

Accessöversväganden vid
hemdialys (och tatueringar?)

Access considerations for
home dialysis (and tattoos?)

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Declarations

- I have no potential conflict of interest to report

ESKD Life-Plan and Associated Access Needs: *What's the PLAN?*

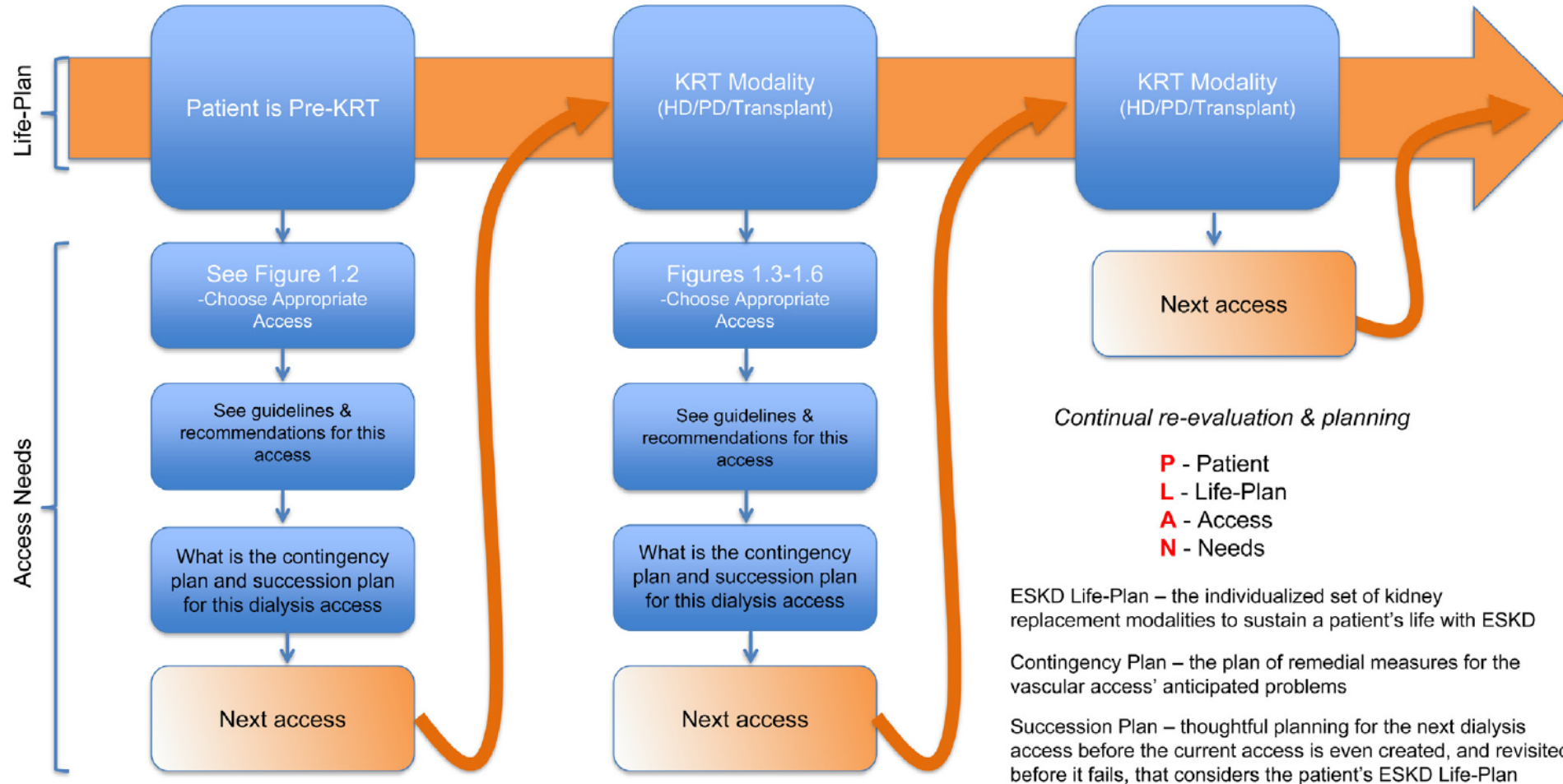


Figure 1.1. ESKD and Dialysis Access Life Plan: *What's the P-L-A-N?* Abbreviations: HD, hemodialysis; PD, peritoneal dialysis; KRT, kidney replacement therapy.

Individualised plan that is patient led – so what should we advise for HHD?

What is the best access for Home HD?

- All the things we want from VA(patient survival/ patency)

+ Special considerations for HHD

- Ease of cannulation (laterality)
- More regular cannulation
- Minimise complications
- Surveillance
- Identify complications and address them



Hospitalization in Daily Home Hemodialysis and Matched Thrice-Weekly In-Center Hemodialysis Patients

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Allan J. Collins, MD^{1,2}

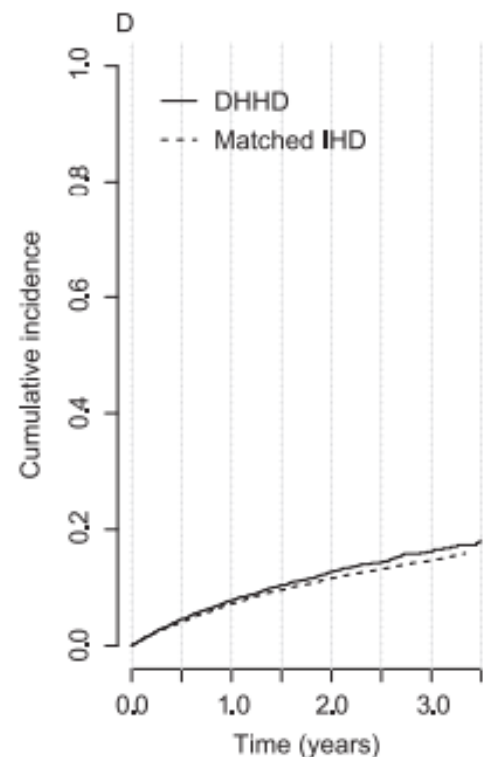


Figure 2. Cumulative incidence estimates of first vascular access dysfunction-related admission in intention-to-treat analysis. Abbreviations: DHHD, daily home hemodialysis; IHD, in-center hemodialysis.

Am J Kidney Dis. 65(1):98-108.

No difference between HHD and In centre HD

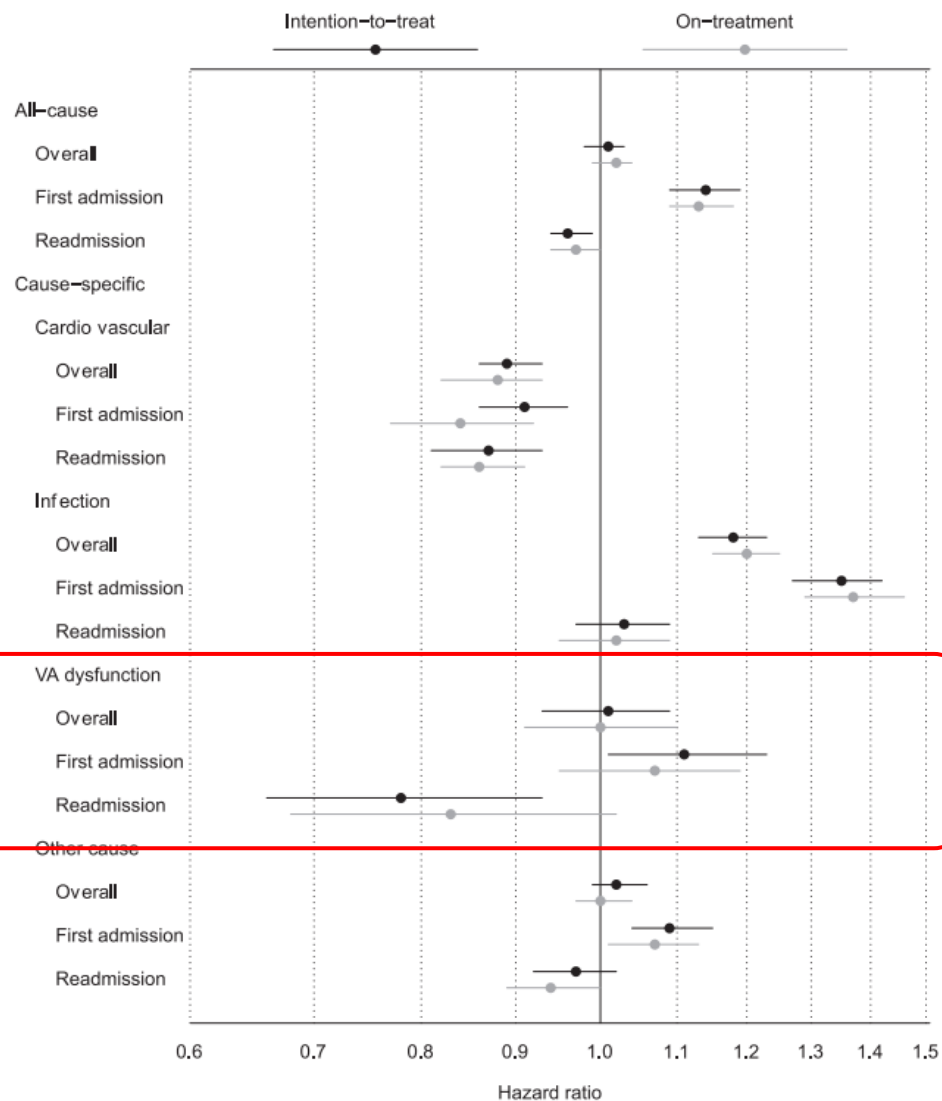


Figure 4. Pooled relative hazards of all-cause and cause-specific admission in intention-to-treat and on-treatment analyses (referent: matched thrice-weekly in-center hemodialysis patients). Hazard ratios are represented by filled circles and 95% confidence intervals by solid lines. Abbreviation: VA, vascular access.

Vascular Access Type and Patient and Technique Survival in Home Hemodialysis Patients: The Canadian Organ Replacement Register

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Ron Wald, MD, MPH,^{1,2} Yingbo Na, MSc,^{1,2} Karthik K. Tennankore, MD,⁶ and
Christopher T. Chan, MD⁷

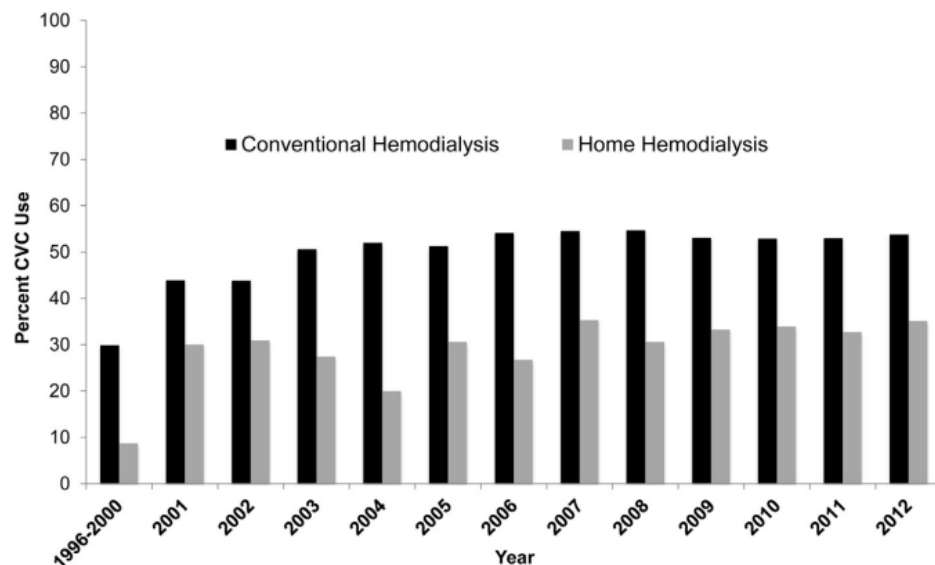


Figure 1. Central venous catheter (CVC) use in Canada, 1996 to 2012, among prevalent patients: conventional versus home hemodialysis.

Table 1 (Cont'd). Baseline Characteristics of Patients at the Time of HHD Initiation in Canada, by Hemodialysis Vascular Access

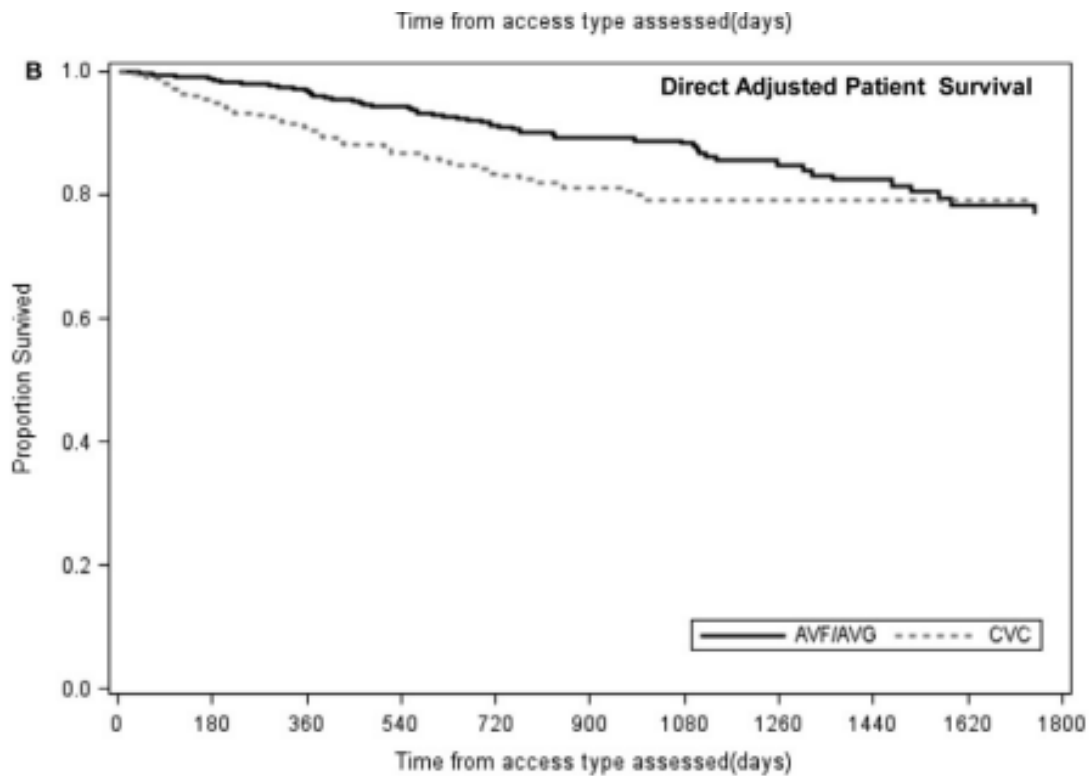
	AVF/AVG (n = 694)	CVC (n = 523)	P
Modality prior to HHD			0.007
Incident HHD	15	12.6	
Hemodialysis	81.1	79	
Peritoneal dialysis	3.5	7.3	
Transplant	0.4	1.1	
HHD type ^a			0.8
Conventional	44.7	46.3	
Short daily	16.4	15.5	
Slow nocturnal	38.9	38.2	

Note: Values for categorical variables are given as percentages; values for continuous variables, as mean \pm standard deviation or median [interquartile range].

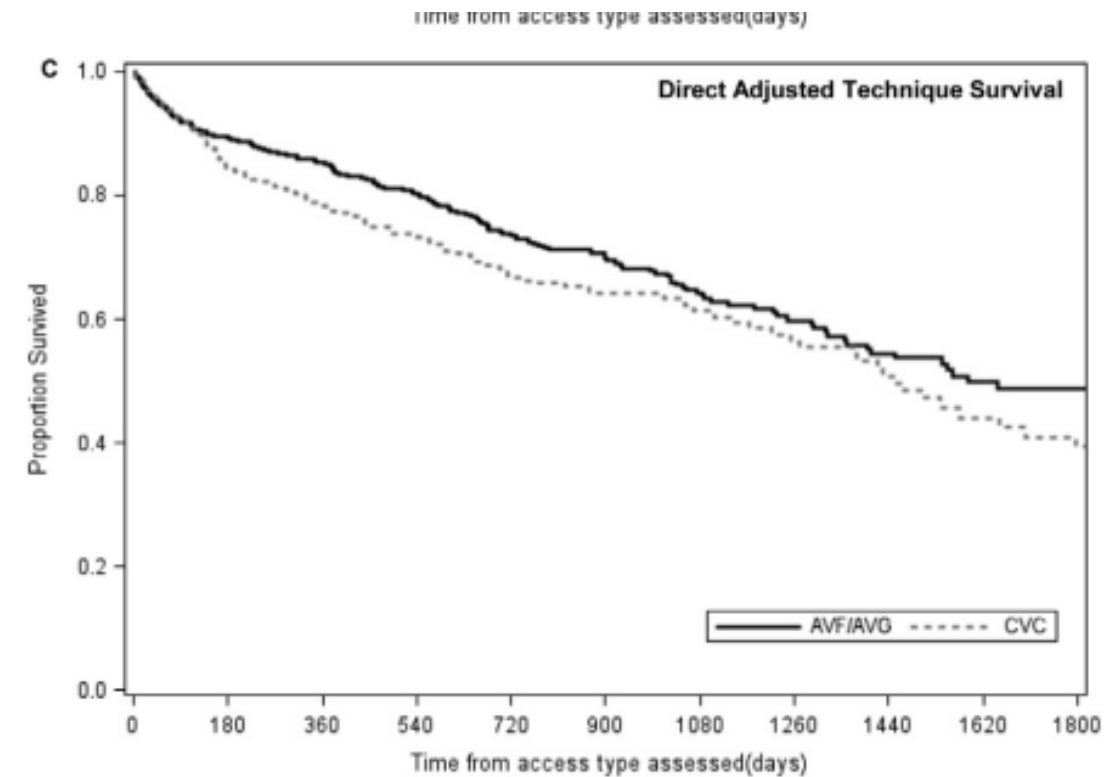
Abbreviations: AVF, arteriovenous fistula; AVG, arteriovenous graft; BMI, body mass index; CAD, coronary artery disease; CVC, central venous catheter; ESRD, end-stage renal disease; HHD, home hemodialysis; PVD, peripheral vascular disease.

^aConventional HHD, thrice weekly 4-hour treatments; slow nocturnal HHD, nightly 8-hour treatments; short daily HHD, daily less than 4-hour treatments at least 5 times weekly.

Outcome



Patient survival ($p=0.01$)



Technique survival ($p=ns$)

Figure 2. Adjusted survival curves for (A) patient and technique survival ($P = 0.001$), (B) patient survival ($P = 0.009$), and (C) technique survival by vascular access ($P = 0.04$). All curves were adjusted for age, sex, race, cause of end-stage renal disease (ESRD), a validated ESRD comorbidity index,²⁹ body mass index, facility size, income quintile, home hemodialysis therapy subtype, distance from the dialysis center, era of dialysis therapy initiation, prior ESRD vintage, and region. Abbreviations: AVF, arteriovenous fistula; AVG, arteriovenous graft; CVC, central venous catheter.

Adverse Technical Events in Home Hemodialysis

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Elizabeth Wong, RN, BHSc(N),² and Christopher T. Chan, MD, FRCPC²

N= 202 patients with
Total follow-up of 757 patient-years.

Median of **5 dialysis treatments per week and 8 hours per session**.
22 first adverse events and 7 recurrent events were identified.

Adverse event rates were
0.049 per arteriovenous fistula access-year
0.015 per arteriovenous graft access-year
0.022 per dialysis catheter access-year.

Event rates per 1,000 dialysis treatments were:
0.208 arteriovenous fistula
0.068 arteriovenous graft
0.087 dialysis catheter access

Adverse events are low in HHD

Table 2. Type and Characteristics of Events

Event	No.	Fistula Access	Patient Error	Symptomatic or Requiring Intervention	In-Person Retraining or Review of Patient Technique ^a	Other Notes
Needle dislodge	18	17 (94%)	14 (78%)	Bleeding leading to anemia (n = 4) and need for transfusion (n = 3)	15 (83%)	9 patients not using wetness detector at time of event
Air embolism	6	4 (67%)	6 (100%)	Chest pain and dyspnea (n = 6)	5 (83%)	
Cut AVF cannulation catheter ^b	2	2 (100%)	2 (100%)	0	2 (100%)	
Cut dialysis catheter ^c	1	0	1 (100%)	Complicated by line sepsis, leading to line change (n = 1)	1 (100%)	
Dislodged dialysis catheter ^d	1	0	0	Line changed (n = 1)	1 (100%)	Accidental dislodge
RO connection error (by technician) leading to severe hypercalcemia	1	0	0	Acute dialysis and ICU admission (n = 1)	Not applicable	Connection protocol reviewed with technical staff

Abbreviations: AVF, arteriovenous fistula; ICU, intensive care unit; RO, reverse osmosis.

^aFour patients refused in-person retraining/review of technique.

^bBoth patients accidentally cut the flexible plastic needles being used to cannulate the arteriovenous access while using scissors to cut away the dressing over the access.

^cPatient accidentally cut the dialysis catheter with scissors while attempting to change the dressing over the catheter.

^dPatient accidentally pulled line out after a fall while dialyzing overnight.

Table 3. Event Rates for Each Access Type Stratified by Type of Event

Event Type	Total Event Count	Event Rate (per access year)	Event Rate (per 1,000 HHD treatments)	No. of Patient-y to Have 1 Event	No. of Treatments to Have 1 Event
Needle dislodge					
AVF	17	0.037	0.153	27	6,534
AVG	1	0.015	0.068	67	14,798
Air embolism					
AVF	4	0.009	0.036	116	27,771
Dialysis catheter	2	0.009	0.035	113	28,861
Dialysis catheter damage or dislodge	2	0.009	0.035	113	28,861
Other					
Cut AVF cannulation catheter	2	0.004	0.018	232	55,541
Hypercalcemia due to RO misconnection	1	0.004	0.017	226	57,723
Total	29				
AVF	23	0.049	0.208	20	4,830
AVG	1	0.015	0.068	67	14,798
Dialysis catheter	5	0.022	0.087	45	11,545

Abbreviations: AVF, arteriovenous fistula; AVG, arteriovenous graft; HHD, home hemodialysis; RO, reverse osmosis.

Identified that life-threatening adverse events occurred at a rate of 0.060 per 1,000 treatments.

Table 1. Patient Characteristics

Case No.	Age (y)	Sex	Year of Adverse Event	Home HD Vintage (mo) ^a	Vascular Access	Home HD Type	Heparin Bolus Dose (U)	Infusion Rate (U/h)	Alone ^b
1	65	M	2007	7	AVF: double-needle, single-pump	Nocturnal ^c	2,500	1,000	No
2	40	F	2007	<12	CVC	Nocturnal ^c	1,000	1,000	No
3	46	F	2011	48	CVC	Nocturnal ^c	600	1,100	No
4	59	M	2011	<1	CVC	Nocturnal ^c	1,500	500	Yes
5	50	F	2012	35	AVF: double-needle, single-pump	Nocturnal ^c	1,800	1,300	Yes
6	35	M	2012	<24	AVF: single-needle, double-pump	Nocturnal ^c	2,000	1,200	No
7	59	M	2012	24	AVF: double-needle, single-pump	Conventional ^d	2,000	1,500	No

Abbreviations: AVF, arteriovenous fistula; CVC, central venous catheter; HD, hemodialysis.

^aVintage at time of adverse event.

^bDialyzing alone at time of adverse event.

^cNocturnal: typically performed 4-6 nights per week for 6-8 hours per dialysis session.

^dConventional: typically performed 3 days per week for 4 hours per dialysis session.

Table 2. Cause

Case No.	Human Error(s) or Machine/ Disposable Defects	Immediate Cause of Adverse Event
1	Human error	Blood loss
2	Human error	Air embolism
3	Possible human error, possible disposable defect	Blood loss
4	Possible human error, possible disposable defect	Blood loss
5	Human error	Blood loss
6	Human error	Blood loss
7	Human error	Blood loss

Abbreviations: CVC, central venous catheter; HD, hemodialys

Vascular access for home haemodialysis

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Intervention rate no difference

N=74 patients.

On initiation of home haemodialysis,
62 arteriovenous fistula as vascular access,
12 tunnelled dialysis catheter.

12 patients who started on a tunnelled dialysis catheter, 5 were subsequently converted to AVF ($n = 4$) or AVG ($n = 1$).

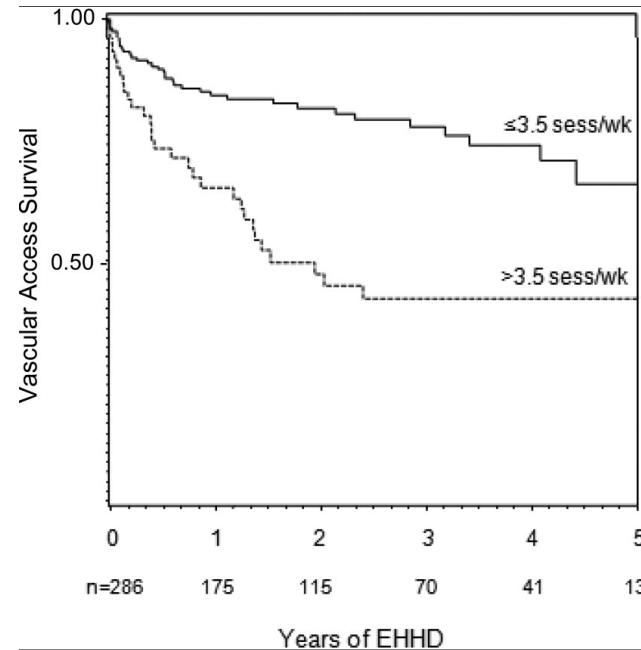
To maintain uninterrupted home haemodialysis,
interventional rates were **0.32 per arteriovenous fistula/ arteriovenous graft access-year and
0.4 per tunnelled dialysis catheter access-year.**

Hospital admission rates for patients on home haemodialysis were 0.33 per patient-year.

Frequency of dialysis and cannulation

- N= 286 patients receiving **extended-hours hemodialysis** (at home (96%)/ nocturnal (77%) hemodialysis).
- Most patients performed alternate-daily dialysis (52%)

Vascular access type ^a	
Arteriovenous fistula	159 (91.9)
Graft	11 (6.4)
Catheter	3 (1.7)
Not specified	4
Cannulation technique ^a	
Buttonhole	78 (48.2)
Rope-ladder	84 (51.9)
Not specified	15




Access-related adverse events ^a	No (%)
Infection	47(59.5)
Bacteremia	14(29.8)
Local AVF infection	22(46.8)
Unspecified infection	11(23.4)
Thrombosis/occlusion	12(15.2)
AVF aneurysm	5(6.3)
Stenosis	8(10.1)
AVF revision requirement	3(3.8)
Other	4(5.1)

More sessions = more infections
 More sessions = worse access survival

ORIGINAL ARTICLE

[f](#) [X](#) [in](#) [✉](#) [🐦](#)

In-Center Hemodialysis Six Times per Week versus Three Times per Week

 This article has been corrected. [VIEW THE CORRECTION](#)

Author: The FHN Trial Group* [Author Info & Affiliations](#)
Published December 9, 2010 | N Engl J Med 2010;363:2287-2300 | DOI: 10.1056/NEJMoa1001593
[VOL. 363 NO. 24](#) | [Copyright © 2010](#)

No significant difference

Dialysis access (%)**		0.86
Fistula	62.5	65.6
Synthetic graft	18.3	16.0
Catheter	19.2	18.4

Table 4. Adverse Events during the 12-Month Follow-up Period of the Study.*						
Outcome	Conventional Hemodialysis (N=120)		Frequent Hemodialysis (N=125)		Hazard Ratio (95% CI)	P Value
	no. of events	no. of patients with event	no. of events	no. of patients with event		
Death	9		5		—	—
All hospitalizations	114	47	109	58	0.88 (0.60–1.28)	0.50
Unrelated to vascular access	90	44	79	47	0.80 (0.53–1.21)	0.30
Related to vascular access	24	14	30	20	0.99 (0.54–1.82)	0.97
Cardiovascular-related	15	12	17	15	0.83 (0.44–1.59)	—
Infection related	27	20	27	23	0.83 (0.49–1.40)	—
All interventions related to vascular access	65	29	95	47	1.35 (0.84–2.18)	0.22
Correction of access failure	23	15	19	15	0.71 (0.35–1.44)	0.35
Other procedures	42	21	76	38	1.71 (0.98–2.97)	0.06
Episodes of hypotension†	470	87	724	99	—	—
Hypokalemia						
Potassium <3.0 mmol/liter	0	0	0	0	—	—
Potassium <3.5 mmol/liter	6	5	13	8	—	0.57‡
Hypophosphatemia§	9	7	15	9	—	0.80‡

Infection in HHD

- N=187 (nocturnal HHD)
- = follow up of six hundred five patient years.

- Endpoint
 - Bacteraemia, Technique failure, Death

79.3% CVC

vs

44.5% AVF/AVG

- Adjusted time to endpoint was significantly shorter in patients with initial CVC access (hazard ratio 2.42, 95% confidence interval 1.50–3.90, $p < 0.001$).
- Risk factors for bacteremia were comorbid status quantified by the Charlson Comorbidity Index ($p < 0.001$) and diabetes ($p < 0.001$)

What is the best access for Home HD

Special considerations for HHD

- All the things we want from VA (patient survival/ patency)

+

- Ease of cannulation (laterality)
- More regular cannulation
- Minimise complications
- Surveillance
- Identify complications and address them



Essentials of Vascular Access for Home Hemodialysis

Anil K. Agarwal, Khaled Y. Boubes, and Nabil F. Haddad

- Cannulation training of the patient or caregiver needs to be implemented after access creation
- AV access cannulation is the rate-limiting step for transition to HHD, other than actual dialysis training.
- There is a natural fear of cannulation that needs to be alleviated to avoid complications that lead to pain, failure to cannulate, infiltration, bleeding, trauma, aneurysm formation



Figure 1: Tattoo delineating the cannulation path (arterial outflow below and venous return above). This patient has given consent for this picture to be published.

Lagaac R, Meruz R, Goh MA. Tattoo of vascular cannulation site as a self-cannulation aid. *J Ren Care*. 2015 Jun;41(2):140-2. doi: 10.1111/jorc.12126. Epub 2015 Mar 26. PMID: 25819533.

TATTOO OF VASCULAR CANNULATION SITE AS A SELF-CANNULATION AID

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Lagaac R., Meruz R., Goh M.A. (2015). Tattoo of vascular cannulation site as a self-cannulation aid. *Journal of Renal Care* 41(2), 140–142.

SUMMARY

Background: Haemodialysis can be provided either in a healthcare setting or home environment. Patients receiving dialysis at home report a better quality of life. Patients or their carers must be able to cannulate their fistula confidently and independently when dialysing at home.

Method: We describe a patient with a functional fistula which was difficult to palpate, leading to difficulties in cannulation and multiple referrals to the home therapies team.

Procedure: A series of discrete dots were tattooed to delineate the borders of the fistula and served to guide cannulation.

Results: Following this simple intervention, our patient was able to self-cannulate confidently, dialysing at home four times per week. There were no further referrals to the home therapies team.

Conclusion: Permanent tattoo of the skin to guide cannulation can be used when a fistula is difficult to palpate or if a further superficialisation procedure is not desired. Patients have to be made aware that the markings are permanent and might outlast the fistula.

Tattoo ink was placed on the skin, and the epidermis was pricked with a 15G hypodermic needle to a depth of 1–2 mm. A series of discrete dots were placed to mark the borders of the fistula (Figure 1). This was completed in a matter of minutes with no complications. The site was dressed and he was advised to keep the site clean to minimise the risk of skin infection.

Monitoring and surveillance

- “It is important to have a protocol for frequent and regular access evaluation including history taking and examination, either physically or virtually, at the time of monthly visits or when there is difficulty in using the access”

Summary

Little evidence to say what the best access is for HHD

Little evidence to say the principles are different to standard VA considerations

BUT patient engagement, training and support is likely the key to success

(LIMITATIONS : Different patient groups!)

Thank you



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CORRESPONDENCE

An Unconscious Patient with a DNR Tattoo

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