Can evidence based medicine improve vascular acces? (and the implications for guideline producing bodies and also for quality assessment programs)

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Renal Division, Ghent University Hospital

www.european-real-best-practice.org
Where are we coming from?
Eloquence based medicine
(theoretical and basic research based)

"Good work ..... but I think we need just a little more detail right here"
Winkel
Diameter (Fläche)
TAMV
Eminence based medicine
(anecdotal medicine)

Don't worry! I've done this hundreds of times!

Experience can just mean making the same mistake with increasing confidence.
Evidence Based Medicine (old school)

This is a whale
Evidence Based Medicine
What is a guideline?

What is Evidence Based Medicine?
Evidence Based Medicine

Decision making on (medical) actions, intentionally based on a TRANSPARANT and SYSTEMATIC analysis of available evidence, and this applied to a REAL LIFE clinical context
Evidence Based Medicine

Decision making on (medical) actions, intentionally based on a transparent and systematic analysis of available evidence, and this applied to a real-life clinical context.

With the goal to decrease the DISCREPANCY between medical actions And Medical knowledge
Evidence Based Medicine is a way of thinking about your everyday caring for patients.
Evidence Based Medicine is a way of thinking about your everyday caring for patients.
Evidence Based Medicine

1. Individual level
   a) Individual patient individual physician
   b) Individual physician and his patients with a specific problem (systematic review)
Evidence Based Medicine

1. Individual level
   a) Individual patient
   b) Individual physician and his patients with a specific problem (systematic review)

2. Organisational (Hospital) level
   a) Group of physicians and their patients with a specific problem (Protocolized medicine, standing orders, pathways of care)
   b) Different groups of physicians and a patient
      • with one problem on the borderline of different specialties
      • With different comorbidities
Evidence Based Medicine

1. Individual level
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      • with one problem on the borderline of different specialties
      • With different comorbidities

3. Society level
   • Sustainability
   • Fairness/Equity
   (guidance/guidelines)
Probability

ambiguity

complexity

CONTEXT
Asking the right (clinical) question rigorously

1. Question: PICOM

- **P**: Patient
  - Population

- **I**: Intervention

- **C**: Comparator

- **O**: Outcomes

- **M**: Methodology: question type, best feasible study design
Asking the right (clinical) question rigorously

1. Question : PICOM

- **P**
- **I**
- **C**
- **O**
- **M**

**EXTERNAL VALIDITY**

**GENERALISABILITY**

Table 3  Percentage of individuals who potentially meet eligibility criteria for included asthma randomised controlled trials

<table>
<thead>
<tr>
<th>RCT reference</th>
<th>Current asthma (%)</th>
<th>Current asthma on treatment (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>14</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>15</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>16</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>17</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>26</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>27</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>28</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>29</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

RCT, randomised controlled trial.
External validity

RALES-study

Graph showing the probability of survival over months for Spironolactone and Placebo treatments.
Rate of in-hospital death due to hyperkalemia in patients receiving ACEI

External validity is problematic in vascular access: Very different patient categories
Asking the right (clinical) question

1. Question: PICOM

P
- Patient
- Population

I
- Intervention

C
- Comparator

O
- Outcomes

M
- Methodology: question type, best feasible study design
Many of the interventions in vascular access difficult to standardise because of differences in surgical skills
Does the Surgeon’s Experience Impact on Radiocephalic Fistula Patency Rates?

**TABLE 1. Demographics, patency figures, and complications in the two groups**

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Consultant surgeon</th>
<th>Junior surgeon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age (range)</td>
<td>47 (22-82)</td>
<td>51 (34-73)</td>
</tr>
<tr>
<td>Gender: M/F</td>
<td>92/61</td>
<td>24/18</td>
</tr>
<tr>
<td>Number with diabetes (%)</td>
<td>43 (28.1)</td>
<td>13 (30.1)</td>
</tr>
<tr>
<td>Cardiovascular disease (%)</td>
<td>101 (66.0)</td>
<td>24 (57.1)</td>
</tr>
<tr>
<td>Hypertension (%)</td>
<td>85 (55.5)</td>
<td>20 (47.5)</td>
</tr>
<tr>
<td>Ischemic heart disease (%)</td>
<td>16 (10.5)</td>
<td>3 (7)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fistula patency</th>
<th>Consultant surgeon</th>
<th>Junior surgeon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary success rate (5%)</td>
<td>94.2*</td>
<td>81.0*</td>
</tr>
<tr>
<td>Primary patency (22 months—%)</td>
<td>80</td>
<td>74</td>
</tr>
<tr>
<td>Secondary patency (22 months—%)</td>
<td>93**</td>
<td>81**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Complications</th>
<th>Consultant surgeon</th>
<th>Junior surgeon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (%)</td>
<td>31 (20.3)</td>
<td>11 (26.2)</td>
</tr>
<tr>
<td>Postoperative failure</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Clotted</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>Stenosis</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Aneurysm</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Rescued fistula (surgical)</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>Failed rescue (clotted)</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

*p < 0.01, **p < 0.025.
Prevention of uncuffed hemodialysis catheter-related bacteremia using an antibiotic lock technique: A prospective, randomized clinical trial

fistula or graft were enrolled in this study. Patients with a UC were randomly assigned to receive either an antibiotic-heparin lock solution (antibiotic group: cefazolin 10 mg/ml, gentamicin 5 mg/ml, heparin 1000 U/ml) or a heparin lock solution (no-antibiotic group: heparin 1000 U/ml) as a catheter lock solution during the interdialytic period. The end point of the trial was CRB. CRB developed in seven (11.7%) patients in
Asking the right (clinical) question

1. Question: PICOM

- **P**: Patient, Population
- **I**: Intervention
- **C**: Comparator
- **O**: Outcomes
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Outcome selection

What we observe can be divided into:

- Signal
- Noise

what we see
Why it is of importance?

“Our study concludes that installing speeding cameras is good...”
Why it is of importance?

“Our study concludes that installing speeding cameras is good...”

Philosophical problem: what is “good”?  
- speeding tickets are good..
Why it is of importance?

“Our study concludes that installing speeding cameras is good...”

Philosophical problem: what is “good”?  
• speeding tickets are good..  
  • to reduce speed
Why it is of importance?

“Our study concludes that installing speeding cameras is good…”

**Philosophical problem:** what is “good”?
- speeding tickets are good..
  - to reduce speed
  - to reduce accidents
Why it is of importance?

“Our study concludes that installing speeding cameras is good...”

**Philosophical problem:** what is “good”?  
- speeding tickets are good.  
  - to reduce speed  
  - to reduce accidents  
  - to reduce accidents with human damage  
  - to enhance income from penalties....
Why it is of importance?

“Our study concludes that installing speeding cameras is good...”

Philosophical problem: what is “good”?  

estimation problem: how much better as compared to not installing cameras or doing something else? 

Appreciation problem: do we really value this “improvement”?
Outcomes

• Types of outcomes:
  – Hard endpoints
  – Surrogate endpoints (valid and invalid)
  – Composite endpoints
Outcomes in vascular access

• “a” fistula?
• A maturing fistula?
• A reliably working fistula?
• The least hassle possible
  – For the patient
  – For the nurses
Patients’ Perspectives on Hemodialysis Vascular Access: A Systematic Review of Qualitative Studies

Disrupted identity

Disfigurement
- Preserving normal appearance
- Avoiding stigma
- Visual reminder of disease

Heightened vulnerability
- Dependence on a lifeline
- Bodily intrusion
- Fear of cannulation
- Wary of unfamiliar providers
- Threat of complications and failure
- Unpreparedness

Mechanization of the body
- Bonded to a machine
- Internal abnormality
- Constant maintenance

Confronting decisions and consequences
- Imminence of dialysis
- Existential thoughts

Impinging on way of life
- Physical incapacitation
- Wasting time
- Added expense
- Instigating family tension

Self-preservation and ownership
- Task-focused control
- Advocating for protection
- Acceptance

Social consequences and coping

J. Casey et al.: AJKD 64(2014) 937-953
Outcomes in vascular access

- Definitions of fistula patency (Side
  - Primary patency
  - Assisted primary patency
  - Secondary patency
  - Postintervention primary patency
  - Postintervention assisted patency
Fistula first initiative

Schinstock et al, cJASN 2011
Table 1. Population-focused versus patient-centered approach to vascular access

<table>
<thead>
<tr>
<th>Approach</th>
<th>Population Focused</th>
<th>Patient Centered</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVF</td>
<td>Presumed appropriate for 66%</td>
<td>Deemed appropriate based on suitability: clinical, prognostic, or vascular anatomy</td>
</tr>
<tr>
<td>AVG</td>
<td>Acceptable if AVF not possible</td>
<td>May be best choice in older patients with limited life expectancy and/or need of imminent dialysis or patients with anatomy not amenable to AVF</td>
</tr>
<tr>
<td>CVC</td>
<td>Acceptable for no more than 10%</td>
<td>Acceptable only for patients with vascular access failure or poor prognosis for long-term survival</td>
</tr>
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</table>

AVF, arteriovenous fistula; AVG, arteriovenous graft; CVC, tunneled cuffed central venous catheter.
Implications of correct outcome selection for quality control

Indicator
Percentage of patients with CKD 5 on dialysis who have functioning AV access.

Question
Does this process indicator meet the four Chassin criteria?
1. strong evidence-based link to relevant outcomes
2. can be measured reliably
3. proximate to the desired outcome
4. minimal or no unintended consequences.

Adapted From Fishbane, 2012 Kidney Int
Calculating an indicator (an example)

Numerator

Denominator

How many times is preferred care provided

Total number of patients
## Calculating an indicator (an example)

### Vascular access data of centre X

<table>
<thead>
<tr>
<th></th>
<th>All ages</th>
<th>Age &lt;80</th>
</tr>
</thead>
<tbody>
<tr>
<td>All incident HD patients</td>
<td>536</td>
<td>429</td>
</tr>
<tr>
<td>Screened for fistula suitability at least once before start HD</td>
<td>418</td>
<td>364</td>
</tr>
<tr>
<td>Functioning AV fistula at start HD</td>
<td>171</td>
<td>156</td>
</tr>
<tr>
<td>Functioning AV fistula at day 91 of HD</td>
<td>240</td>
<td>227</td>
</tr>
</tbody>
</table>

### Indicator A

**Numerator**: All patients with AVF at start HD

| 171 |

**Denominator**: All incident HD patients

| 536 |

\[
\text{Numerator} = 171 \\
\text{Denominator} = 536 \\
\text{Indicator A} = \frac{171}{536} = 32\%
\]
Calculating an indicator (an example)

### Vascular access data of centre X

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<td>240</td>
<td>227</td>
</tr>
</tbody>
</table>

### Indicator B

**Numerator**

All patients with AVF at day 91 of HD

\[
\frac{240}{536}\ = \ 45\%
\]

**Denominator**

All incident HD patients
Calculating an indicator (an example)

<table>
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<td>240</td>
<td>227</td>
</tr>
</tbody>
</table>

**Indicator C**

*Numerator*  
All patients with AVF at day 91 of HD  
227

*Denominator*  
All incident HD patients <80 years  
429  
= 53%
Calculating an indicator (an example)

<table>
<thead>
<tr>
<th>Vascular access data of centre X</th>
<th>All ages</th>
<th>Age &lt;80</th>
</tr>
</thead>
<tbody>
<tr>
<td>All incident HD patients</td>
<td>536</td>
<td>429</td>
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<tr>
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<td>171</td>
<td>156</td>
</tr>
<tr>
<td>Functioning AV fistula at day 91 of HD</td>
<td>240</td>
<td>227</td>
</tr>
</tbody>
</table>

**Indicator D**

**Numerator**

Screened for AVF suitability before start HD

\[
\frac{418}{536} = 78\%
\]
ARGUMENTS AGAINST:
Asking the right (clinical) question rigorously

### 1. Question : PICOM

- **P** - Patient
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- **M** - Methodology: question type, best feasible study design
Methodology

• RCT vs Observational trial
**Study ID**  
- Ekbal 2008  
- Garcia-Cortes 2005  
- Thomson 2007  
- Krzanowski 2011  
- Ocak 2011  
- Astor 2005  
- Lorenzo 2004  
- Dhingra 2001  
- Ocak 2011  
- Dhingra 2001  
- Foley 2009  
- Pastan 2002  
- Polkinghorne 2004  
- Wasse 2008  
- Mois 2008  
- Pisoni 2009  
- Xue 2003  
- Lacson 2009 A  
- Lacson 2009 B  

**Cohort Characteristics**  
- Prevalent & Incident Patients  
- Incident Patients  
- Patients with Perm. Catheters  
- Prevalent & Incident Patients  
- Incident Patients (<65)  
- Incident Patients  
- Incident Patients  
- Prevalent Diabetics  
- Incident Patients  
- Prevalent Patients  
- Prevalent & Incident Patients  
- Incident Patients  
- Prevalent & Incident Patients  
- Incident Patients  
- Prevalent & Incident Patients  
- Prevalent & Incident Patients  

**No. of Patients**  
- 146  
- 32  
- 237  
- 209  
- 496  
- 495  
- 538  
- 1517  
- 613  
- 638  
- 220157  
- 2470  
- 3381  
- 4196  
- 14809  
- 12854  
- 44244  
- 46268  
- 57768

**Risk Ratio**  
- 2.66 [0.79; 8.96]  
- 1.59 [0.64; 3.96]  
- 2.75 [1.25; 6.05]  
- 1.97 [0.91; 4.26]  
- 1.54 [0.87; 2.73]  
- 1.47 [1.01; 2.14]  
- 1.75 [1.25; 2.45]  
- 1.70 [1.24; 2.33]  
- 1.54 [1.13; 2.10]  
- 1.54 [1.17; 2.03]  
- 1.78 [1.38; 2.30]  
- 1.40 [1.10; 1.78]  
- 2.59 [2.04; 3.29]  
- 1.05 [0.88; 1.25]  
- 1.60 [1.45; 1.77]  
- 1.32 [1.22; 1.43]  
- 1.70 [1.59; 1.81]  
- 1.39 [1.31; 1.47]  
- 1.30 [1.25; 1.35]  

**Pooled RR**  
- 1.53 [1.41; 1.67]  

*Heterogeneity: I-squared=83.1%, Q=106.6, df=18, p<0.0001*
# Vascular access in elderly patients

Table 4. Vascular access used at the first dialysis session by extent of predialysis nephrology care among patients with previous vascular access surgery by type of vascular access at initiation of dialysis

<table>
<thead>
<tr>
<th>Type of Predialysis Vascular Access Creation</th>
<th>Predialysis Nephrology Care (n)</th>
<th>AVF</th>
<th>AVG</th>
<th>CVC All</th>
<th>CVC AVF-M</th>
<th>CVC AVG-M</th>
<th>CVC Only</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVG</td>
<td>277</td>
<td>15.9</td>
<td>54.5</td>
<td>28.5</td>
<td>6.1</td>
<td>10.1</td>
<td>12.3</td>
<td>1.1</td>
</tr>
<tr>
<td>Nephrology evaluation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None or late (40)</td>
<td></td>
<td>5.0</td>
<td>52.5</td>
<td>37.5</td>
<td>7.5</td>
<td>17.5</td>
<td>12.5</td>
<td>5.0</td>
</tr>
<tr>
<td>Intermediate (62)</td>
<td></td>
<td>21.0</td>
<td>48.4</td>
<td>30.7</td>
<td>9.7</td>
<td>4.8</td>
<td>16.1</td>
<td>0</td>
</tr>
<tr>
<td>Early (175)</td>
<td></td>
<td>16.6</td>
<td>57.1</td>
<td>25.7</td>
<td>4.6</td>
<td>10.3</td>
<td>10.9</td>
<td>0.6</td>
</tr>
<tr>
<td>AVF</td>
<td>1381</td>
<td>47.7</td>
<td>3.9</td>
<td>46.0</td>
<td>33.2</td>
<td>1.0</td>
<td>11.8</td>
<td>2.3</td>
</tr>
<tr>
<td>Nephrology evaluation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None or late (179)</td>
<td></td>
<td>30.7</td>
<td>1.1</td>
<td>65.4</td>
<td>47.5</td>
<td>1.7</td>
<td>16.2</td>
<td>2.8</td>
</tr>
<tr>
<td>Intermediate (213)</td>
<td></td>
<td>44.6</td>
<td>3.3</td>
<td>51.7</td>
<td>37.6</td>
<td>1.4</td>
<td>12.7</td>
<td>0.5</td>
</tr>
<tr>
<td>Early (989)</td>
<td></td>
<td>51.5</td>
<td>4.6</td>
<td>41.4</td>
<td>29.7</td>
<td>0.8</td>
<td>10.8</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Data are given as percentages unless otherwise specified. We excluded patients who initiated dialysis in 2004 and 2005, because information on vascular access use among dialysis patients was not collected before 2005. Time between the first evaluation by a nephrologist and the start of dialysis were categorized as none or late evaluation (0–≤4 months), intermediate evaluation (4–≤12 months), and early evaluation (12–24 months). CVC, central vein catheter; AVF-M, dialysis with central vein catheter with maturing arteriovenous fistula; AVG-M, dialysis with central vein catheter with healing arteriovenous graft.

www.european-real-best-practice.org

Lee et al, JASN 2015
2. Systematic Search

- Goal: to retrieve the relevant studies
  - Without bias ↔ those you know/believe
  - Efficient: balance between
    - Sensitivity: avoids missing relevant studies
    - Specificity: avoids too many irrelevant studies: noise
    - Time-efficient

- World-wide accepted methodology:
  - Electronic database-search: Cochrane Library, Medline using PICOM
Fist meeting co-chairs Istanbul 5/2013
Barriers to adopting a fistula-first policy in Europe: an international survey among national experts

74 experts (response rate, 76%) from 28 countries

Problems identified:
- Lack of dedicated training of clinicians
- Suboptimal access to surgical resources
- Limited routine use of preoperative diagnostic imaging

van der Veer et al: JVA 2015(16) 113-119
ERBP Mission

improve the outcome of patients with kidney disease in a sustainable way, through enhancing the accessibility of knowledge on patient care, in a format that stimulates its use in clinical practice.
Native fistula creation

No attempts for cannulation should be done during the first 2 weeks

- After >4 week interval
- OR
- Between 2-4 weeks AND indication for urgent dialysis start

Palpable thrill?

- yes
  - Attempt cannulation
  - Successful?
    - yes: Continue cannulation
    - no: Ultrasound

- no
  - Ultrasound

- Venous diameter > 4-5mm?
- Blood flow > 800 ml/min?
- End diastolic arterial flow > 110 cm/sec

- yes
  - Attempt cannulation
  - Successful?
    - yes: Continue cannulation
    - no: Do diagnostic and interventional work up as described in flowchart IIIQ3, 5 and 6

- no
European renal best practice on Vascular Access

4 Subgroups
1. Catheter related topics
2. Pre-operative related topics
3. Peri-and postoperative topics
4. Surveillance/maintenance/follow up related topics