Home and Self Care Haemodialysis: 
*The implied and the sought*
Hypothesis: The “unphysiology” of dialysis

Kjellstrand et al KI 1975

“...Approximation of normal physiology should reflect the best clinical outcome...”
Why Do We Care About Quality of Life (Q of L)?

- DOPPS data base
- lower Q of L values associated with more hospitalization and death
- applies to both physical and mental components
- “adjusted” for co-morbidities

Mapes et al Kidney Int 2003
A Sound Alternative: **Home Hemodialysis**

- Improved Patient Outcomes (Survival QOL)
- Cost Effectiveness

*NICE Technology Appraisal Guidance – No. 48 (2002)*
*Guidance on home compared with hospital haemodialysis for patients with end-stage renal failure*

- All suitable patients should be offered the choice of home hemodialysis
- Given choice 10-15% of dialysis pts may opt to consider home hemodialysis
Cardiovascular benefits of extended HD schedules

Long conventional hemodialysis
- Predialysis hypertension
- Paradoxical hypertension
- Heart failure
- Left ventricular hypertrophy
- Peripheral resistance

Short daily hemodialysis
- Left ventricular hypertrophy
- Hypertension
- Sympathetic activity

Long nocturnal daily hemodialysis
- Hypertension
- Left ventricular hypertrophy
- Heart failure
- Vascular reactivity and endothelial function
- Sleep hypoxemia

Frequent HD: mortality studies

Observations:

- Overall – suggests frequent HD better than incenter HD
- BUT estimate of clinical benefit varies
- Technique survival is different

<table>
<thead>
<tr>
<th>Study</th>
<th>Countries and duration of follow-up</th>
<th>Study population</th>
<th>Relative mortality in HHD population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johansen et al. (2009)</td>
<td>USA, 3 years</td>
<td>94 patients receiving home NHD (mean 5.7 days per week)</td>
<td>HR 0.36 (95% CI 0.22–0.61); P&lt;0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>940 patients in USRDS</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>In-centre CHD</td>
<td></td>
</tr>
<tr>
<td>Johansen et al. (2009)</td>
<td>USA, 3 years</td>
<td>43 patients receiving SDHD (mean 5.4 days per week)</td>
<td>HR 0.64 (95% CI 0.31–1.31); P=NS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>430 patients in USRDS</td>
<td></td>
</tr>
<tr>
<td>Marshall et al. (2011)</td>
<td>Australia and New Zealand, 72,052 patient-years</td>
<td>Inception cohort of incident dialysis patients, of whom 865 were receiving frequent or extended HHD</td>
<td>HR 0.53 (95% CI 0.41–0.68); P&lt;0.05 Per protocol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21,184 patients included in Australian and New Zealand registry</td>
<td></td>
</tr>
<tr>
<td>Lockridge &amp; Kjellstrand (2011)</td>
<td>USA, 287 patient-years</td>
<td>87 patients receiving home NHD (mean 40 ± 6 h per week)</td>
<td>SMR 0.53 (95% CI 0.34–0.79); P=0.005 Intention to treat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>87,121 incident dialysis patients from the 1998 USRDS cohort</td>
<td></td>
</tr>
<tr>
<td>Nesrallah et al. (2012)</td>
<td>France, USA, Canada, 3,008 patient-years (median 1.8 years)</td>
<td>338 patients receiving intensive HHD (4.8 sessions per week, of 7.4 h each)</td>
<td>HR 0.55 (95% CI 0.34–0.87); P=0.01 Intention to treat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,388 patients from DOPPS</td>
<td></td>
</tr>
<tr>
<td>Weinhandl et al. (2012)</td>
<td>USA, mean 1.8 years</td>
<td>1,873 patients receiving daily HHD (5–6 sessions per week)</td>
<td>HR 0.87 (95% CI 0.78–0.97); P&lt;0.01 Intention to treat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9,385 patients from USRDS</td>
<td></td>
</tr>
</tbody>
</table>

Adapted from
Tennankore et al: Nature Neph Reviews
2012
Survival Equivalence of FNHD to Cadaveric Tx

Time to death in patients treated with nocturnal haemodialysis, deceased and living donor kidney transplantation (log-rank test, $P = 0.03$).

Pauly R P et al.
Nephrol. Dial. Transplant. 2009;24:2915-2919
Estimates of survival of Home HD in New Zealand

Home dialysis is independently associated with improved overall survival; Compared to facility HD

Home HD is associated with the best overall survival; Compared to facility HD and PD,

When to consider Intensive Home HD in Hospital HD patients?

**Failing Conventional HD**

- Failure to thrive (low appetite, malnutrition)
- Intolerant fluid gains
- Intractable hypertension, hyperphosphatemia
- Refractory sleep disorders,
- Unable to sit for dialysis for 4hrs
- Retention syndromes
- Disruption to work
- Family and social setting

Patients with high health expectations
BASIC – HHD project

- Patient-level predictors of modality choice are potentially modifiable except in instances when the choice is dictated by a high degree of physical/cognitive limitation.

- Physician-level barriers are most readily overcome when systems are modified to alter the existing levels of knowledge and attitudes regarding home haemodialysis (clinical and economic).

- Routinely in clinics with patients, there is a need to expand and understand the stated ‘fear’ of self-cannulation as there may be a modifiable concern, thereby allowing self-care haemodialysis, at home or in hospital.
Modality choice – Self Cannulation, Home ownership and cultural barriers

• Routinely in clinics with patients, there is a need to expand and understand the stated ‘fear’ of self-cannulation as there may be a modifiable concern, thereby allowing self-care haemodialysis, at home or in hospital.

• Patients of non-white ethnicity show a 70% lower odds of choosing self-care dialysis modality, after adjustment for home ownership, comorbidities index, perceived cognitive ability and centre characteristics.
The Change of Dialysis Practice

UK Renal Registry
Self Care Haemodialysis (SC-HD)

- Patient can safely undertake and complete a prescribed HD treatment as at home with or without minimal carer assistance

- Self Care, Minimal Care, Auto-dialysis, Self-managed Dialysis, Independent HD
The idea is not new

1972 Medicare coverage of Dialysis as an enabling therapy for patients, allowing them to live more productive lives, including flexibility

Dialysis facilities in UK (Royal Free, Seattle, Wisconsin, Manchester): where patient self dialysed out of centre


SC-HD: A NEW IDEA?

174 pts, mean age 31.2 years in 1974 to 52.6 years in 1997. The overall survival was 90% at 5 years, 77% at 10 years, risk factors were older age, diabetes and vascular diseases

“If adequate choice is given, out-centre SCHD offers a reliable and safe modality of dialysis” Arkouche W et al Kidney Int. 1999 Dec;56(6):2269-75.
ROLE OF SC-HD: BENEFITS

- Patient self control over health management
- Better informed patient (dialysis, medications and treatment outcomes)
- Greater potential for rehabilitation
- Flexibility with the dialysis schedule
- Clinical benefit (high dose HD)
EVOLVING CLINICAL CARE MODEL

- Lease Contract
- Cost per Therapy
- Extended Schedules

- Prestwich 6 stations
- MRI 2 stations
- Stockport 2 stations

Patients 25% HHD, 3.5% HD
Clinical Housekeepers

Roles

- to support and assist in similar way a carer would do at home
- to ensure patient comfort/support wellbeing
- to be responsible for cleaning machine/station after use

Duties

- No direct clinical duties, but may support/assist patients
- Present when patients dialyse to provide food/drinks
- Daily “Quality Care Rounds” allowing patients to express any concerns before starting their treatment

Reports to Community Sister

Stock control

Trained in BLS/use of “heart start” defibrillator
Nursing support

- Routine visits

- Clinical reviews – target weight; B/P and routine clinical management

- Facilitate maximised dialysis schedule 5 – 6 hrs x 4 sessions/week

- Urgent/Crisis visits - e.g. needling support (variable)
  Unstable patients moved to hospital based dialysis

- Medical reviews – clinic every 4-6 months

- Critical emergencies - BLS, Defib support, 999
What you need for your table
- 6 10ml Syringes
- 1 250ml bag of Saline
- 1 Connector
- 2 Dressing Pack
- 1 spike
- 2 Fistula Needles (1 Fistula Needle to be in your folder)
- 2 Green Needles
- Chloraprep
- Gauze
- 5 (Blue) Sani Cloth 2%
- 2 (Red) Sani Cloth

If you are diabetic you need to add
- 2 5ml syringes
- 2 Needles

If you are taking blood samples
- Blood bottles
- Vacutainer
- Vacutainer Adapter

EMERGENCY HELPLINE:
PLEASE DIAL EXTENSION: 65724
OR 01612765724
(when using own mobile phone)
Patient Selection

• The single most important factor is a desire to practise self-care.

• Vascular access that functions well, good basic manual dexterity and adequate vision.

• Clinical factors: Is it likely to deliver a better outcome?

• Consider human factors: Positive Impact on lifestyle.
Total SCHD programme = 132 patients

PATIENT PATHWAY 2004-2015

- Pre-Dialysis N=15
- Failed PD N=7
- ICHD N=18
- Failed Tx N=10
- HHD N=5

Total SCHD n=55

- HHD 13% n=8
- ICHD 9% n=5
- TX 33% n=18
- Death 9% n=5
- Prevalent Self care 35% n=19
Co-morbidity
(Mean 2 or more co-morbidities)

Neuropathy
Advanced Cystic Fibrosis
EPS /Peritonectomies
Asthma/COPD
Hypertension
ICD
Advanced Heart Failure EF < 30%
Multiple Myeloma
Avascular Necrosis
Cardiomyopathy
Hepatitis
Calcification
Seizure
Pancreatic Disease
Mitral Regurgitation
Cancer
Calcification
Severe obesity
Aortic Aneurysm
CABG
Diabetes
Sleep Apnoea
Hip Replacement
Reasons for choosing Self Care HD

- Patient Choice
- Inappropriate/unsuitable housing to accommodate HHDX
- Patients requiring interim support to increase confidence to self care
- Stepping stone to home HD
- Patients requiring short term respite (for holiday or carer unwell)
### PATIENT DEMOGRAPHICS 2000-2015

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Age (mean)</strong></td>
<td>$50.3 \pm 10.1$ yrs</td>
</tr>
<tr>
<td><strong>Age (median)</strong></td>
<td>51 yrs</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td>30%</td>
</tr>
<tr>
<td><strong>Non Caucasians</strong></td>
<td>26%</td>
</tr>
<tr>
<td><strong>Employed</strong></td>
<td>61%</td>
</tr>
<tr>
<td><strong>Carer</strong></td>
<td>72%</td>
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<tr>
<td><strong>Co-morbidity</strong></td>
<td>2.2</td>
</tr>
<tr>
<td><strong>Hours weekly</strong></td>
<td>15-24 hrs / week</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>3-6 / week</td>
</tr>
<tr>
<td><strong>4 per week (4h)</strong></td>
<td>55%</td>
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</table>
## Clinical Targets

<table>
<thead>
<tr>
<th>AV Access</th>
<th></th>
<th>AVF</th>
<th>85.2%</th>
<th>AVG</th>
<th>7.4%</th>
<th>Catheter</th>
<th>7.4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivered stdKt/V</td>
<td></td>
<td>1.51 - 2.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>PO₄ (mmol/l)</td>
<td></td>
<td>1.4 ± 0.4</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>PTH</td>
<td></td>
<td>23.4 ± 24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood Pressure mean (mmHg)</td>
<td></td>
<td>134/72</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medication types/day</td>
<td></td>
<td>8 ± 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>EPO weekly (ug)</td>
<td></td>
<td>24.6 ± 22.6</td>
<td></td>
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</tbody>
</table>
Length of stay (SC-HD)

(Post – 2000)

Mean: 33 ± 36 months  Median: 21 months

- Range 4 – 160 months
- 148 patient life years
- 27972 treatments delivered
- 37.5% cost-efficiency (cf tariff)

Longest stay 223 months!
Challenges

- Lapses in self care
- Operational challenges (flexibility, staffing, policies, governance)
- Human factors (knowledge, skills, attitude)
- Enabling technology

Dealing with transition
Is there an unmet need?

HD network modality review 2015 (CMFT) shows huge gap between actual and predicted modality in SCHD.

<table>
<thead>
<tr>
<th></th>
<th>Current Numbers</th>
<th>Current percentage</th>
<th>Predicted Totals</th>
<th>Predicted Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hub</td>
<td>150</td>
<td>26%</td>
<td>45</td>
<td>8%</td>
</tr>
<tr>
<td>Satellite</td>
<td>296</td>
<td>51%</td>
<td>350</td>
<td>60%</td>
</tr>
<tr>
<td><strong>Self-care HD</strong></td>
<td><strong>15</strong></td>
<td><strong>3%</strong></td>
<td><strong>79</strong></td>
<td><strong>14%</strong></td>
</tr>
<tr>
<td>PD</td>
<td>70</td>
<td>12%</td>
<td>75</td>
<td>13%</td>
</tr>
<tr>
<td>HHD</td>
<td>58</td>
<td>11%</td>
<td>60</td>
<td>10%</td>
</tr>
<tr>
<td>SC+PD+HHD</td>
<td>131</td>
<td>23%</td>
<td>214</td>
<td>37%</td>
</tr>
<tr>
<td>Total</td>
<td>577*</td>
<td></td>
<td>581*</td>
<td></td>
</tr>
</tbody>
</table>

- Experienced dialysis nurse estimated that about “38% (41 of 109) of patients in one of her outpatient dialysis clinics would be capable of performing in-centre self-care”.... ADC 2007
Nothing is more difficult, and therefore more precious, than to be able to decide’
Napoleon Bonaparte

Thank You
HD Modality choice and selection at Home

Multiple co-morbidities is a contraindication

Attitude and willingness matter a great deal
Self care HD in Satellite HD setting
Are there any benefits?

- Improves access to self care pathways
- Promotes ethos of patient empowerment
- Improve patient concordance and outcomes
- Cultural shift in dialysis units
- Patients motivate patients!
- Improves unit/staff morale
29 May 2014 15:26

Dear Sandip,
RH continues to struggle with very low B/P’s which seem to be more of a problem for her at home. She says she has frequent days when she can’t do anything, and also says that on a few occasions when blood pressure has been very low, her sight and hearing has gone temporarily! Are we any nearer being able to acquire Northera for her? Can we order it?

*Severe ANS disease*

20th June 2014

She does 4 sessions per week each of 4 hours duration. Her B/P is to be between 80 - 90 systolic pre-dialysis, to be considered stable to dialyse at Prestwich.

If B/P drops below the agreed level, but RH is asymptomatic of low B/P – at what point is she considered to need transfer to a maintenance dialysis area where there is support from qualified nurses and medical support? She is reluctant to move from Prestwich after 15 yrs......
No trained nurses staff this unit

Patients trained to self care as for home

Clinical Housekeepers

HD nurse in charge - routine visit

Additional support by Community Dialysis nursing team

Dialysis schedules: Mon/Tues/Thurs/Sat

Strong peer support

Described as a 5 star service by patients

27/04/1981 Prestwich opened for business with the first self care patient!

07.00am - 16.00hrs. Monday-Saturday

Prestwich opened for business with the first self care patient!
Extended Dialysis Schedules at Home

- Nocturnal HHD (5 or more treatments per week, > 5.5 hours per treatment)
- Alternative Nocturnal HHD (3.5 treatments per week, > 5.5 hours per treatment)
- Short Daily HHD (5 or more treatments per week, 2.5 to 4 hours per treatment)
  - Alternative Day HHD (3.5 treatments per week, 4-5 hours per treatment)
- Standard extended hour HHD (3 treatments per week, 5+ hours per treatment)
  - Standard HHD (3 treatments per week, 4-5 hours per treatment)
Decision making – dialysis schedules at Home

1. The experiences with Intensive HD make a formidable case for frequent and long therapies.

2. The data show that SDHD regimens are associated with the best biochemical profiles, volume and hypertension control and nutritional status, health outcomes and better survival than incentre HD.

3. SDHD do not provide the evidence for superior survival when compared to long nocturnal thrice weekly or alternate day HD.

4. The correlation between frequency and clinical outcomes seems evident, but not likely to be linear.

   Perhaps the greatest benefits are achieved from the simple avoidance of 48 hours without dialysis.

5. Extended schedules justified in order to achieve more physiological therapy, at a reasonable cost with minimal alteration of the patient’s lifestyle.

As much dialysis as the patients need to feel well!
## Description of typical HD prescriptions

<table>
<thead>
<tr>
<th>Prescription</th>
<th>Abbreviation</th>
<th>Frequency</th>
<th>Duration</th>
<th>Total time</th>
<th>Q\text{\textsubscript{B}}</th>
<th>Q\text{\textsubscript{D}}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional HD</td>
<td>cHD\textsuperscript{3}</td>
<td>3</td>
<td>3-6</td>
<td>9-18</td>
<td>200-450</td>
<td>300-800</td>
</tr>
<tr>
<td>Long thrice-weekly HD</td>
<td>IHD\textsuperscript{3}</td>
<td>3</td>
<td>7-12</td>
<td>21-36</td>
<td>200-300</td>
<td>250-500</td>
</tr>
<tr>
<td>Conventional HD, QOD</td>
<td>cHD\textsuperscript{3.5}</td>
<td>3.5</td>
<td>3-6</td>
<td>10.5-21</td>
<td>300-450</td>
<td>500-800</td>
</tr>
<tr>
<td>Long HD, QOD</td>
<td>IHD\textsuperscript{3.5}</td>
<td>3.5</td>
<td>7-12</td>
<td>24.5-42</td>
<td>200-300</td>
<td>250-500</td>
</tr>
<tr>
<td>Short daily HD</td>
<td>sHD\textsuperscript{5-7}</td>
<td>5-7</td>
<td>2-2.5</td>
<td>10-17.5</td>
<td>300-450</td>
<td>500-800</td>
</tr>
<tr>
<td>Long nightly (or daily) HD</td>
<td>IHD \textsuperscript{5-7}</td>
<td>5-7</td>
<td>7-12</td>
<td>35-84</td>
<td>200-300</td>
<td>250-500</td>
</tr>
</tbody>
</table>
Enhanced toxin removal by extended HD schedules

<table>
<thead>
<tr>
<th>Retention molecules</th>
<th>Control HD</th>
<th>Daily HD</th>
<th>Nocturnal HD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phosphate removal</strong></td>
<td>299 mg/d</td>
<td>415 mg/d (+39%)</td>
<td>1218 mg/d (+328%)</td>
</tr>
<tr>
<td><strong>Beta Microglobulin Clearance</strong></td>
<td>4.7 ml/min</td>
<td>4.8 ml/min (+39%)</td>
<td>9 ml/min (+91%)</td>
</tr>
</tbody>
</table>
How to measure Adequacy in Extended HD modalities?

Pt 1  FNHD - URR 85 %  spKt/V 1.8

Pt 2  SDHD - URR 50%  spKt/V 0.8

Is Pt 2 underdialysed?
Standard Kt/V: a continuous clearance equivalent

Reproduced with permission from Daugirdas JT. Urea Kinetic Modeling. HDCN (Hypertension, Dialysis, and Clinical Nephrology, http://www.hdcn.com)
Prescription changes expected on switching to high dose intensive Home HD

- Heparin use increase
- BP medications reduce/withdrawn
- Phosphate binder reduce/withdrawn
- Bicarbonate tablets reduce/withdrawn
- EPO dose reduction
- Water soluble vitamins – added
- Dialysate calcium higher
- Dialysate Phosphate supplementation in some
Adverse impact in high dose HD

- Vitamin losses
- Low Phosphate levels
- Access complications
- Patient Burn out
- Caregiver impact
- Treatment costs
Technique success
Procedure-Related Serious Adverse Events Among Home Hemodialysis Patients: A Quality Assurance Perspective

Ben Wong, MD,1 Deborah Zimmerman, MD,2 Frances Reintjes, BScN,3 Mark Courtney, MD,1 Scott Klarenbach, MD,1 Graeme Dowling, MD,4 and Robert P. Pauly, MD, MSc, FRCPC1

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Human Error(s) or Machine/Disposable Defects</th>
<th>Immediate Cause of Adverse Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Human error</td>
<td>Blood loss</td>
<td>Ignored machine alarms; improper threading of connections; placement of wetness detectors in incorrect position</td>
</tr>
<tr>
<td>2</td>
<td>Human error</td>
<td>Air embolism</td>
<td>Neglected to clamp CVC</td>
</tr>
<tr>
<td>3</td>
<td>Possible human error, possible disposable defect</td>
<td>Blood loss</td>
<td>Possible failed integrity of cap; possibly did not correctly thread connections</td>
</tr>
<tr>
<td>4</td>
<td>Possible human error, possible disposable defect</td>
<td>Blood loss</td>
<td>Improper placement of clamp; failed integrity of cap</td>
</tr>
<tr>
<td>5</td>
<td>Human error</td>
<td>Blood loss</td>
<td>Improper machine setup; neglected to use wetness detectors</td>
</tr>
<tr>
<td>6</td>
<td>Human error</td>
<td>Blood loss</td>
<td>Improper threading of connections; placement of wetness detector in incorrect position</td>
</tr>
<tr>
<td>7</td>
<td>Human error</td>
<td>Blood loss</td>
<td>Did not follow machine setup protocol specific to local home HD program</td>
</tr>
</tbody>
</table>

Abbreviations: CVC, central venous catheter; HD, hemodialysis.
Vitamin C levels by dialysis hours. Dashed and solid red lines indicate deficient and severely deficient levels.  

Crowther N et al, HDI, 2010
Hypophosphatemia on Intensive Nocturnal Dialysis

• Intensive HD regimes sometimes lead to hypophosphataemia, causing muscle weakness, arrhythmias, haemolysis...

• Oral and IV phosphate replacement is ineffective and cumbersome

• Replacement in dialysate most effective

• No such dialysates exist
The equation \( y = 172.79x - 1.47 \) defines the Fleet volume (y) needed for a desired dialysate phosphate (x).
1. Fleet produces predictable concentrations of phosphate-enriched dialysate

2. Dialysate phosphate up to 1mmol/L remains stable, Other dialysate ions remains stable, and no crystallization occurs at these concentrations

3. Fleet is a cheap & safe source of phosphate for enrichment of dialysate in routine & extended HD

Ebah et al Blood purification 2012
Buttonhole

- AKA “Constant-site cannulation”
- Described in 1977 (Hospital for Miners, Poland)

- Cannulation:
  - Same spot
  - Same angle
  - Same depth
  - EVERY TIME

Scar tissue tunnel tract develops
DO’S AND DON’T’S OF BUTTONHOLING
Scrupulous Hand Hygiene for patient

1. BEFORE scab removal, area to be needled, clean with chlorhexidine or derivative and cleaned again AFTER scab removal for the prescribed time. Allow time to dry.

2. Establish exactly where each scab is and remove using the plastic pick provided with the blunt needle.

3. Use a separate pick for each scab (don’t re-use on second scab).

4. Avoid using needles/sharp instrument as this fragments the scab thereby risking pushing scab into fistula. This can cause infection.

5. Ensure the WHOLE of the scab has been removed (ideally in a single piece).

6. Sharp needling into exactly the same point, at the same angle, in the same direction, must take place for 6-9 sessions. After this a blunt needle must be used. Blunt needle at times can be used at session 4; the insertion of the needle will glide smoothly down the track. If more than 12 session, give serious consideration of starting a new site (as more will create an area puncture effect which is undesirable).

7. Use correct length of blunt needle- 1” for normal depth fistula and 1¼ ” for deep fistulas.

8. If you still can’t use a blunt needle DO NOT UNDER ANY CIRCUMSTANCES use a sharp needle in the same place. Doing so will destroy the buttonhole track and cause aneurysm/false tracks/bleeding or infection.

9. If you need to use a sharp needle you MUST needle ½ inch above or below buttonhole site.

10. Document method you have used in notes and on patients’ needling record; drawing/photographs of needle placement are helpful.

11. If a needle has to be withdrawn from a track (trampolining/blind track, etc.) for any reason - discard and use a new needle. NEVER reinsert.
• **Q: What mechanism will you use for stock-take and delivery of supplies to the patients home?**

Examples: arranged by the dialysis company provider, or as an extension of hospital stores. The usual case is for the dialysis vendor to provide this service.

• **Q: In the case of using the dialysis vendor’s systems, how will this be incorporated into the contract?**

Which party is liable for charges related to non-standard deliveries?

Examples: special deliveries when a patient’s
Similarly, who will be liable for extra delivery services for patients that require more frequent deliveries?

- For example, some patients need weekly deliveries of supplies, due to highly restricted storage space in a small home.

In the case of the program providing this service, consideration should be given to the costs of stockpiling supplies and providing personnel and equipment to accept incoming orders from patients, and to coordinate the delivery service.
• **Q: Waste management/disposal in the community: are there any local council restrictions?**

• If there are special disposal rules for spent dialysis supplies, then the costs of recovering and disposing of waste items needs to be considered.

• **Q: Who will pay for the home utilities including heating, power, and water?**

• Examples: patients, NHS

• **Q: How will maintenance of the dialysis equipment be performed?**

• Consider both routine and urgent maintenance (when equipment has failed). Will maintenance be provided on-site in the patient’s home, or will the equipment be swapped? If on-site maintenance is planned, will it be provided by the equipment vendor or by the program? If by the vendor, then the terms of this service must be clear, and incorporated into the contract.
• If by the program, then the program must provide sufficient technical personnel, as well as a stockpile of parts, and a method of transporting both equipment and technicians to the patient’s home.

• The program will need to maintain a pool of extra dialysis machines and water treatment systems to cover the eventuality of malfunctioning equipment that cannot be repaired in a timely manner, and needs to be swapped for working equipment.

• If equipment is to be swapped for routine and urgent maintenance, then several factors need to be considered:
  – How will equipment be packaged and delivered? Consider both the replacement equipment being delivered to the patient, as well as the existing equipment being returned to the program. What types of delivery service guarantees will need to be in place (eg. Timeliness of delivery, weekends as well as weekdays, care for fragile equipment)?

A pool of extra equipment will need to be in place to allow for timely replacement of equipment in patient’s home.
Electricals

Plumbing – water supply, pressure Rx softeners, carbon

Waste drain – angle

Floor set up - ? Leaks

Running Costs
Non dialysis factors influencing Dialysis Outcomes

- Pre-ESRD care under Nephrologist
- CKD education influences modality selection
- Access at start of Dialysis
  - PD catheter = AVF/AVG and > HD Catheter
- Modality driven by patient or physician choice
- Residual Renal function, transition factors
- Size of the dialysis Program!

Knowledge – Care Gap (implementation issue)
Combining clinical and cost benefit

*Up to 40% savings on Home HD*

<table>
<thead>
<tr>
<th></th>
<th>Home Dialysis</th>
<th>In Centre - MRI dialysis</th>
<th>In Centre - Satellite dialysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Type I</td>
<td>18,904</td>
<td>32,233</td>
<td>37,716</td>
</tr>
<tr>
<td>Cost Type II</td>
<td>26,289</td>
<td>40,145</td>
<td>45,629</td>
</tr>
</tbody>
</table>

Projected costs ££s per patient per year by modality in 2011

Financial report 2010 (Manchester Business School project)

Dialysis capacity with substantial cost avoidance

£0.66-0.96 million per year  Overall benefit ~ £5m
FHN SDHD Study

Co-primary endpoint:
1-year mortality and, for survivors, change in LVM

RESULTS: Statistical significant improvement
Switch to longer dialysis, 3/week

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Longer session time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea clearance</td>
<td>Enhanced</td>
</tr>
<tr>
<td>Blood flow</td>
<td>Typically lower</td>
</tr>
<tr>
<td>Volume</td>
<td>Lower UF rate, greater sodium loss</td>
</tr>
<tr>
<td>Smaller difficult toxins</td>
<td>Phosphate, homocysteine</td>
</tr>
<tr>
<td>Larger Toxins</td>
<td>Sulfate, phenols, uric acid, and middle molecules (Leptin)</td>
</tr>
<tr>
<td>Bicarbonate</td>
<td>Improved acidosis correction</td>
</tr>
</tbody>
</table>
Prescribing frequent therapy at home

<table>
<thead>
<tr>
<th>Parameter</th>
<th>3X week HD</th>
<th>6X week HD</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sessions per week</td>
<td>3</td>
<td>6</td>
<td>+ 100%</td>
</tr>
<tr>
<td>Hours per session</td>
<td>&gt; 2.5 hrs</td>
<td>1.5 – 2.75 hrs</td>
<td>- 33%</td>
</tr>
<tr>
<td></td>
<td>Median = 3.5</td>
<td>Median = 2.4</td>
<td></td>
</tr>
<tr>
<td>Max time between HD sessions</td>
<td>68.5 hours</td>
<td>45.6 hours</td>
<td>- 33%</td>
</tr>
<tr>
<td>Avg. interdialytic interval</td>
<td>52.5 hours</td>
<td>25.6 hours</td>
<td>- 51%</td>
</tr>
<tr>
<td>Hours HD per week (5th – 95th percentile)</td>
<td>10.5 (9.0 – 13.1)</td>
<td>14.2 (11.5 – 16.5)</td>
<td>+ 35%</td>
</tr>
</tbody>
</table>
Three times a week HD
Kt/V 1.65 v 1.25
No overall outcome benefit
Summary

- Unique stand alone SC units—Prestwich longest serving in modern times with a high patient turnover 152 pts, 15 yrs experience

- Favourable outcomes and patient experience

- Major support for HHD programmes

- Clinical co-morbidities, technical and service delivery challenges in SCHD

- Modern SC programme need to integrate well with mainstream HD provision and being fit for purpose
Dealing with transition to ICHD

8 March 2011 12:31

Dear Sandip,

Briefly WD was transferred from HHD to Prestwich, however as he was initially grossly fluid overloaded he came back to the training unit for several weeks using our step down facility where he should have been able to dialyse himself independently.

Not safe at Home

His motivation is low at present and he has had some niggling family issues and alcohol related problems (though always stable on dialysis). I have suggested that rather than return to Prestwich self care unit, in centre dialysis would offer him the support he needs currently.

Failed Prestwich
FHN SDHD Study

Co-primary endpoint:
1-year mortality and, for survivors, change in PHC

RESULTS: Statistical significant improvement
Dialysis modality considerations

• Tailored for Patient characteristic (Clinical factors)

• Provide the highest value – High efficiency therapy

• Balancing health gain with minimal disruption to patient lives (Human factors)
20 February 2014 16:33

Subject: Prestwich patient needing move to RDU

Deteriorated with EF 11%

Importance: High

Prestwich, 18 months SCHD @Prestwich

Deteriorated with EF 11%

I have spoken to JT, and had a long conversation with his wife. Their feelings are that he will feel much safer in the hospital MHD setting with medical staff on hand, should he become unwell.

JT has really been struggling with self care in recent weeks, mainly due to side effects of very poor cardiac function. I have spoken to JT, and had a long conversation with his wife. Their feelings are that he will feel much safer in the hospital MHD setting with medical staff on hand, should he become unwell.

His feelings are that he will feel much safer in the hospital MHD setting with medical staff on hand, should he become unwell. The House Keepers and the other patients have been concerned about him during his time at the unit since Christmas... we will put in as much extra support as we can to limit JT's exertion in relation to self care, but if his symptoms worsen he may need to come in via A/E.

In his words, "quote..."

9th November 2014, on his own request, he was retrained, step down and repatriated to SCHDF where he continues to self-dialyse.
In-Center Hemodialysis Six Times per Week versus Three Times per Week

The FHN Trial Group

<table>
<thead>
<tr>
<th>Main Secondary Outcomes</th>
<th>Effect Measure</th>
<th>Estimated Standardized Effects (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV mass</td>
<td>Mean decrease</td>
<td></td>
</tr>
<tr>
<td>Physical-health composite score</td>
<td>Mean increase</td>
<td></td>
</tr>
<tr>
<td>Beck Depression Inventory score</td>
<td>Mean decrease</td>
<td></td>
</tr>
<tr>
<td>Predialysis albumin</td>
<td>Mean increase</td>
<td></td>
</tr>
<tr>
<td>Predialysis phosphorus</td>
<td>Mean decrease</td>
<td></td>
</tr>
<tr>
<td>ESA dose</td>
<td>Mean decrease in log</td>
<td></td>
</tr>
<tr>
<td>Predialysis systolic blood pressure</td>
<td>Mean decrease</td>
<td></td>
</tr>
<tr>
<td>Trail Making Test Part B</td>
<td>Negative log relative risk</td>
<td></td>
</tr>
<tr>
<td>Death or hospitalization unrelated to vascular access</td>
<td>Negative log hazard ratio</td>
<td></td>
</tr>
</tbody>
</table>

FHN: NEJM 2011