Assisted Peritoneal Dialysis

BC Kidney Days
Vancouver, BC

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University of Toronto
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Declaration

- Co-inventor of the Dialysis Measurement Analysis and Reporting (DMAR) system
- Some of the data presented is derived from DMAR
Objectives for the talk

- To describe the key components of home care assisted PD
- To provide a framework for understanding PD utilization
- To apply this framework to explain how assisted PD may increase PD utilization
Key components of assisted PD

- **Target pop:** Patients with barriers to self-care (elderly)
- **Assistants:** Nurses or nursing assistants
- **Tasks:** Assessments, machine set-up, connection, disconnection
- **Funding:** Home agencies, PD programs +/- Vendors
Cost considerations

- Periods of assistance and rate during the periods
- Number of assistants distributed over the patients
- Training and monitoring costs
- Maintaining critical mass
- Catchment area
Cost – variable periods of support
Cost – mean rate of visits per time on PD

Annual cost of PD = $34,919  
Annual cost of HD = $66,353  
Additional operating cost of $12,000 per patient-year at $50.00 per visit (all RNs)

**Figure 1 | Weekly rate of home care nursing visits.** The rate of home care visits is indicated in the total PD population living in the region of home care assistance (solid line) and the subgroup of patients who received assistance at some point (dashed line). The home rate was stable over time and below the maximum rate available, which were 14 visits per week.

<table>
<thead>
<tr>
<th>Country</th>
<th>PD Use (%)</th>
<th>GDP per Capita (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>18%</td>
<td>$51,689</td>
</tr>
<tr>
<td>United States</td>
<td>7%</td>
<td>$49,601</td>
</tr>
<tr>
<td>Mexico</td>
<td>66%</td>
<td>$10,514</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>66%</td>
<td>$36,218</td>
</tr>
</tbody>
</table>


PD use among prevalent patients

NEW PD PATIENTS → PD → LOSS OF PD PATIENTS

TIME ON PD
Patient start on PD through six steps

1. Identify new patients
2. Assess for PD eligibility
3. Eligible for PD
4. Patient chooses PD
5. PD catheter insertion
6. PD Start

Time on PD

Loss of PD Patients
Patients leave PD through four mechanisms:

- Technique Failure
- Death
- Transplantation
- Transfer out of region
Resulting in 10 primary drivers of PD utilization

- Identify new patients
- Assess for PD eligibility
- Eligible for PD
- Patient chooses PD
- PD catheter insertion
- PD Start
- Technique Failure
- Death
- Transplantation
- Transfer out of region
Assisted PD likely affects 3 of these drivers

- Identify new patients
- Assess for PD eligibility
- Eligible for PD
- Patient chooses PD
- PD catheter insertion
- PD Start
- Technique Failure
- Death
- Transplantation
- Transfer out of region
PD eligibility – Three secondary drivers

- Incident ESRD Patients
- Potential PD Candidates
- Eligible for PD

Contraindications to PD

Barriers to self-care PD not overcome by support in the home
PD eligibility – Barriers to self care PD

N = 940 consecutive patients across 3 programs who were assessed for PD and did not have a medical or social contraindication identified (unpublished data)

<table>
<thead>
<tr>
<th>Category</th>
<th>Types</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical</td>
<td>Strength, Dexterity, Vision, Hearing, immobility, frailty</td>
<td>41%</td>
</tr>
<tr>
<td>Cognitive</td>
<td>Dementia, psychiatric illnesses, anxiety, non-compliance, language barriers, learning disabilities</td>
<td>37%</td>
</tr>
<tr>
<td>Social</td>
<td>Caregiver burden</td>
<td>NA</td>
</tr>
</tbody>
</table>
Table 2 | Eligibility, choice, and use of PD according to availability of home care

<table>
<thead>
<tr>
<th></th>
<th>Region with home care</th>
<th>Region with no home care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>83</td>
<td>51</td>
</tr>
<tr>
<td>Age, median</td>
<td>75(^a)</td>
<td>66</td>
</tr>
<tr>
<td>Male, (N) (%)</td>
<td>42 (51)(^b)</td>
<td>35 (68)</td>
</tr>
<tr>
<td>Predialysis care, (N) (%)</td>
<td>60 (74)</td>
<td>21 (78)</td>
</tr>
<tr>
<td>Hospital start, (N) (%)</td>
<td>29 (57)</td>
<td>35 (42)</td>
</tr>
<tr>
<td>Conditions acting as</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

| Eligible for PD, \(N\) (%)   | 66 (80)\(^c\)         | 33 (65)                  |
| Choose PD if they were eligible, % | 39 (59)      | 19 (58)                  |
| Received PD as chronic modality | 39 (47)      | 19 (37)                  |

\(^a\)\(^P\)=0.02.
\(^b\)\(^P\)=0.04.
\(^c\)\(^P\)=0.06 compared to region with no home care (unadjusted); \(P=0.01\) adjusted for differences in age, sex, predialysis care, and number of conditions acting as barriers to PD between the regions.
Assisted PD – Technique survival

- Identify new patients
- Assess for PD eligibility
- Eligible for PD
- Patient chooses PD
- PD catheter insertion
- PD Start
- Technique Failure
- Death
- Transplantation
- Transfer out of region
Traditional PD technique survival

75% at 2 years

Death, transplant, and transfer out are CENSORED
Technique survival – French PD registry

<table>
<thead>
<tr>
<th>Event per Type of Assistance</th>
<th>6 Months</th>
<th>12 Months</th>
<th>18 Months</th>
<th>24 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-PD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>death</td>
<td>1.8</td>
<td>3.8</td>
<td>5.4</td>
<td>7.2</td>
</tr>
<tr>
<td>renal recovery</td>
<td>0.6</td>
<td>1.0</td>
<td>1.1</td>
<td>1.3</td>
</tr>
<tr>
<td>transfer to HD</td>
<td>6.6</td>
<td>12.4</td>
<td>17.2</td>
<td>21.5</td>
</tr>
<tr>
<td>renal transplantation</td>
<td>4.4</td>
<td>12.2</td>
<td>19.1</td>
<td>24.7</td>
</tr>
<tr>
<td>Assisted PD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>death</td>
<td>13.8</td>
<td>24.3</td>
<td>32.5</td>
<td>39.8</td>
</tr>
<tr>
<td>renal recovery</td>
<td>0.7</td>
<td>1.1</td>
<td>1.3</td>
<td>1.4</td>
</tr>
<tr>
<td>transfer to HD</td>
<td>6.1</td>
<td>9.5</td>
<td>12.7</td>
<td>15.0</td>
</tr>
<tr>
<td>renal transplantation</td>
<td>0.3</td>
<td>0.7</td>
<td>0.9</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Data are expressed as percentages. PD, peritoneal dialysis; HD, hemodialysis.

Table 6. Cause-specific relative hazard and subdistribution relative hazard associated with assisted PD (event of interest: transfer to hemodialysis)

<table>
<thead>
<tr>
<th>Assistance</th>
<th>Cause-Specific RH (95% CI)</th>
<th>Subdistribution RH for HD (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Death</td>
<td>Recovery</td>
</tr>
<tr>
<td>Family-assisted PD (reference group: nurse and self-care PD)</td>
<td>2.23 (1.97–2.53)</td>
<td>0.72 (0.40–1.31)</td>
</tr>
<tr>
<td>Nurse-assisted PD (reference group: family and self-care)</td>
<td>2.18 (1.96–2.42)</td>
<td>0.74 (0.48–1.13)</td>
</tr>
<tr>
<td>Assisted PD (reference group: self-care PD)</td>
<td>2.19 (1.98–2.43)</td>
<td>0.73 (0.49–1.10)</td>
</tr>
</tbody>
</table>

Adjusted for age, sex, modified Charlson comorbidity index, underlying nephropathy, failed transplantation, transfer to hemodialysis, early peritonitis, and center size. RH, relative hazard; CI, confidence interval; HD, hemodialysis; PD, peritoneal dialysis.

Technique survival - peritonitis

- Verger et al (France) – 1 per 36 months (similar to self-care, worse than family assisted PD)
- Xu et al (China) – 1 per 55 months (no difference between assisted and self-care PD)
- Hsieh (Taiwan) – 1 per 24 months (higher than family assisted or self-care PD)
Assisted PD as rescue or palliation

- Assisted PD has been described as salvage therapy in patients who have exhausted vascular access or those who are too hemodynamically unstable for hemodialysis (e.g. severe CHF)
- Some patients may choose assisted PD over palliation if incenter HD is the only other option
The 10 primary drivers of PD utilization

- Identify new patients
- Assess for PD eligibility
- Eligibility - 65% to 80%
- Patient chooses PD
- PD catheter insertion
- PD Start
- Technique Failure +15%
- Death – ? effect
- Transplantation
- Transfer out of region
Indirect arguments for assisted PD

- The utilization of assisted PD is high if it is available.
Indirect arguments for assisted PD: Only home dialysis modality that targets an elderly population

Assisted PD patients are much older than self-care patients

<table>
<thead>
<tr>
<th></th>
<th>Self-care (N=44)</th>
<th>Assisted (N=61)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean</td>
<td>63</td>
<td>74</td>
</tr>
<tr>
<td>Diabetes, %</td>
<td>50</td>
<td>53</td>
</tr>
<tr>
<td>Coronary artery disease, %</td>
<td>25</td>
<td>51</td>
</tr>
<tr>
<td>Congestive heart failure, %</td>
<td>23</td>
<td>38</td>
</tr>
<tr>
<td>Other cardiac, %</td>
<td>25</td>
<td>44</td>
</tr>
<tr>
<td>Peripheral vascular disease, %</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>Cerebrovascular disease, %</td>
<td>5</td>
<td>21</td>
</tr>
<tr>
<td>History/active cancer, %</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td>12 months of predialysis care, %</td>
<td>68</td>
<td>75</td>
</tr>
<tr>
<td>eGFR at start, ml/min, mean</td>
<td>8.1</td>
<td>12.9</td>
</tr>
</tbody>
</table>

Sunnybrook Data, unpublished
What is not known about assisted PD

- The effect of implementing assistance on PD utilization at a program, regional, or national level.
- Whether the added cost of implementing and maintaining an assisted program is “paid back” from increasing PD utilization.
- The effect of assisted PD compared to self-care PD on other important outcomes such as hospitalization and mortality adjusted for the significant differences in the populations.
PD program survival

- Identify new patients
- Assess for PD eligibility
- Eligible for PD
- Patient chooses PD
- PD catheter insertion
- PD Start

- Technique Failure
- Death
- Transplantation
- Transfer out of region
PD program survival – a sobering look

75% at 2 years

50%
Home care assisted PD allows elderly patients with barriers to self-care the option to receive dialysis in their home. This benefits shifts home dialysis up the age demographic.

The availability of assistance likely increases PD eligibility, reduces technique failure and may extend life by offering patients a dialysis option when in-center HD is not possible.

Assistance is widely used if offered.

Continued research is required to better define the cost utility of assisted PD and outcomes on assisted PD.
Partners

ICES Institute for Clinical Evaluative Sciences

Sunnybrook Health Sciences Centre

Halton Healthcare

MaRS

Programme manitobain des maladies rénales

London Health Sciences Centre

St. Michael’s
Inspired Care. Inspiring Science.

The Ottawa Hospital

L'Hôpital d'Ottawa

Alberta Health Services

Hospital Soldiers’ Memorial