Catheters and fistulas for chronic HD

Rukshana Shroff

Great Ormond Street Hospital for Children
and Institute of Child Health
London, UK

Great Ormond Street Hospital

UCL

Outline

– central venous lines (CVLs) vs arteriovenous fistulae (AVFs) vs arteriovenous grafts (AVGs) Pros and cons

Principle:

Vascular access preservation

Guidelines for pediatric vascular access

Nephrol Dial Transplant (2019) 1–20
doi: 10.1093/ndt/gfz011

ndt
Nephrology Dialysis Transplantation

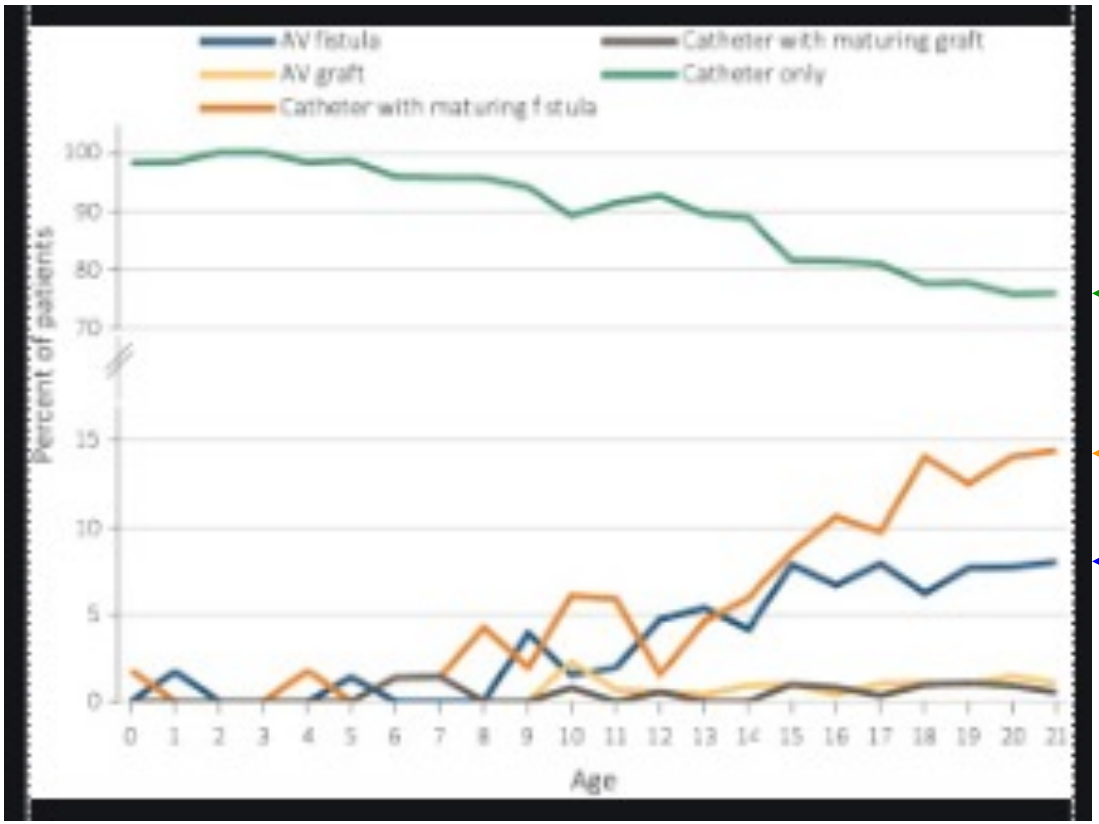
Vascular access in children requiring maintenance haemodialysis: a consensus document by the European Society for Paediatric Nephrology Dialysis Working Group

Rukshana Shroff[1], Francis Calder[1], Sevcan Bakkaloğlu[2], Evi V. Nagler[3], Sam Stuart[1], Lynsey Stronach[1], Claus P. Schmitt[4], Karl H. Heckert[4], Pierre Bourquelot[5], Ann-Marie Wagner[1], Fabio Paglialonga[6], Sandip Mitra[7] and Constantinos J. Stefanidis[8] on behalf of the European Society for Paediatric Nephrology Dialysis Working Group

european society for paediatric nephrology

International Pediatric Fistula First initiative – a call to action

AJKD 2008



CVLs

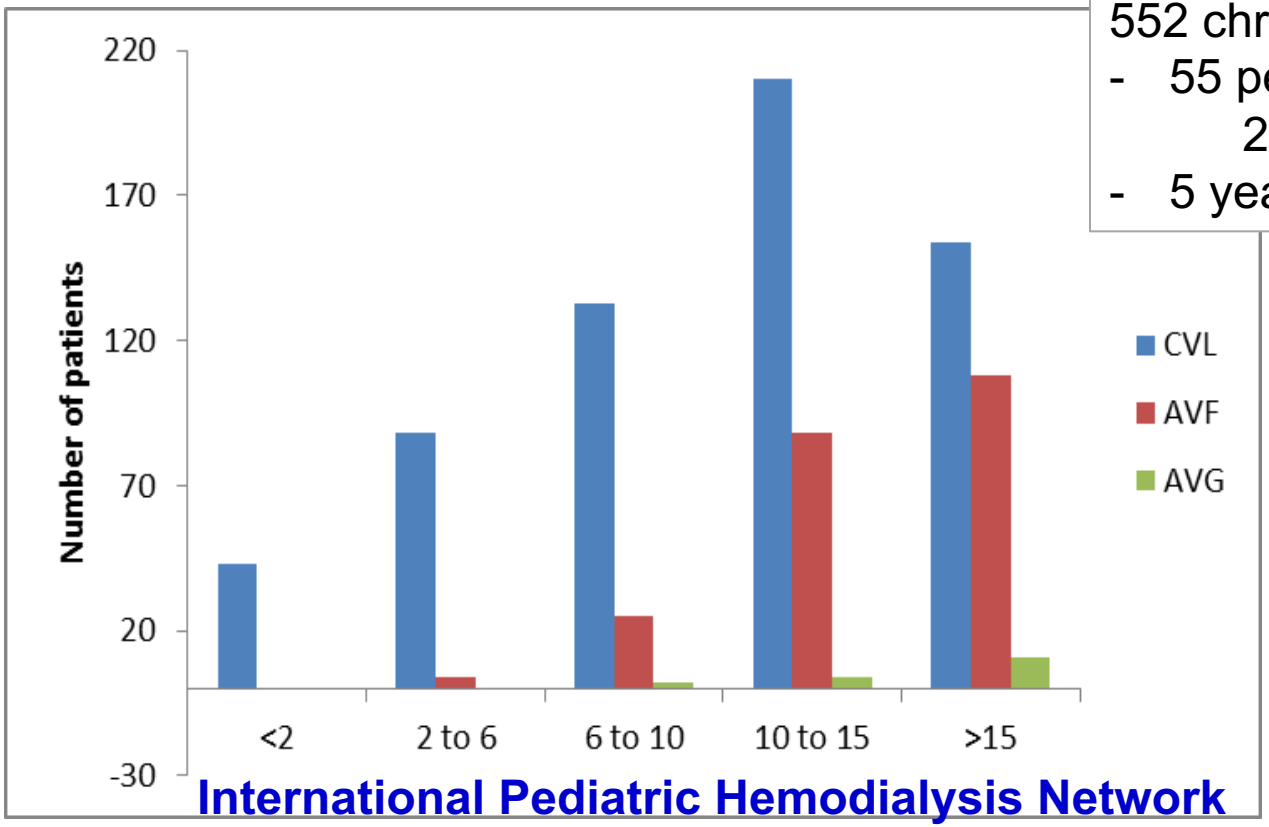
AVGs

AVFs

NAPRTCS

HD access types in the EU

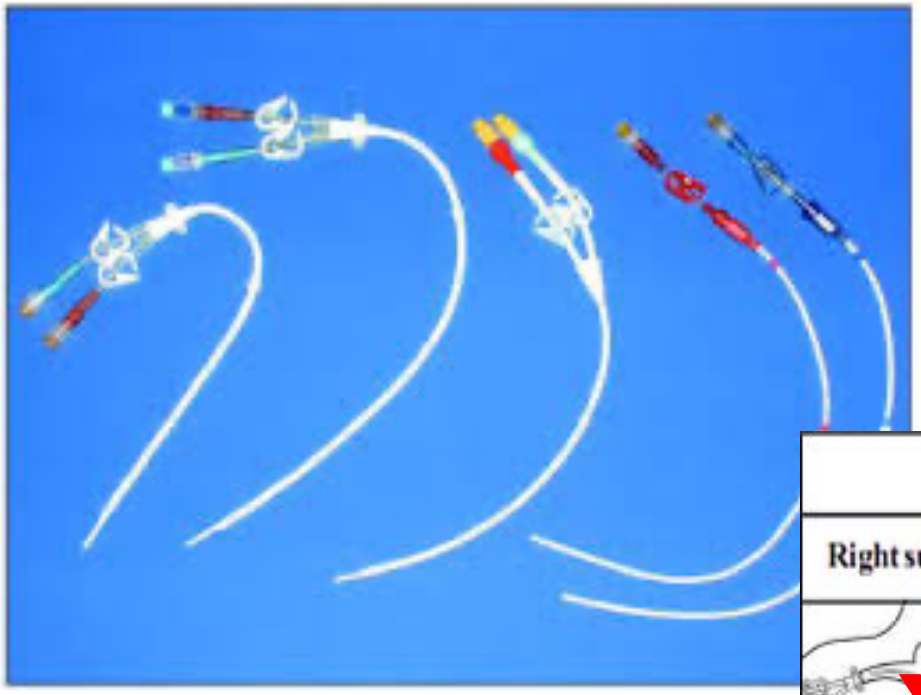
552 chronic HD/HDF patients
- 55 pediatric dialysis units in 27 countries
- 5 year data

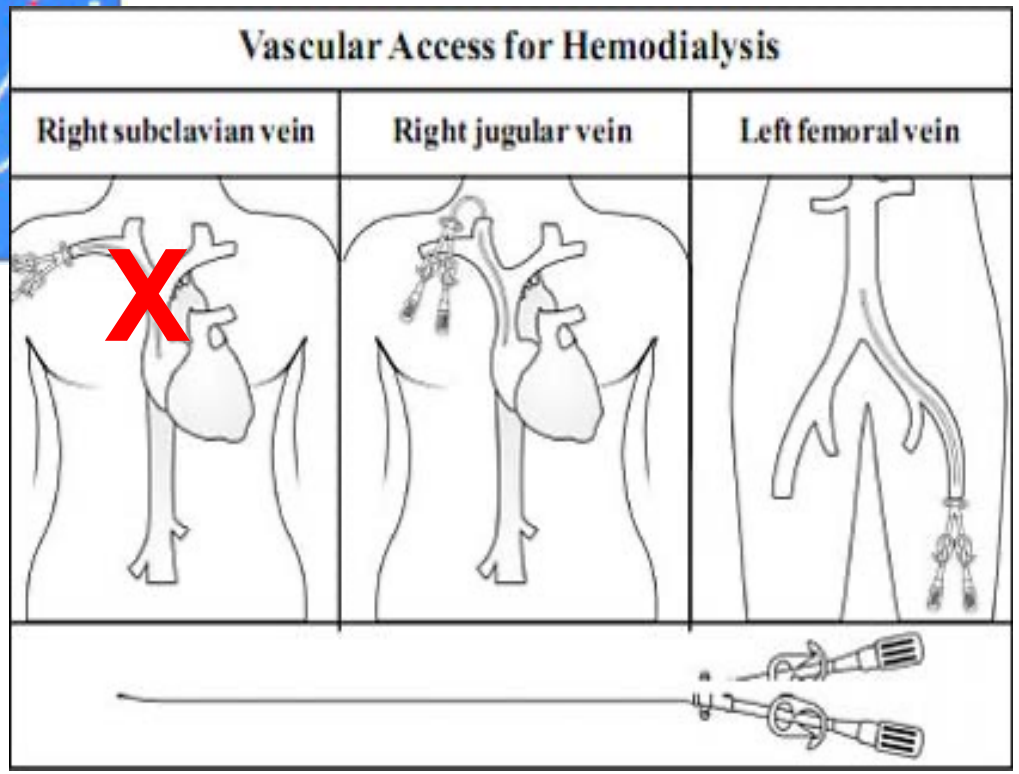


In Europe
~ 60% CVCs
~ 38% AVFs
< 2% AVGs

Borzych-Duzalka et al; AJKD 2019

Central venous lines (CVLs)





Avoid subclavian line placement – high risk of subclavian stenosis

CVLs – the risks

Increased risk with CVL of:

- Infection
- Poor dialysis adequacy
- Hospitalisations
- Thrombosis
- Death

Type of vascular access and survival among incident hemodialysis patients: the Choices for Healthy Outcomes in Caring for ESRD (CHOICE) Study.
J Am Soc Nephrol 2005; 16:1449-1455

Clinical Course Associated with Vascular Access Type in a National Cohort of Adolescents Who Receive Hemodialysis: Findings from the Clinical Performance Measures and US Renal Data System Projects

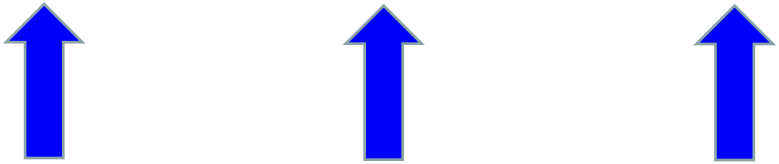
Clin J Am Soc Nephrol 1: 987–992, 2006.

Jeffrey J. Fadrowski,* Wenke Hwang,† Diane L. Frankenfield,‡ Barbara A. Fivush,* Alicia M. Neu,* and Susan L. Furth*§

Characteristic	Total Population (n = 418)	Stratified Population	
		Catheter (n = 175)	Permanent Access (n = 243)
Mean age (yr [SD])	15.6 (1.6)	15.4 (1.6)	15.7 (1.5)

Table 3. RR (catheter *versus* permanent access) of dialysis outcomes in adolescent patients who received hemodialysis[a]

Parameter	Hospitalization, All-Cause		Hospitalization, Infection-Related		Access Complication	
	RR[b]	95% CI	RR	95% CI	RR	95% CI
Vascular catheter *versus* permanent access	1.84[d]	1.38 to 2.44	4.74[d]	2.02 to 11.14	2.72[d]	2.00 to 3.69

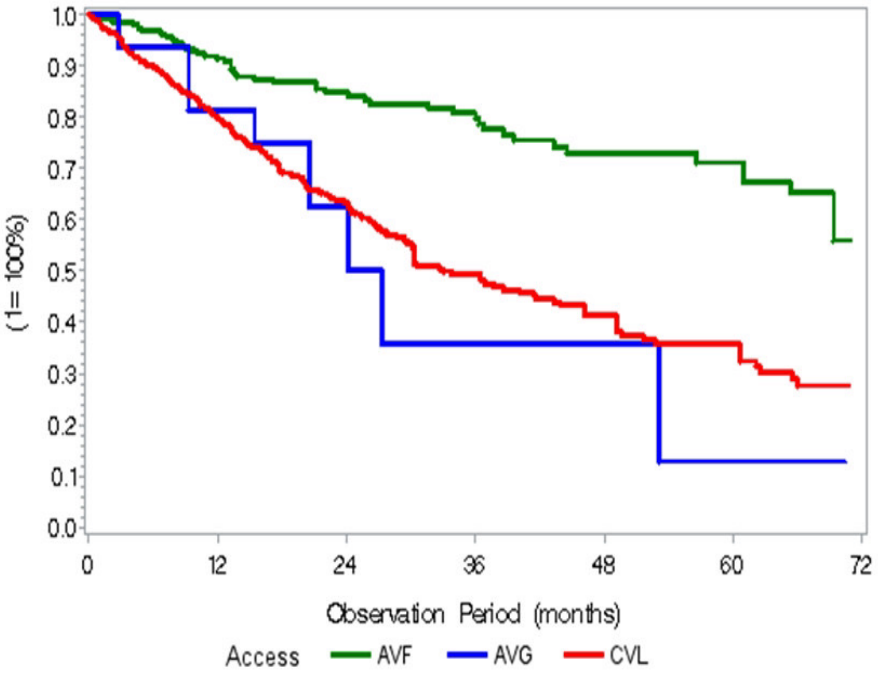


Access patency rates

International Pediatric Hemodialysis Network (n = 870)

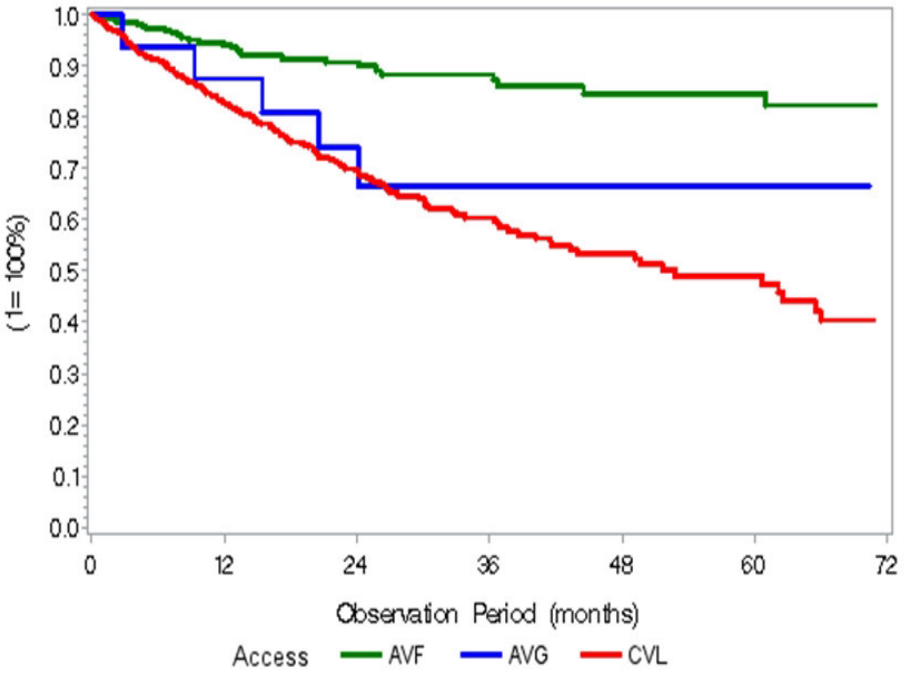
Primary patency

P<0.001 AVF vs. others



Event free survival probability until first intervention or surgical revision

Secondary patency

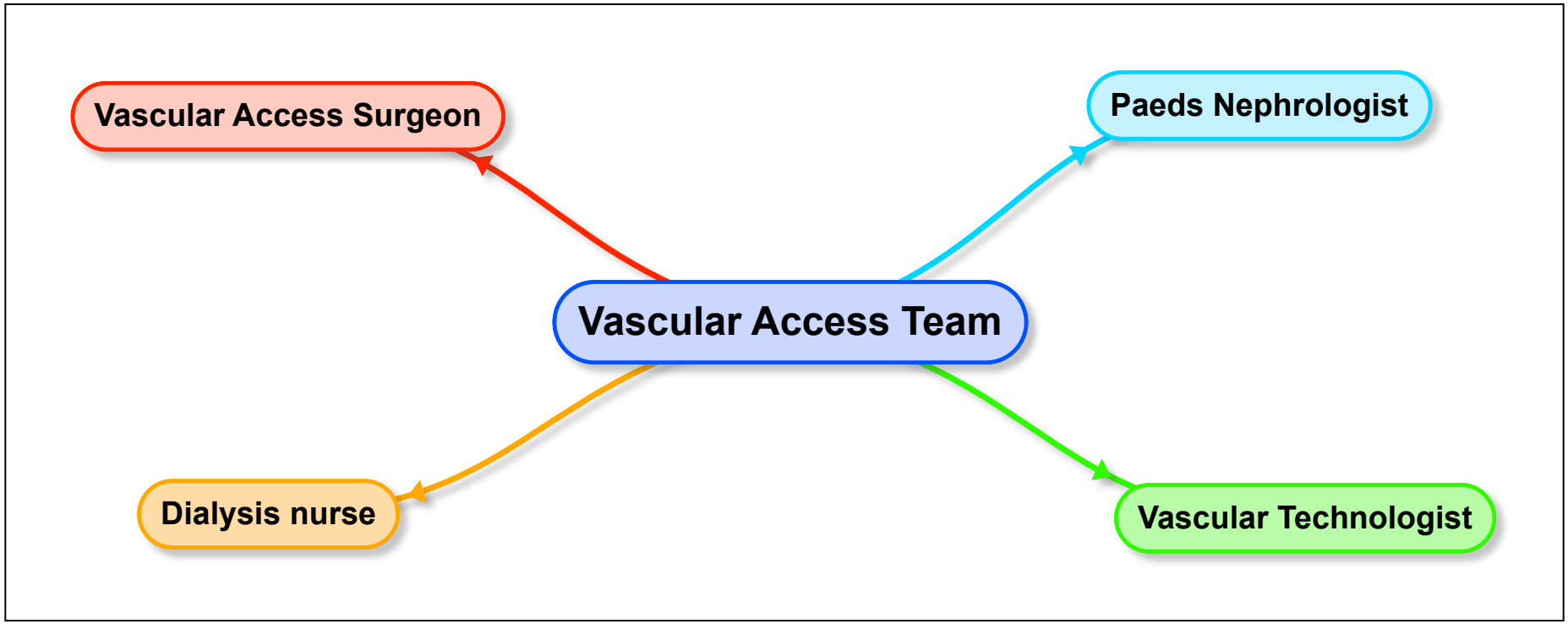


Event free survival probability until access exchange (to CVL, AVF or AVG)

Borzych-Duazalka D et al, Am J Kidney Dis 2019

Central Veins

‘One – Stop’ Vascular Access Clinic



Vascular Access Strategy

- See the patient early
- Vein preservation
- Non-dominant before dominant
- Distal before proximal
- Native before Graft
- Avoid CVLs

See the patient early

- eGFR < 30ml/min
  - No age / weight limit

Aim:

- Discuss dialysis types and access options
- Vein preservation
- Psychological preparation

Venous Assessment - clinical

- **Peripheral veins**
  - Size
  - Dilation
  - Continuity
  - Length
  - Straightness
  - Depth

Assess with / without tourniquet

- **Central veins**

Venous Assessment - ultrasound

Ultrasonic Angiology Department

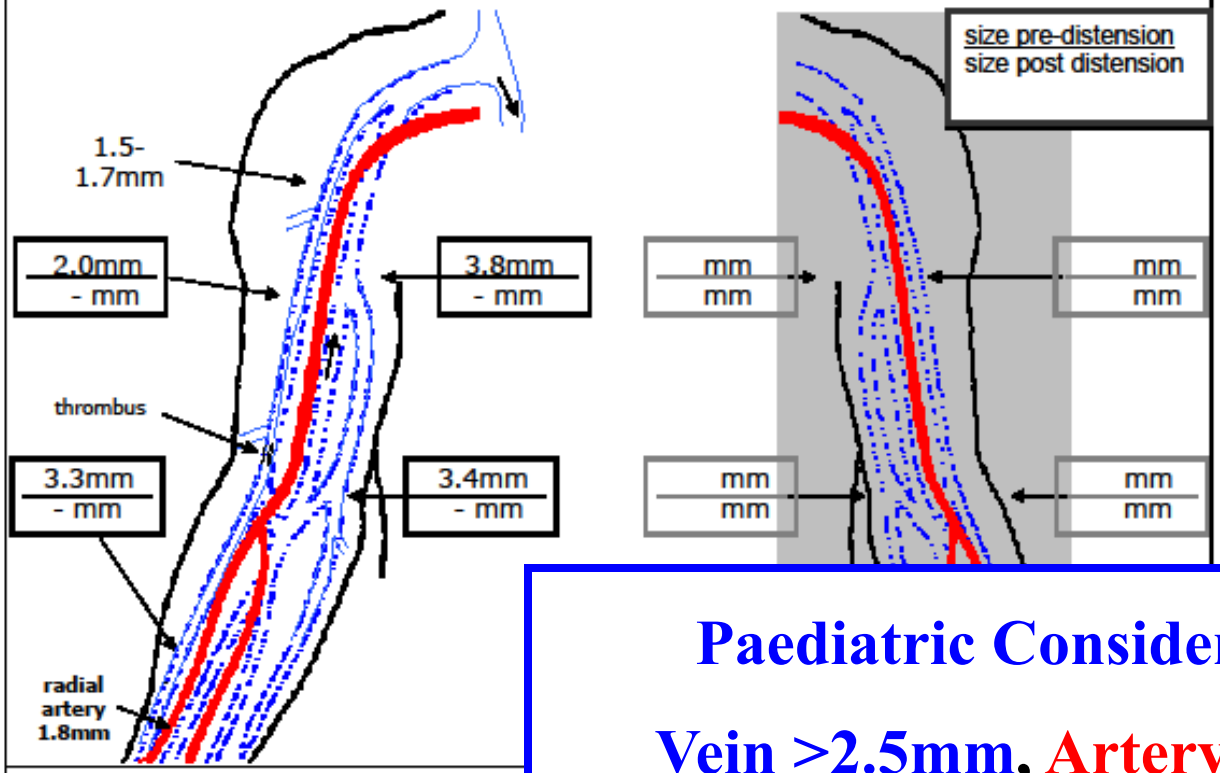
Patient Name:
Hospital Number: DOB:
Address:

Hospital: GOSH
Consultant:

Ultrasonic Angiology Department
2nd Floor, Borough Wing,
Guy's Hospital, London SE1 9RT
Tel/Fax: 0207 188 6778/6771
Head of Dept: Dr. TS Padayachee

V5

RENAL ONE STOP CLINIC Scan Date: 02.06.2015



Conclusion:

RIGHT ARM

Paediatric Considerations

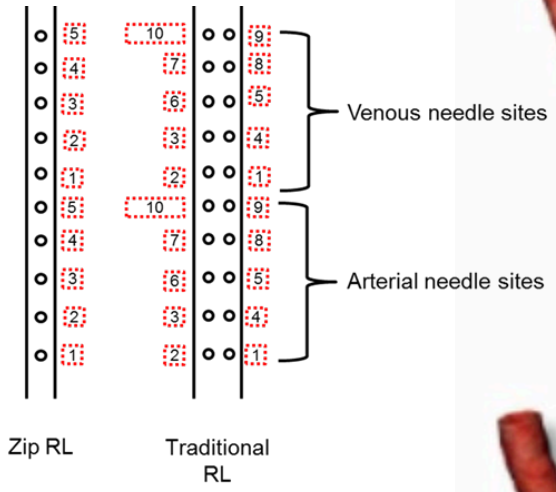
Vein >2.5mm, Artery >1.5mm

Looking after your AVF - Cannulation Technique

- Preservation of function
- Patient/Parental Confidence
- Prevention:
  - Aneurysm
  - Infiltration - “Blow”
  - Stenosis
  - Haemorrhage
  - Thrombosis
  - Reduced Infection

Ladder Technique

- Technique:
  - Over at least 8cm segment
  - Each site 0.5-1cm above previous
  - Sharp needles
  - Zip / Central
  - Traditional / Side to side
  - Move up the vein
  - Once reach the top, move to the bottom again
- Benefits:
  - Decreased risk of aneurysm formation
  - Less risk of stenosis
  - Lower infection risk
- Disadvantage
  - Harder needle insertion
  - Increased risk of infiltration
  - Requires patient and staff confidence
  - Still requires planning

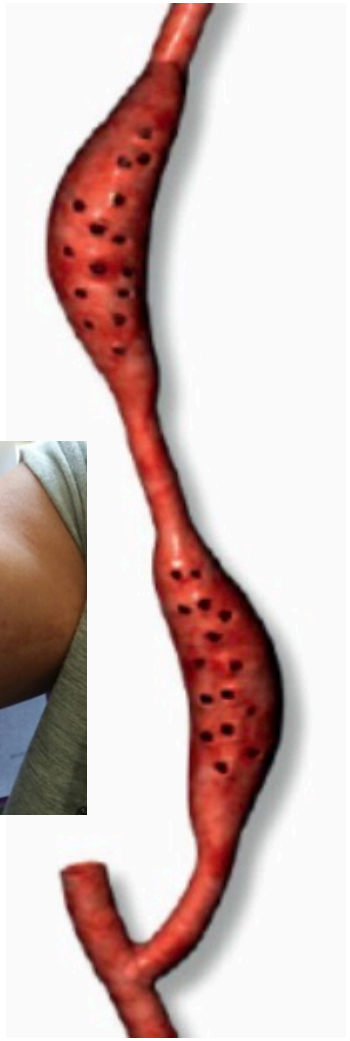


Buttonhole

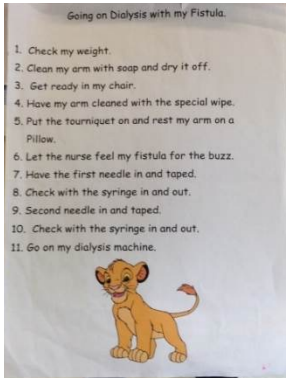
- Technique:
  - Same hole in the skin, same place in the vein
  - Picking scabs
  - Start with sharp needles
  - Same person needling to establish a track
  - Blunt needles once track has been established
  - 3 – 4 buttonholes
- Benefits:
  - Less pain with needle insertion
  - Reduced bleeding time post needle removal
  - Less missed cannulations
  - Reduced infiltrations
  - Decreased risk of aneurysm formation
  - Promotes self cannulation
- Disadvantage
  - Scab picking!
  - Increased infection risk
  - Easy to mistake for area puncture

Area Puncture

- Technique:
  - Single cannulation site in one small area
  - Both cannulation sites on the same segment but do not meet
  - Sharp needles
- Benefits:
  - Patient choice – needle phobia
  - Small AVF – space
  - Reduced infiltrations
- Disadvantage
  - Aneurysms
  - Bleeding
  - Stenosis
  - Increased risk of life-threatening haemorrhage
  - Body image

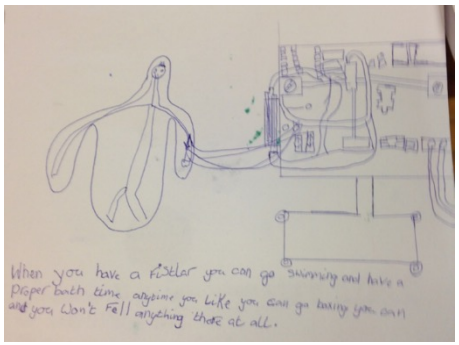


Psychological Preparation



- Play therapy
- Coping techniques
- Time
- Adhering to coping strategies/routine
- Experience – cannulation technique
- Trust

th



First cannulation

Pediatr Nephrol
DOI 10.1007/s00467-016-3382-9

ORIGINAL ARTICLE

Timing of first arteriovenous fistula cannulation in children on hemodialysis

Veronika Almási-Sperling[1] · Matthias Galiano[2] · Werner Lang[1] · Ulrich Rother[1] ·
Published online: 25 April 2016 nne Regus[1]

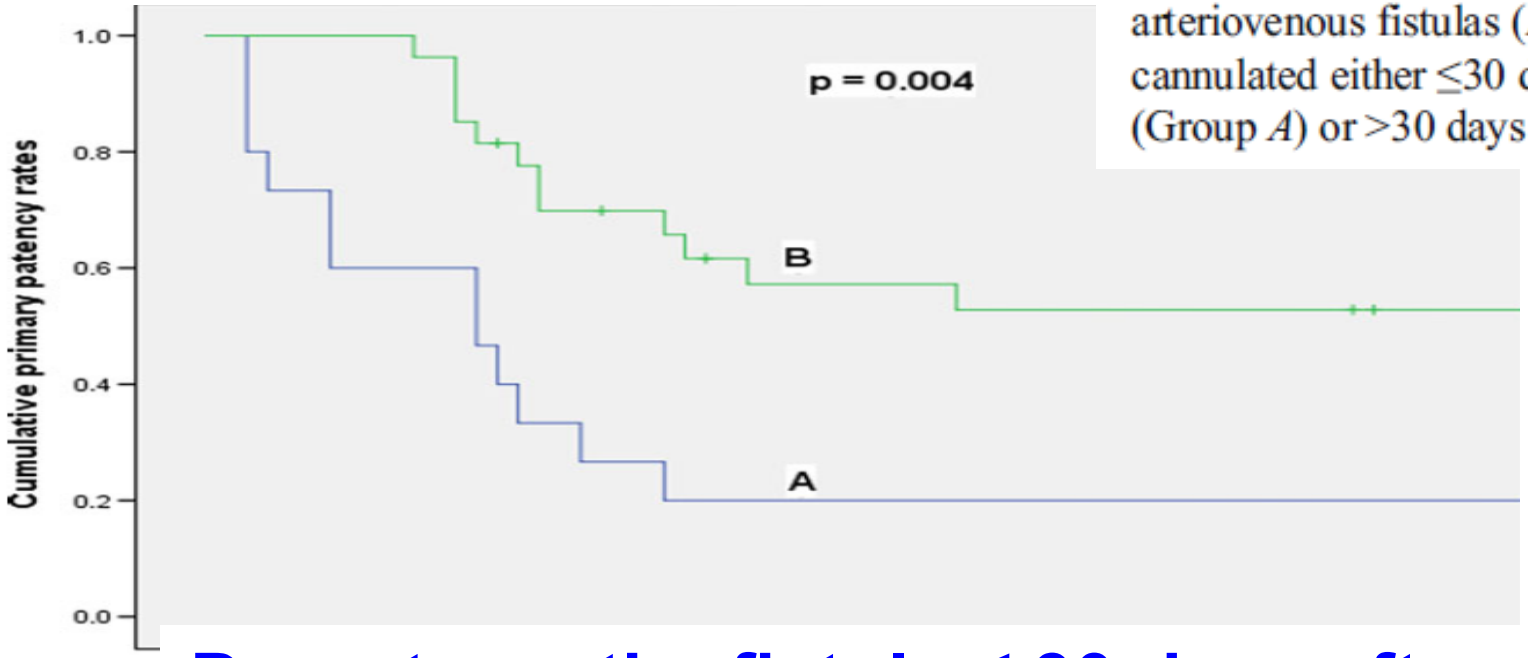


Fig. 2 Comparison of primary patency (PP) rates for arteriovenous fistulas (AVFs) cannulated either ≤30 days (Group *A*) or >30 days (Group *B*)

Do not use the fistula ≤ 30 days after it's creation; wait until 45 days

Looking after your AVF - Surveillance

- **Adequacy of dialysis**
- **Blood flow rate**
- **Clinical problems**
- **Diagnostic imaging / Dialysis parameters**
- **Examination**

Suggest 3-6 monthly surveillance

- ESPN guidelines; 2019
- ERBP guidelines; 2019

Surveillance – risk parameters

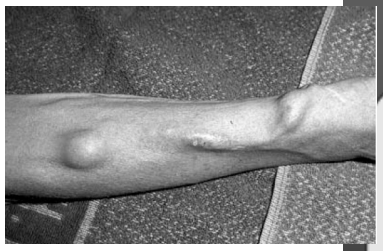
- 25% decrease in baseline volume flow

- Reduced blood flow:

<400ml/min AVF

<600ml/min AVG

Causes of AVF loss



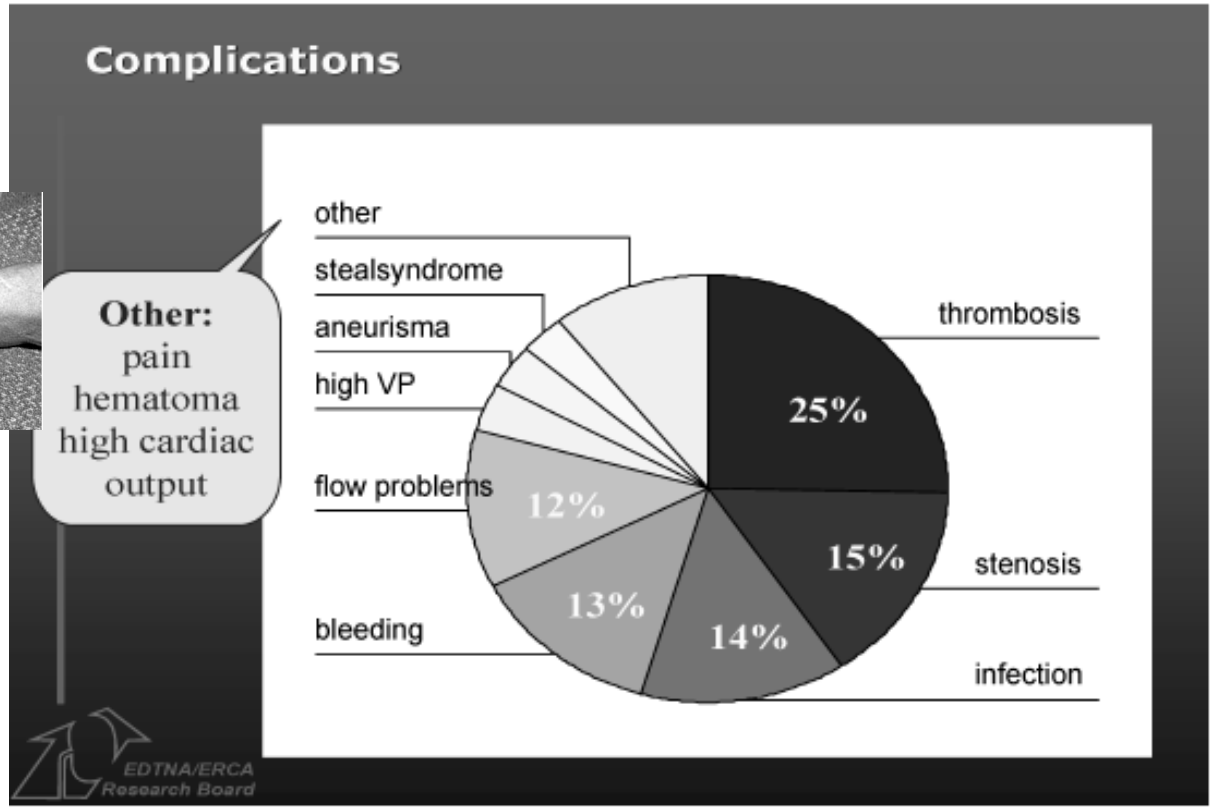
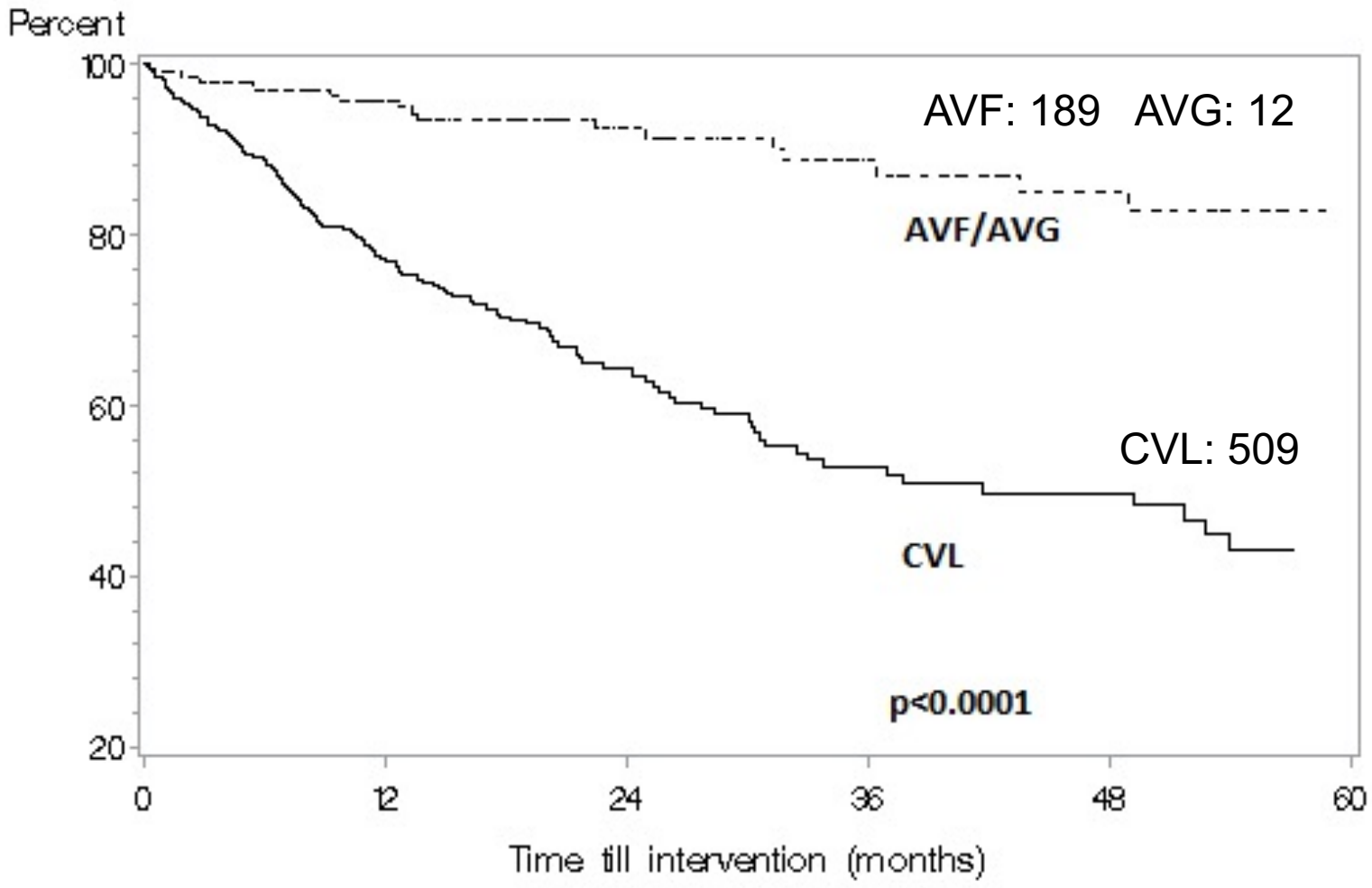


Figure 3: Overview of VA complications in a European population


Upper arrow indicates the radial artery. Stenosis found between the two lower arrows.

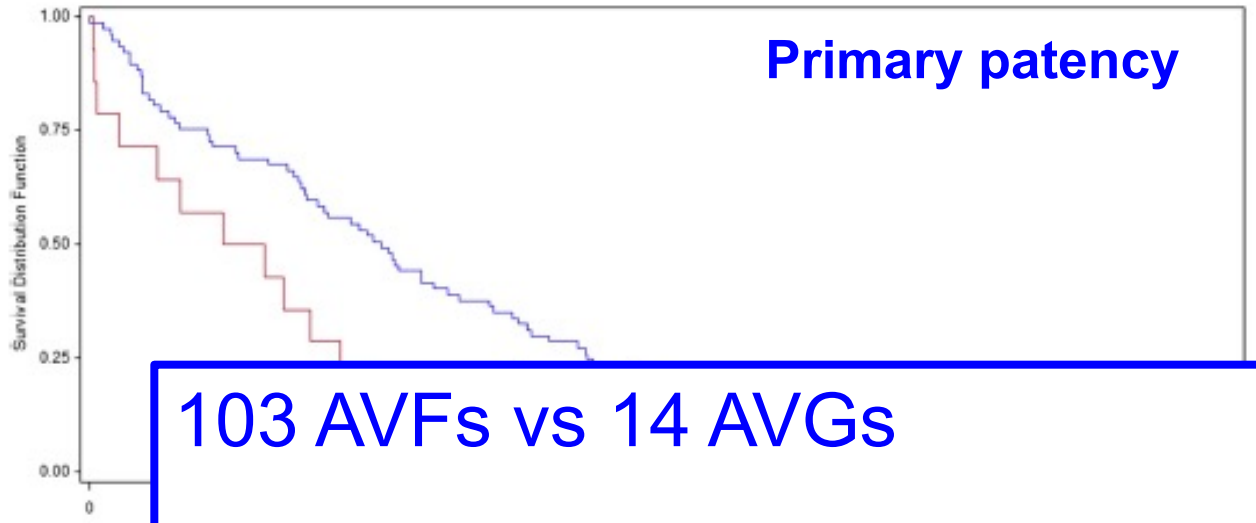
McCann M., Einarsdottir H., Van Waeleghem J.P., Murphy F., Sedgewick J. (2009).Vascular access management II: AVF/AVG cannulation techniques and complications. *Journal of Renal Care* **35**(2), 90–98.

Access survival – IPHN data



Borzych-Duzalka et al; AJKD 2019

Predictors of patency for AVF and AVG



103 AVFs vs 14 AVGs

- AVF superior to AVGs
- Intervention-free survival was the only predictor of secondary patency

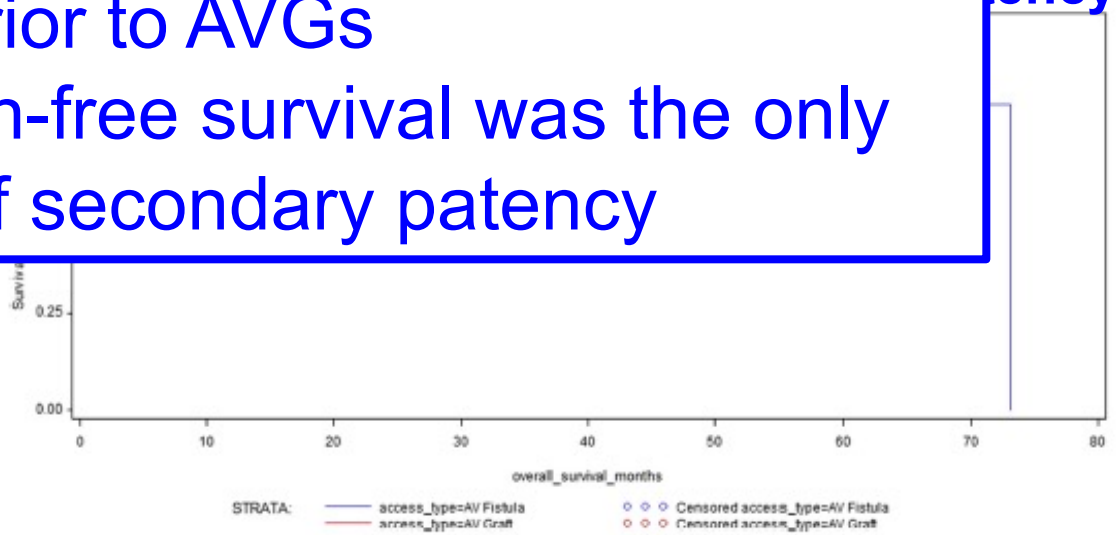
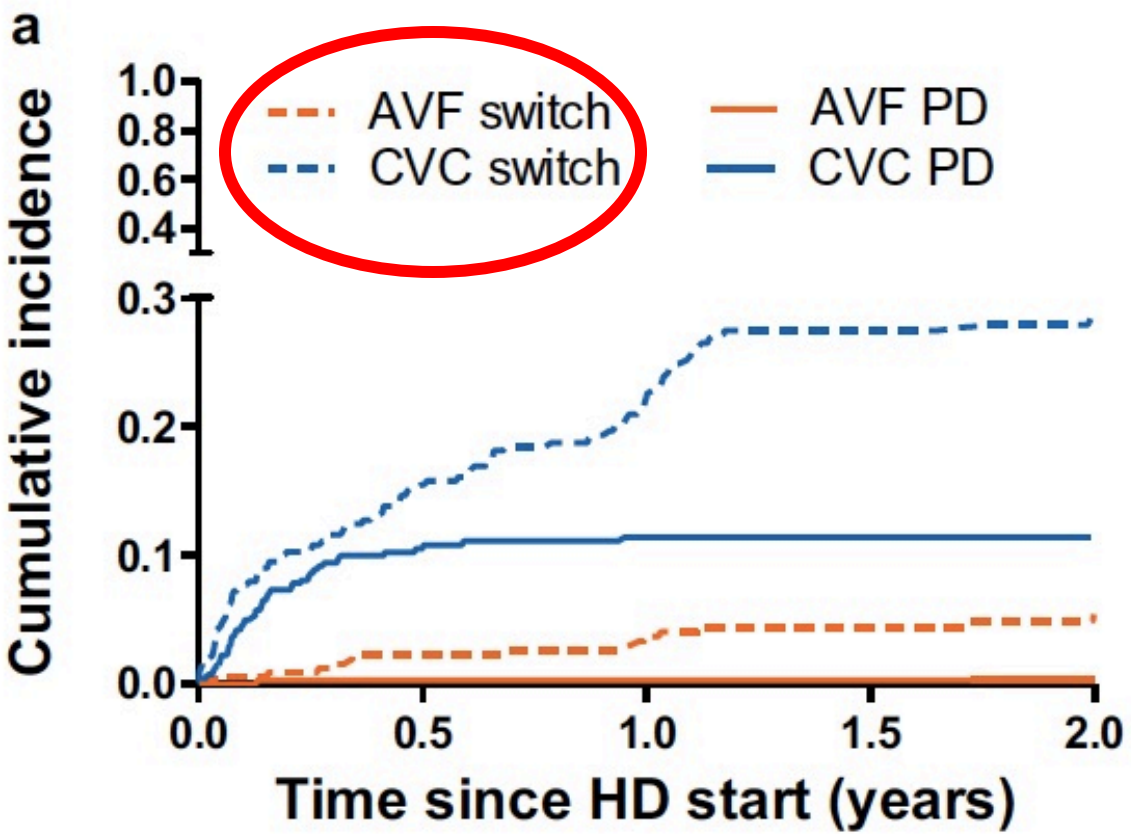


Fig. 2 Secondary patency. Kaplan-Meier analysis of secondary patency for arteriovenous fistulae (AVF) (blue) and arteriovenous graft (AVG) (red) in children on chronic hemodialysis. When censored for those permanent vascular access (PVA) that were functional at the end of study (circles), AVF ($N = 88$) demonstrated superior secondary patency rates than AVG ($N = 13$) ($p = 0.0227$, Wilcoxon rank test). Secondary patency outcome is defined in months

Onder et al;
Ped Nephrol 2019

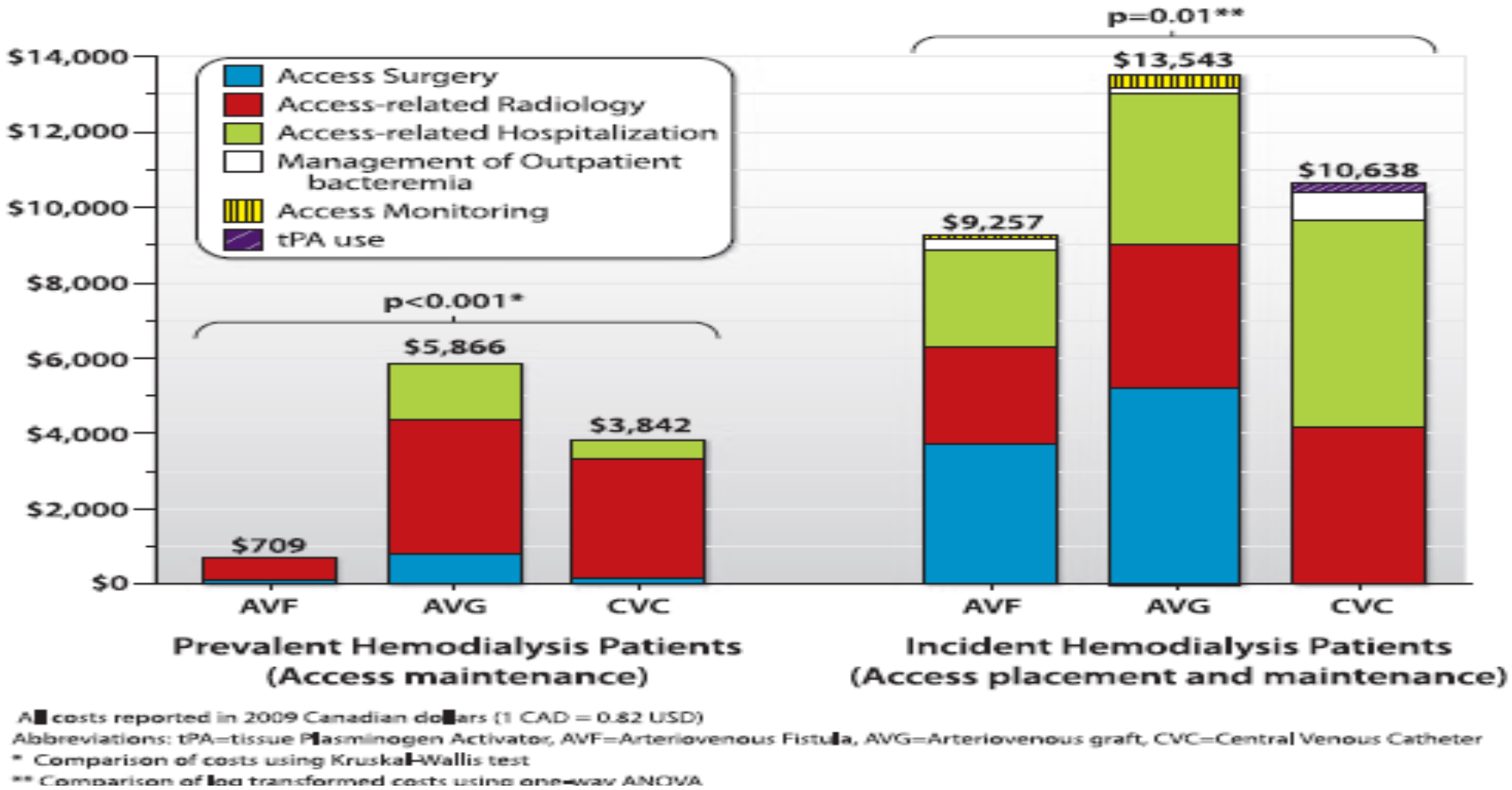
Vascular access changes



Patients who started with an AVF were 91% less likely to switch to a second VA as compared to those who started with a CVC
(adjusted hazard ratio (aHR), 0.09; 95% CI, 0.05–0.16)

ESPN/ERA-EDTA Registry; Ped Nephrol 2019

$$$$$?



All costs reported in 2009 Canadian dollars (1 CAD = 0.82 USD)
Abbreviations: tPA=tissue Plasminogen Activator, AVF=Arteriovenous Fistula, AVG=Arteriovenous graft, CVC=Central Venous Catheter
* Comparison of costs using Kruskal-Wallis test
** Comparison of log transformed costs using one-way ANOVA

Controversies and Concerns in Hemodialysis
Series Editor: Marcello Tonelli

What's Next After *Fistula First*: Is an Arteriovenous Graft or Central Venous Catheter Preferable When an Arteriovenous Fistula Is Not Possible?

Matthew T. James,*† Braden J. Manns,*†‡ Brenda R. Hemmelgarn,*† and Pietro Ravani*† for the Alberta Kidney Disease Network

Seminars in Dialysis—Vol 22, No 5
2009 pp. 539–544

Pros and cons for vascular access types

AVFs

Pros

- Allows for high blood flow rates
  => efficient dialysis delivery
- Superior access patency rates
- Best long-term survival
- Lowest hospitalization rates
- Higher Hb, lower EPO requirement
- Patients can bathe and swim without restrictions

Cons

- Not possible in small(er) children
- Needs time to mature
- Needling pain
- cosmetic features
- (high output cardiac failure)
- (steal syndrome)

CVLs

Pros

- Immediate access
- Needle-free dialysis

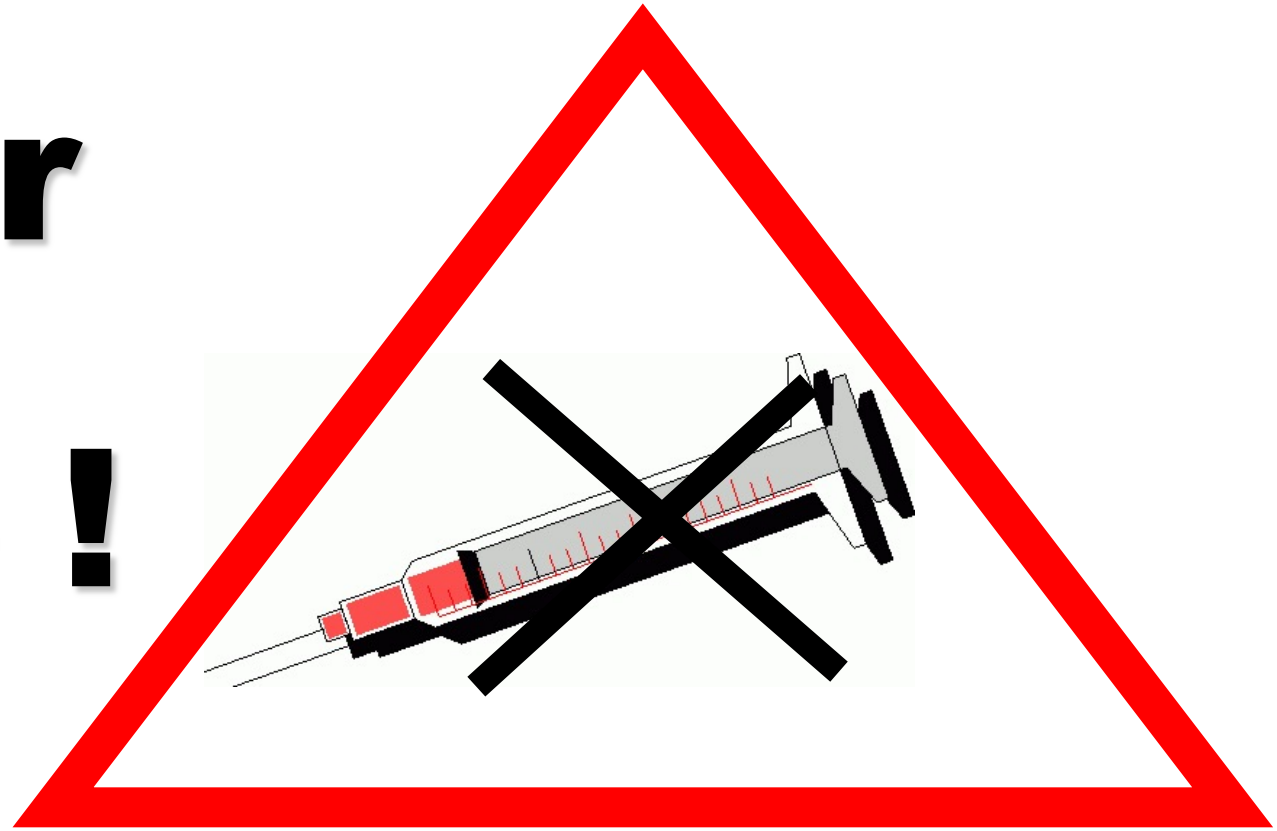
Cons

- High infection rate
- Inadequate blood flow (malposition, fibrin sheath formation)
- Restriction of the child‘s activities (swimming)
- Higher hospitalisation rates
- More likely to require access revision
- Central venous thrombosis or stenosis

Save Your Veins

Your

Life !

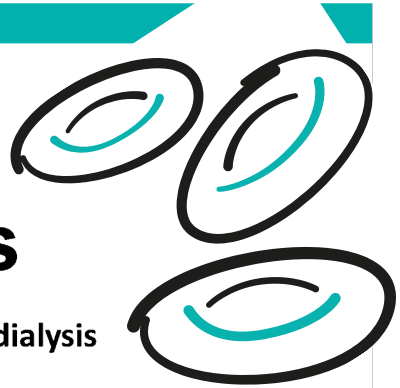


No to Needling

For more details.....

NHS
Great Ormond Street Hospital for Children
Learning Academy

Advances in Paediatric Dialysis



This 2-day virtual conference is aimed at doctors and nurses working with children on dialysis

It forms part of the core curriculum for training in Paediatric Dialysis. From the basic principles of dialysis and practical workshops on PD and HD to state-of-the-art lectures, this is your opportunity to hear experts discuss different dialysis modalities (PD, HD, HDF and home HD) as well as the CKD and dietetic management of children on dialysis.

Date: 10th and 11th February 2022

Time: 13:00-17:00 GMT

Who can attend?

- Junior Doctors (Fellows)
- Consultants
- Dialysis nurses and technicians
- Allied health professionals
- Industry Members

Course Director: Rukshana Shroff

Faculty: The GOSH team & international speakers

For queries please contact: PGME.Education@gosh.nhs.uk

Thank you!