Is Home HD better than PD or is it all Case Mix Differences?

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Objectives

- To review studies comparing outcomes with PD vs. home HD (and their limitations)
- To discuss the importance of patient choice in modality selection
- To discuss an integrated home dialysis model
What modalities are we comparing?

- Conventional HD vs. PD
- Home HD vs. PD
Are modality comparisons fair?

What are “case mix differences”? Some patient populations are just different, and this can’t easily be adjusted for in observational studies:

- Eg. Comorbidities, adherence to treatment, socioeconomic status, etc...
What is the outcome of interest?

- Mortality?
- Hospitalization?
- Technique failure?
- Quality of life?
Mortality: PD vs. HHD (incident patients)

Marshall et al, AJKD 2013
4709 patients in NZ (2000-2010)

Nadeau-Fredette et al, CJASN 2015
10,710 PD patients and 706 HHD patients in ANZDATA (2000-2012)
Mortality: PD vs. HHD

Limitations

- Did not quantify how HHD was delivered (frequency, # of hours)
- 85% of home HD patients had AVF (Marshall et al, AJKD 2013)
- Very different patient populations!
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Peritoneal Dialysis (n=10,710)</th>
<th>Home Hemodialysis (n=706)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>62 (50, 71)</td>
<td>50 (42, 58)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Men</td>
<td>6082 (57)</td>
<td>531 (75)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>White</td>
<td>7389 (69)</td>
<td>590 (84)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>1236 (12)</td>
<td>47 (7)</td>
<td></td>
</tr>
<tr>
<td>Aboriginal/Torres Strait Islander</td>
<td>601 (6)</td>
<td>7 (1)</td>
<td></td>
</tr>
<tr>
<td>Maori</td>
<td>899 (8)</td>
<td>33 (5)</td>
<td></td>
</tr>
<tr>
<td>Pacific Peoples</td>
<td>468 (4)</td>
<td>24 (3)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>117 (1)</td>
<td>5 (1)</td>
<td></td>
</tr>
<tr>
<td>Primary kidney disease</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Chronic/immune</td>
<td>2662 (25)</td>
<td>273 (39)</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>3739 (35)</td>
<td>126 (18)</td>
<td></td>
</tr>
<tr>
<td>Hypertension/renovascular</td>
<td>1526 (14)</td>
<td>47 (7)</td>
<td></td>
</tr>
<tr>
<td>Polycystic kidney disease</td>
<td>593 (6)</td>
<td>132 (19)</td>
<td></td>
</tr>
<tr>
<td>Reflux</td>
<td>338 (3)</td>
<td>39 (6)</td>
<td></td>
</tr>
<tr>
<td>Other/unknown</td>
<td>1852 (17)</td>
<td>89 (13)</td>
<td></td>
</tr>
<tr>
<td>Cigarette use (current)</td>
<td>1458 (14)</td>
<td>85 (12)</td>
<td>0.23</td>
</tr>
<tr>
<td>Comorbidities at dialysis entry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic lung disease</td>
<td>1606 (15)</td>
<td>54 (8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Coronary disease</td>
<td>4060 (38)</td>
<td>122 (17)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Periphery vascular disease</td>
<td>2585 (24)</td>
<td>61 (9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>1594 (15)</td>
<td>32 (5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Diabetes</td>
<td>4648 (43)</td>
<td>159 (23)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>&lt;20</td>
<td>823 (7)</td>
<td>32 (5)</td>
<td></td>
</tr>
<tr>
<td>20–24.9</td>
<td>3451 (32)</td>
<td>177 (25)</td>
<td></td>
</tr>
<tr>
<td>25–29.9</td>
<td>3712 (35)</td>
<td>248 (35)</td>
<td></td>
</tr>
<tr>
<td>≥30</td>
<td>2682 (25)</td>
<td>243 (33)</td>
<td></td>
</tr>
<tr>
<td>Late referral (&lt;3 months)</td>
<td>2128 (20)</td>
<td>45 (6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>eGFR</td>
<td>7.5 (5.6–9.9)</td>
<td>7.5 (5.8–9.4)</td>
<td>0.59</td>
</tr>
</tbody>
</table>

Nadeau-Fredette, CJASN 2015
Mortality: PD vs. HHD (prevalent patients)

- Propensity matched cohort study (USRDS 2006-2010)
  - compared 4201 new daily HHD patients vs. 4201 new PD patients
  - HHD patients used NxStage System with 5-6 treatments/week
  - Mean time from ESRD to home dialysis initiation ~44 months

Weinhandl et al, AJKD 2016
When all patients analyzed, mortality was lower with daily HHD vs. PD (HR 0.8).

When a subset of patients with ESRD duration < 6 months was analyzed, the survival difference disappeared.

Weinhandl et al, AJKD 2016
Limitations

- Matching is unlikely to reduce confounding attributable to unmeasured factors
- In order to get matched patients, >90% of PD patients were removed from the analysis – populations are fundamentally different
Mortality: PD vs. HHD (prevalent patients)

- Propensity matched cohort study (USRDS 2004-2011)
  - compared 2,688 HHD patients vs. 2,688 PD patients
  - Home HD defined as ≥5 days/week for ≥1.5 h/day
  - Mean duration of ESRD 2.4 years
  - Primary endpoint - mortality

Mortality: PD vs. HHD

- Better survival with HHD
- This was persistent regardless of ESRD duration
Limitations

- Prevalent patients - 2/3 of matched patients started on PD > 1 year after ESRD onset
- >95% of PD patients were excluded
Figure 5. Comparative risk of mortality in intensive HD versus PD.
Meta-analysis of mortality in PD vs. HHD

Table 8. GRADE Evidence Profile Table: Effects of Intensive HD Compared With PD in Patients on Chronic HD.

<table>
<thead>
<tr>
<th>Quality assessment</th>
<th>Intensive HD</th>
<th>PD</th>
<th>Relative (95% CI)</th>
<th>Absolute (95% CI)</th>
<th>Quality</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of studies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mortality 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study design</td>
<td>Observational studies</td>
<td>Serious</td>
<td>Serious</td>
<td>Not serious</td>
<td>Not serious</td>
<td>None</td>
</tr>
</tbody>
</table>

Note. HD = hemodialysis; PD = peritoneal dialysis; CI = confidence interval; HR = hazard ratio.

*Concern for lack of matching on prognostic factors and adjustment in statistical analysis.

**I² = 91% for pooled effect estimate, with unexplained heterogeneity possibly due to study design and population.

*Absolute event counts not provided, precluding estimation of absolute event rates.
Hospitalization: PD vs. HHD

Weinhandl et al

- 8% lower risk for all-cause hospitalization with HHD vs. PD
- Fewer days spent in hospital with HHD vs. PD (RR 0.81)
- Lower rate of hospitalization for CVD with HHD (RR 0.85)
- Lower rate of hospitalization for infection with HHD (RR 0.89), but more bacteremia/sepsis with HHD (RR 1.18)
- However, among those with ESRD onset < 6 months, this difference in hospitalization between modalities disappeared

Weinhandl et al, AJKD 2016
Hospitalization: PD vs. HHD

- Matched cohort study comparing 1,116 daily HHD patients to 2,784 PD patients (USRDS data)
  - Fewer hospitalizations with HHD (HR 0.73)
  - Fewer days in hospital (5 vs. 9 days per patient-year)

Suri et al, KI 2015
Technique failure: HHD vs. PD

- Weinhandl study: 37% lower risk with HHD
- Nadeau-Fredette study: 66% lower with HHD
- Suri study: PD patients 3.4x more likely to return to in-center HD than HHD patients

Weinhandl et al, AJKD 2016
Nadeau-Fredette, CJASN 2015
Suri et al, KI 2015
Quality of life: PD vs. HHD

- Single center, cross-sectional study comparing quality of life between PD and HHD
  - Using the KDQOL, no difference in the kidney disease component summary, physical component summary, and the mental component summary between the two groups
  - Trend toward better sexual function in the nocturnal HHD group
  - Less social support in nocturnal HHD patients vs. PD
  - No difference with respect to the Beck Depression Index
  - No difference in total illness intrusiveness score

Fong et al, CJASN 2007
“In clinical practice, modality choice should be individualized with the aim of maximizing quality of life, patient-reported outcomes, and achieving patient-centered goals. Expected survival is often irrelevant to modality choice…Patients care more about how they will live instead of how long.”

Lee and Bargman, CJASN 2016
What if we considered the different home modalities as complimentary and not in competition?

CLINICAL OUTCOME OF HOME HEMODIALYSIS IN PATIENTS WITH PREVIOUS PERITONEAL DIALYSIS EXPOSURE: EVALUATION OF THE INTEGRATED HOME DIALYSIS MODEL

Annie-Claire Nadeau-Fredette, Joanne M. Bargman, and Christopher T. Chan

Toronto General Hospital – University Health Network, University of Toronto, Toronto, Ontario, Canada
Integrated home dialysis model

Direct transition or transition through other RRT modalities (CHD/transplant/PD)

Chronic kidney disease

Peritoneal dialysis

Kidney transplantation

In-center hemodialysis

Direct transition or transition through CHD

n=13

n=13

n=9

Direct transition or transition through transplant

Home hemodialysis with PD exposure
n=35

Home hemodialysis without PD exposure
n=172

Nadeau-Fredette et al, PDI 2015
Patients with prior PD exposure had longer dialysis vintage (12.3 vs. 0.9 years) and higher Charleston comorbidity index.

Despite this, patient survival and technique survival was similar in the 2 groups.

Nadeau-Fredette et al, PDI 2015
Integrated home dialysis model

Original Articles

Outcomes of integrated home dialysis care: a multi-centre, multi-national registry study

Annie-Claire Nadeau-Fredette¹,²,³, Christopher T. Chan⁴, Yeoungjee Cho¹,²,⁵, Carmel M. Hawley¹,²,⁵, Elaine M. Pascoe⁶, Philip A. Clayton¹,⁷, Kevan R. Polkinghorne¹,⁸,⁹, Neil Boudville¹,¹⁰, Martine Leblanc³ and David W. Johnson¹,²,⁵

Nadeau-Fredette et al, NDT 2015
Conclusions

- Observational data suggests better patient survival and technique survival, and fewer hospitalizations with HHD compared to PD.
- However, the populations being studied are inherently different, which can lead to important bias and residual confounding.
- Quality of life is comparable between PD and HHD, and such patient-centered outcomes may be more relevant to patients who are trying to choose a modality.
- PD and HHD are not mutually exclusive – PD prior to HHD is not associated with worse outcomes than HHD alone.