpo ha recibido A su fistula con cuidado. Usted debe hacer el acceso al cuidado con cuidado. Usted debe hacer el acceso al cuidado con cuidado. Usted debe hacer el acceso al cuidado con cuidado. Usted debe hacer el acceso al cuidado con cuidado. Usted debe hacer el acceso al cuidado con cuidado.
Cognitive Impairment is Common in Patients on Dialysis

- 50-70yo: 30%
- > 70yo: 60%
- 50-70yo: 30%

Figure 3. Prevalence of cognitive impairment by decade of age. Note that global cognitive impairment was defined as a score <80 on the 3MS and impaired executive function was defined as a score ≥300 seconds on the Trails B test.

Tamura MK. Clin J Am Soc Nephrol 5:1429
Patient Choice
25-42% of “eligible” patients refuse

“Doc..I really have no problems with this catheter  Thanks for the advice. You are a good doctor but no thanks
Why did eligible patients refuse a AVF/ AVG

- **Previous experience**
  - Pain
  - Bleeding
  - Cannulation problems

- **Knowledge transfer**
  - Lack of information
  - Timing of information
  - Lack of appreciation of risks of CVC
  - Peer influence toward negative aspects of the AVF

- **Outlook on Life**
  - Live day to day
  - Maintaining status quo

"Doc..I hate needles
The guy with the fistula stays 30min longer
The nurses do not know how to needele
I like the way things are now
I have had no problems with my line’
I am living my life for today
Thanks but no thanks “
Patient perceptions ..or misperceptions as to why they were using a Catheter

<table>
<thead>
<tr>
<th>Reason (N responses)</th>
<th>Patient (n=155)</th>
<th>VAC (n=163)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awaiting permanent access surgery</td>
<td>2.5%</td>
<td>13.5%</td>
</tr>
<tr>
<td>Waiting for access to mature</td>
<td>7.8%</td>
<td>12.2%</td>
</tr>
<tr>
<td>Worsen cardiac condition</td>
<td>2.5%</td>
<td>0%</td>
</tr>
<tr>
<td>Poor vessels or vasculitis</td>
<td>16.8%</td>
<td>3.6%</td>
</tr>
<tr>
<td>Exhausted access (not able - PD)</td>
<td>25.8%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Temporary PD/ Too ill</td>
<td>0%</td>
<td>6.3%/9.0%</td>
</tr>
<tr>
<td>Steal syndrome</td>
<td>2.5%</td>
<td>3.7%</td>
</tr>
<tr>
<td>Needle shy/phobia</td>
<td>30.3%</td>
<td>22.7%</td>
</tr>
<tr>
<td>Cosmetic reasons</td>
<td>18.7%</td>
<td>13.5%</td>
</tr>
<tr>
<td>Other</td>
<td>30.3%</td>
<td>57.7%</td>
</tr>
</tbody>
</table>

**Just likes CVC** 31.0%

**Surgical Fatigue** 21.1%
We need to develop skills in behavioral theory and decision making ....

Telling people what to do makes it more likely they will want to do the opposite.

Importance of early decision making before starting dialysis

Power of patient to patient KT
Influence of Health Care Providers On Optimal VA Case Mix

NURSING TIPS
Late Referral ≈ 30% of dialysis starts
Strong effect on type of incident VA

<table>
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<td>First nephrology review &lt; 3 mo before dialysis start (vs &gt; 3 mo)</td>
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<td>8.20 (5.92-11.36)</td>
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<td>0.44 (0.27-0.71)</td>
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<td>eGFR at AVF/AVG creation (/5-mL/min/1.73 m² increase)</td>
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Work with primary care provider toward early detection
Urgent clinics with fast track for late starts

Marked Variability in choice of VA by Nephrologists

Graft is the second choice access in the USA
CVC is second choice in Canada

No consensus on who should NOT use a fistula

What are the absolute contraindications to AVF creation?

Xi, Moist NDT Feb 2010
Major disconnect between preference and reality

% incident CVC use 2009

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 - 49 Years</td>
<td>88</td>
</tr>
<tr>
<td>50 - 74 Years</td>
<td>76</td>
</tr>
<tr>
<td>75 - 84 Years</td>
<td>86</td>
</tr>
<tr>
<td>85+ Years</td>
<td>84</td>
</tr>
</tbody>
</table>

Canadian Organ Replacement Register, 2011, Canadian Institute for Health Information.
Barriers to AVF creation
Surgeons’ perspective

(a) Barriers to fistula creation

- Inadequate exposure to dialysis access surgery during training
- Inadequate surgical fees for VA surgery
- Lack of resources for venous mapping
- Lack of OR time
- Wait time for vascular access surgical procedure
- Late referral for VA (first seen by a nephrologist within 3 months of starting dialysis)
- Patient refusal for fistula

% Surgeons

Moist Nica under review
Surgical Wait times influence appropriate access

62 days to get access in Canada and sometimes longer

[Bar chart showing mean and median wait times for different regions: Canada, Europe, USA. The chart indicates longer wait times in Europe compared to Canada and USA.]

Per response from vascular access surgeon, 2003-2004; n=# of responses
<table>
<thead>
<tr>
<th>Priority</th>
<th>Case Descriptions</th>
<th>Target Wait</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Immediate -emergency surgery required</strong>&lt;br&gt;Life threatening bleeding from access&lt;br&gt;Anticipated aneurysm rupture&lt;br&gt;Severe limb threatening ischemia from steal syndrome&lt;br&gt;Sepsis related to access with systemic complications&lt;br&gt;Thrombosis of graft/ fistula</td>
<td>Within 24 hrs</td>
</tr>
<tr>
<td>2</td>
<td><strong>Urgent</strong>&lt;br&gt;Rapidly failing access and/or inadequate dialysis due to failing access (radiology intervention not possible or failed )</td>
<td>Within 2 weeks</td>
</tr>
<tr>
<td>3</td>
<td><strong>Semi-Urgent</strong>&lt;br&gt;Maturation failure requiring revision&lt;br&gt;Access creation for patient on hemodialysis or Expected hemodialysis start within 6 months</td>
<td>Within 4 weeks</td>
</tr>
<tr>
<td>4</td>
<td><strong>Elective</strong>&lt;br&gt;Hemodialysis start expected &gt; 6mo&lt;br&gt;Minimal risk of morbidity incurred by waiting</td>
<td>Within 26 weeks</td>
</tr>
</tbody>
</table>
Experience of the surgeon influences achieving optimal access

44 x risk of failure if < 25 AVFs in training

Time to primary fistula (arteriovenous fistula [AVF]) failure in hemodialysis patients for tertiles of the number of AVFs created by the facility’s primary surgeon during surgical training.

Adapted from Saran et al. 2008
Variation in size of vein eligible for AVF creation

Minimum diameter of cephalic vein and of basilic vein that would be acceptable for the creation of an AVF

Moist Nica under review
Does Remuneration Influence type of VA?

% satisfied with Remuneration

Differences in satisfaction of remuneration for AVF / AVG in Canada, USA and Europe

Moist, Nica under review
Cannulation Skills as a Barrier to Optimal VA Use

(b) Barriers to fistula use

Lack of radiology resources to provide assessment and intervention of failing VA
Patient refusal to allow cannulation of a viable fistula
High fistula failure to mature rate
Inconsistent cannulation skills of the nurse

The Perpetual Novice
“limited opportunities to acquire the skill “
pace pressures that may impact on proper technique
Tendency to avoid cannulation
Patient pressure to get on and off quickly .

Orientation needs to be standardized
Expert providing orientation around cannulation
Formal follow-up with each new HD nurse to identify ongoing learning needs.

Wilson B CANNT 2011
Lack of Standardized Process of Care for VA

Vascular Access Decision. Referral, follow-up

Patients who started HD and had been followed > 12 mo in CKD clinic had no care plan for access

VA Coordinator Improves appropriate use of access
Specific attention to VA care plan

[Graph showing comparison between pre- and post-implementation periods for different access methods: Catheter vs. AVF]
Have Guidelines been a barrier to Optimal Vascular Access

CSN: The preferred type of vascular access is a radio-cephalic native vessel arteriovenous fistula. (Grade C)

CARI: A native fistula is superior to an artificial arteriovenous graft. (level B evidence)

KDOQI: Options for fistula placement should be considered first.
AVF promotion and effect on grafts...did we lose a viable 2nd option?

Predicting the future
.... who will get to dialysis
.... When will they need dialysis

![Graph showing risk of death and risk of ESRD](image)

**Figure 2.** Baseline eGFR threshold below which risk for ESRD exceeded risk for death for each age group

Age >65
eGFR <15ml/min
Death > ESRD

Higher eGFR at Time of Referral Influences the type of incident VA

<table>
<thead>
<tr>
<th>Variable</th>
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<td>Variables Associated With Incident Catheter Versus Permanent Access Use</td>
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Higher eGFR at time of referral for VA associated with AVF use
Likely an interaction between late referral and CVCs so...not all catheters are created equal a planned catheter might not be so bad

AJKD, Vol 43, No 6 (June), 2004: pp 999-1007
Achieving Optimal Vascular Access Mix

Team approach

- Understanding Patient choice
- Education that leads to KT
- Care pathways VA coordinator
- Centralized surgical wait list
- management
- Data management for patient tracking and VA outcomes

We need individualized approach to vascular access