ESRD Modalities: Questions for 2011 and Beyond
Disclosures

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  – Liberty Dialysis (Consultant)
  – Fresenius (Consultant)
  – Amgen (Consultant)
  – AMAG (Consultant)
  – Genzyme (Consultant)
  – Abbott (Consultant)
  – Nephrian (Consultant)
Objectives: “Just the Facts on Modalities”

- Review Epidemiology in End Stage Renal Disease Modalities: Worldwide and United States
- Understand the Implications of the New Bundled Environment for Policy and Implementation of Best Practices
- Review the current Medical Literature on Modalities
- Predict the Potential Trends for Modalities for this Decade
Question one: What is the Worldwide Experience with Renal Replacement Therapy?
Geographic variations in the incidence (per million population) of ESRD, 2008

Data presented only for those countries from which relevant information was available. All rates are unadjusted. Data from Bangladesh, Brazil, Czech Republic, Japan, Luxembourg, & Taiwan are dialysis only. Latest data for Hungary are for 2007. Data for France include 18 regions in 2008. USRDS 2010
Incident rates per million population of reported ESRD in 2008

<table>
<thead>
<tr>
<th>Location</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morelos (Mexico)</td>
<td>557</td>
</tr>
<tr>
<td>Jalisco (Mexico)</td>
<td>400</td>
</tr>
<tr>
<td>Taiwan</td>
<td>384</td>
</tr>
<tr>
<td>United States</td>
<td>362</td>
</tr>
<tr>
<td>Japan (dialysis only)</td>
<td>288</td>
</tr>
<tr>
<td>Canada</td>
<td>164</td>
</tr>
<tr>
<td>France</td>
<td>146</td>
</tr>
<tr>
<td>Australia</td>
<td>116</td>
</tr>
<tr>
<td>Location</td>
<td>Percentage</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Morelos (Mexico)</td>
<td>59.8%</td>
</tr>
<tr>
<td>Malaysia</td>
<td>55.8%</td>
</tr>
<tr>
<td>Jalisco (Mexico)</td>
<td>54.6%</td>
</tr>
<tr>
<td>United States</td>
<td>43.8%</td>
</tr>
<tr>
<td>Canada</td>
<td>34.2%</td>
</tr>
<tr>
<td>France</td>
<td>22.5%</td>
</tr>
<tr>
<td>Australia</td>
<td>34%</td>
</tr>
</tbody>
</table>
Prevalent rates per million population of reported ESRD in 2008

<table>
<thead>
<tr>
<th>Country</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taiwan</td>
<td>2,311</td>
</tr>
<tr>
<td>Japan</td>
<td>2,126</td>
</tr>
<tr>
<td>United States</td>
<td>1,752</td>
</tr>
<tr>
<td>Canada</td>
<td>1,096</td>
</tr>
<tr>
<td>France</td>
<td>1,052</td>
</tr>
<tr>
<td>Australia</td>
<td>803</td>
</tr>
</tbody>
</table>
### Percentage of dialysis patients by modality in 2008

<table>
<thead>
<tr>
<th>Country</th>
<th>In center</th>
<th>Peritoneal</th>
<th>Home HD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taiwan</td>
<td>90.7%</td>
<td>9.3%</td>
<td>0%</td>
</tr>
<tr>
<td>Japan</td>
<td>96.9%</td>
<td>3.1%</td>
<td>0.04%</td>
</tr>
<tr>
<td>United States</td>
<td>92%</td>
<td>7%</td>
<td>1%</td>
</tr>
<tr>
<td>Canada</td>
<td>78.3%</td>
<td>18.4%</td>
<td>3.3%</td>
</tr>
<tr>
<td>France</td>
<td>87.8%</td>
<td>10.9%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Australia</td>
<td>68.6%</td>
<td>22%</td>
<td>9.4%</td>
</tr>
<tr>
<td>New Zealand</td>
<td>48.1%</td>
<td>36%</td>
<td>15.6%</td>
</tr>
</tbody>
</table>
What is happening concerning renal replacement modalities in the US?
NxStage Growth 2004 to 2008

- NxStage Daily Patients
- NxStage HT Centers

<table>
<thead>
<tr>
<th>Year</th>
<th>Daily Patients</th>
<th>HT Centers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>45</td>
<td>8</td>
</tr>
<tr>
<td>2005</td>
<td>295</td>
<td>70</td>
</tr>
<tr>
<td>2006</td>
<td>1022</td>
<td>174</td>
</tr>
<tr>
<td>2007</td>
<td>2223</td>
<td>334</td>
</tr>
<tr>
<td>2008</td>
<td>3100</td>
<td>400</td>
</tr>
</tbody>
</table>
Home Hemodialysis Patients in US 2008

- **Home Hemodialysis patients in US 2008**: 4332
- **Conventional HD**: 3130
- **Home SDHD**: 882
- **Nocturnal Home HD**: 220
- **Nocturnal Home HD > 5/W**: 100

Categories:
- Home Hemodialysis patients in US 2008
- Conventional HD
- Home SDHD
- Nocturnal Home HD
- Nocturnal Home HD > 5/W
December 31 point prevalent ESRD patients; excludes those with unknown modality. Rates adjusted for age, gender, & race. USDRS 2010
Estimated prevalent patient counts in US by dialysis modality 12-31-10

- Dialysis patients: 408262
- In center: 375601
- Peritoneal: 28578
- Home Hemo: 5726
Will the bundle change where we are going?
“WE BELIEVE THAT BY PROVIDING ONE BASIC PAYMENT RATE UNDER THE ESRD PPS FOR BOTH PD AND HD, FACILITIES WILL HAVE A POWERFUL FINANCIAL INCENTIVE TO ENCOURAGE THE USE OF HOME PD AMONG DIALYSIS PATIENTS WHERE FEASIBLE”

DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR MEDICARE & MEDICAID SERVICES, 42 CFR PART 410, 413 AND 414, [CMS-1418-F], RIN 0938-AP57; PAGE 448
The Bundle: Payment for home HD

• The bundle rule did not change the rules on payment by CMS for hemodialysis treatments at home

• The rule still states that CMS will pay for three treatments per week, more with medical justification
The Bundle: Payment for PD

- PD will continue to be paid for at the in-center HD equivalent rate
- “Because we want to encourage home dialysis, in which PD is currently the prevailing mode of treatment, we are proposing an ESRD PPS which does not rely on separate payment rates based on modality. By establishing prospective payment rates that are higher for PD patients ..... we believe home dialysis will be encouraged for patients able to use PD.”
Annual Dialysis Patient Medicare Expenditure 2008: PD vs. in-center HD

USRDS 2010 Annual Data Report Volume 2 Figure 11.7
# Dialysis Costs per “Treatment Equivalent”

<table>
<thead>
<tr>
<th></th>
<th>CAPD</th>
<th>CCPD</th>
<th>NxStage</th>
<th>In Center HD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmaceuticals</td>
<td>21.10</td>
<td>21.10</td>
<td>24.63</td>
<td>63.30</td>
</tr>
<tr>
<td>ESAs</td>
<td>15.27</td>
<td>15.27</td>
<td>22.42</td>
<td>41.02</td>
</tr>
<tr>
<td>Salaries &amp; Benefits</td>
<td>26.68</td>
<td>26.68</td>
<td>26.68</td>
<td>65.70</td>
</tr>
<tr>
<td>Medical Supplies</td>
<td>66.36</td>
<td>92.62</td>
<td>112.25</td>
<td>27.11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>114.14</strong></td>
<td><strong>140.40</strong></td>
<td><strong>163.55</strong></td>
<td><strong>156.11</strong></td>
</tr>
</tbody>
</table>
The Bundle: Home modalities training

• Reimbursement for home dialysis training is included in the final rule

• $33 additional per training treatment

• 25 training sessions for home HD, 15 for PD
Home Dialysis Technician

- Phlebotomy, lab processing, and scheduling
- PET and Kt/V collections and tracking
- Supply and inventory management
- Patient scheduling and assessments
- Combined clinical and secretarial functions for small facilities
Modality Outcomes?
Five-year survival of patients commencing treatment in 1999-2003, by modality & primary diagnosis
Patient survival (Propensity-matched): 6,337 matched patient pairs from USRDS database

<table>
<thead>
<tr>
<th>Time (months)</th>
<th>PD</th>
<th>HD</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 months</td>
<td>85.8%</td>
<td>80.7%</td>
</tr>
<tr>
<td>24 months</td>
<td>71.1%</td>
<td>68.0%</td>
</tr>
<tr>
<td>36 months</td>
<td>58.1%</td>
<td>56.7%</td>
</tr>
<tr>
<td>48 months</td>
<td>48.4%</td>
<td>47.3%</td>
</tr>
</tbody>
</table>

Weinhandl et al JASN 21: 499-506, 2010
A randomized trial of PD vs. conventional HD

Survival of patients randomized to HD and PD

Randomized study of nocturnal vs. conventional HD

- 52 patients randomized to conventional in-center HD or 5-6 nights per week nocturnal HD
- Primary outcome: Change in LV mass by MRI after 6 months

<table>
<thead>
<tr>
<th></th>
<th>LV Mass g/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nocturnal HD</td>
</tr>
<tr>
<td>Baseline</td>
<td>92.4 (26.6)</td>
</tr>
<tr>
<td>Exit</td>
<td>85.3 (23.2)</td>
</tr>
<tr>
<td>Change</td>
<td>-7.1 (12.4)</td>
</tr>
</tbody>
</table>

NIH FHN Study

- Short daily HD study
  - 6 days per week in-center vs. 3 days per week in-center

- Nocturnal HD study
  - 6 nights per week in the home vs. 3 days per week in-center.

- Each study needed to randomize 250 patients
  - Short daily study randomized 245 patients
  - Nocturnal study randomized 87 patients
NIH Study Results

- Each study had 2 combined end-points
  - Mortality plus decreased LV mass
  - Mortality plus improvement in Physical Health Component of the SF-36 Health Survey
- Short daily was positive for both end-points ($p < 0.001$ and $p = 0.007$)
- Given the failure to achieve the required patient enrollment, no conclusions can be made from the nocturnal study
Co-primary Outcome: Death or change in LV mass

A  Death or Change in LV Mass

- Hazard ratio, 0.61 (95% CI, 0.46–0.82)
- P<0.001

- Frequent hemodialysis
- Conventional hemodialysis
Co-primary Outcome: Death or change in PHC score

B Death or Change in PHC Score

- Hazard ratio, 0.70 (95% CI, 0.53–0.92)
- P=0.007

- Conventional hemodialysis
- Frequent hemodialysis

Survival (mo)

Change in PHC Score among Survivors

Patients with Better Outcome (%)
### Secondary Outcomes

#### C Main Secondary Outcomes

<table>
<thead>
<tr>
<th>Outcome</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>
FREEDOM Study


• Designed to examine the impact of changing from conventional HD or PD to 6x/week home HD using the NxStage HD machine
• Cohort study of 500 patients starting NxStage 6x/week HD (Medicare as primary insurance carrier)
• Dose of dialysis with NxStage was targeted to be a single pool daily KT/V of 0.5, which corresponds to a standardized KT/V of 2.1 per week for each patient
• Standard medical parameters monitored
• Follow-up of at least 12 months
FREEDOM STUDY

• Hospitalizations and costs tracked
• Hospitalizations and costs to be compared to matched HD patients treated thrice-weekly in 10:1 ratio (n=5,000) from the USRDS database
• Focus on quality of life issues measuring a variety of parameters/domains at baseline, 4 months, 12 months and then at 6-month intervals
Time-To-Recovery (N=55: pts for whom enrollment & month 4 & month 12 data are available)

TTR Lindsay: CJASN 1:952,2006: conventional HD: 375 minutes

P < 0.0001 by ANOVA
FREEDOM SUMMARY

• Significant Improvement in post treatment recovery time

• Significant improvements in depressive symptoms

• Significant improvement in validated quality of life parameters

• Significant Reduction in Mortality Risk
Conclusion

• There is suggestive evidence that the outcome with frequent HD is superior to that of PD

• A definitive conclusion would require a randomized controlled trial
ESRD Modalities: Questions for 2011 and Beyond