Important Lessons from the DOPPS:
Implications for quality improvement
Budapest Nephrology School
August 29, 2008
Outline

1) General Aspects of Quality of Health Care
2) Quality of Dialysis Care
3) Measuring Dialysis care
4) DOPPS data
5) The Davita Quality Index
6) The DOPPS derived Practice Risk Score
7) PRS and DSI
To Err is Human
Building a Safer Health Care System (I of M 1999)

- Estimated 44,000 to 98,000 deaths per year in USA due to errors in hospital care
  - That is about 100 deaths per day who die from injuries caused by care, and not from disease

- Serious medication errors occur in 7 of 100 hospital admissions
Quality in the USA

- Only 50% of patients receive recommended preventive care
- 70% receive recommended acute care
- 30% receive contraindicated care

Institute of Medicine, 2001

Between the health care we have and the care we could have lies not just a gap, but a chasm.
Crossing the Quality Chasm: A New Health Care System for the 21st Century

- Institute of Medicine, 2001
- New system must be evidence based
- New system is driven by quality in all aspects
- A systems oriented approach to health care delivery
Goals

- Safety
  - Rather than being an individual responsibility, safety should be considered as a system and built into all policies

- Effective
- Patient centeredness
- Timely
- Efficient
- Equity
Changes

- Improved use of information systems
  - Supports QI, research, education, and accountability
  - Eliminate handwritten notes by 2010
- Utilization of multidisciplinary teams
- Guidelines
- Performance and outcome measures to improve quality and accountability
- Reimbursement methods may be barriers to change
The yawning chasm between what we know and what we do for patients is no longer news; indeed, the repeated evidence is somewhat numbing. We are far less sure what to do next.

S Jencks
Dialysis remains a half way technology

- Survival is only 1/3 that of age adjusted peers
- Quality of life is compromised
  - Modalities are burdensome
- Morbidity remains high
- All modern methods are imperfect
- Funding for innovation is difficult to secure
- Moving expensive new ideas from research to practice is difficult
  - Eg. Funding of home HD
Our primary challenge:
Dialysis growth leads to impersonal care

- Small units that deliver personalized, individualized care may be ideal
- HR crisis makes this impossible
- Units will grow larger and therefore more impersonal with time
- But, bigger units have better patient outcomes
DOPPS

• Longitudinal study of HD patients and practices in 12 countries

• Conducted in three phases: I (1996-2001); II (2002-2004); III (started in 2005; currently ongoing)

• Represents ~ 70% of the global HD population

• Wide variety of data collected both from health care providers and patients

• **Goal:** Identify HD practice patterns associated with improved outcomes to improve patient longevity
Japan (60 facilities)

Australia & New Zealand (20 facilities)

Canada & US (120 facilities)

Europe (140 facilities)

Randomly selected after stratification by unit type and region
<table>
<thead>
<tr>
<th>Feature</th>
<th>Controlled Trials</th>
<th>Observational Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of hypotheses</td>
<td>Usually only 1 or 2</td>
<td>Many</td>
</tr>
<tr>
<td>Cost per hypothesis</td>
<td>Very high</td>
<td>Low to moderate</td>
</tr>
<tr>
<td>Sample size</td>
<td>Often marginal</td>
<td>Less restricted</td>
</tr>
<tr>
<td>Study of poor treatment</td>
<td>Ethically not feasible</td>
<td>Feasible via representative sample study</td>
</tr>
<tr>
<td>Study of medications</td>
<td>Ideally suited</td>
<td>Confounding by indication*</td>
</tr>
<tr>
<td>Study of trends</td>
<td>Limited</td>
<td>Feasible</td>
</tr>
<tr>
<td>Causality</td>
<td>Yes (for positive findings)†</td>
<td>Correlation, suggestive only</td>
</tr>
<tr>
<td>Representativeness</td>
<td>Limits due to selection criteria</td>
<td>Feasible</td>
</tr>
<tr>
<td>Statistical adjustment</td>
<td>Usually not required</td>
<td>Always required</td>
</tr>
</tbody>
</table>

*Results showing benefit associated with medication use despite this confounding are of great interest
†Negative findings may be difficult to interpret because high cost usually limits the sample size

Port FK and Eknoyan G. *Am J Kidney Dis* 44:S1-S6, 2004
Searching for needles in haystacks
Serum Phosphorus Distributions

Among Patients on HD > 180 days

Box-plots with weighted 5th, 25th, median, 75th, 95th percentiles by country and phase of DOPPS. Horizontal lines indicate these percentiles for serum phosphorus: 5th=3.0 mg/dL; 25th=4.3 mg/dL; 50th=5.4 mg/dL; 75th=6.5 mg/dL; 95th=8.7 mg/dL for the overall DOPPS study sample (n=25,375).

BE= Belgium, FR=France, GE=Germany, IT=Italy, SP=Spain, SW=Sweden, UK=United Kingdom, ANZ=Australia-New Zealand, JA=Japan, CA=Canada, US=United States

Tentori et al. AJKD 2008
Mortality Risk by Phosphorus Categories

Among Patients on HD > 180 days

Cox models used all DOPPS (n=25,529) and adjusted for age, sex, race, BMI, years on ESRD, 13 comorbid conditions, facility clustering. Hazard ratios and 95% confidence intervals (whiskers) for all-cause (events n=5,857) and cardiovascular mortality (n events=1,930)

Tentori et al. AJKD 2008
Facility-Level Phosphorus and All-cause Mortality
Among Patients on HD > 180 days

Hazard ratios and 95% confidence intervals (whiskers) for all-cause (events n=5,857) and cardiovascular mortality (events n=1,930). Models (n=20,561) were stratified by study phase and region and adjusted for facility clustering effect; baseline patient age, sex, race, BMI, time on ESRD, 13 comorbid conditions, hemoglobin, albumin, normalized protein catabolic rate, single-pool Kt/V, prior parathyroidectomy, and vitamin D prescription; the percentage of patients at a facility with serum calcium <8.5, 8.6-10, and >10 mg/dL; and the percentage of patients at a facility with serum PTH ≤100, 101-300, 301-600, and >600 pg/mL.

Tentori et al. AJKD 2008
Box-plots with weighted 5th, 25th, median, 75th, 95th percentiles by country and phase of DOPPS. Horizontal lines indicate these percentiles for PTH: 5th=28 pg/mL; 25th=83 pg/mL; 50th=177 pg/mL; 75th=342 pg/mL; 95th=831 pg/mL for the overall DOPPS study sample (n=25,375).

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Tentori et al. AJKD 2008
Prevalence of Cinacalcet Use, by Country: DOPPS 3

DOPPS 3 (2005-2007), prevalent cross-section (n=8224).

Unpublished DOPPS data
MBD Medication Use Before vs After Cinacalcet Therapy is Initiated: DOPPS 3

 Patients (%)

Unpublished DOPPS data

Cinacalcet use before and after initiation:
- **Before**: 100%
- **After**: 62% at 12 Mo

Other medications:
- **Sevelamer**
  - 40% at 4 Mo, 42% at 8 Mo, 44% at 12 Mo

- **Vitamin D**
  - 63% at 4 Mo, 60% at 8 Mo, 58% at 12 Mo

- **Calcium-Phosphorus Binder**
  - 40% at 4 Mo, 45% at 8 Mo, 46% at 12 Mo

**n=306** DOPPS III patients at time of initiating cinacalcet therapy AND having follow-up data for at least 8 months **AFTER** cinacalcet initiation
Serum PTH Levels Before vs After Initiation of Cinacalcet Therapy: DOPPS 3

Unpublished DOPPS data

Patients (%)

Before 4 Mo 8 Mo During After Initiation Initiation

S. PTH Level

>500

301-500

150-300

<150

n=306 DOPPS III patients at time of initiating cinacalcet therapy AND received cinacalcet for at least 8 months AFTER cinacalcet initiation
Serum Phosphorus Levels Before vs After Initiation of Cinacalcet Therapy: DOPPS 3

Unpublished DOPPS data

Patients (%)

Unpublished DOPPS data

Before 4 Mo 8 Mo During After Initiation Initiation

S. PO₄ Level

Before Initiation During 4 Mo 8 Mo After Initiation

n=306 DOPPS III patients at time of initiating cinacalcet therapy AND received cinacalcet for at least 8 months AFTER cinacalcet initiation
Serum Calcium* Levels Before vs After Initiation of Cinacalcet Therapy: DOPPS 3

n=306 DOPPS III patients at time of initiating cinacalcet therapy AND received cinacalcet for at least 8 months AFTER cinacalcet initiation; *albumin-corrected
Serum PTH Levels Before vs After Initiation of Vitamin D Therapy: DOPPS 3

Unpublished DOPPS data

n=786 DOPPS III patients at time of initiating vitamin D therapy AND received vitamin D for at least 8 months AFTER initiating Vitamin D therapy.
Serum Phosphorus Levels Before vs After Initiation of Vitamin D Therapy: DOPPS 3

Patients (%)

<table>
<thead>
<tr>
<th></th>
<th>Before Initiation</th>
<th>During Initiation</th>
<th>4 Mo After Initiation</th>
<th>8 Mo After Initiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. PO$_4$ Level</td>
<td>12.2</td>
<td>10.1</td>
<td>11.1</td>
<td>10.8</td>
</tr>
<tr>
<td>&gt;5.5</td>
<td>50.6</td>
<td>51.5</td>
<td>50.5</td>
<td>51.5</td>
</tr>
<tr>
<td>3.5-5.5</td>
<td>38.4</td>
<td>38.4</td>
<td>38.4</td>
<td>37.7</td>
</tr>
<tr>
<td>&lt;3.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

n=786 DOPPS III patients at time of initiating vitamin D therapy AND received vitamin D for at least 8 months AFTER initiating Vitamin D therapy.
Serum Calcium* Levels Before vs After Initiation of Vitamin D Therapy: DOPPS 3

Unpublished DOPPS data

Patients (%)

Before 4 Mo 8 Mo During After Initiation

S. Ca Level

0 25 50 75

16.4 14.1 13.9 55.1

<8.4 8.4-9.5 =>9.5

Before During 4 Mo 8 Mo

Initiation After Initiation

n=786 DOPPS III patients at time of initiating vitamin D therapy AND received vitamin D for at least 8 months AFTER initiating Vitamin D
What is Continuous Quality Improvement (C.Q.I.)?

1. Identify an Opportunity for Improvement
   - Collect Data
   - Form Team
   - Define problem/goal

2. Test Solution
   - Brainstorm possible causes
   - Select causes(s) to investigate
   - Validate the issues from the analysis through data
   - Understand practice variations

3. Implement and Track Results
   - Select one cause to impact
   - Design protocol
   - Implement on a pilot basis
   - Collect and analyze data
   - Evaluate outcomes: if positive design standardized method

4. Review Strengths and Weaknesses
   - Brainstorm possible causes
   - Select causes(s) to investigate
   - Validate the issues from the analysis through data
   - Understand practice variations

5. Select Solution
   - Select one cause to impact
   - Brainstorm possible solutions
   - Research potential improvements, practice guidelines, expert opinions
   - Select Best Solution

6. Implement and Track Results
   - Standardize process
   - Measure to ensure success
   - Perform post-assessment
What is PDCA?

A Simple, Effective Approach to Get to the Source of Process Problems

Plan: Develop a Plan to Improve
- Identify the opportunity for improvement
- Document the present process
- Create a vision of the improved process
- Define the scope of the improvement effort

Do: Carry out the Plan
- Pilot the proposed changes on a small scale, with customers and over time

Act: Adjust the process, based on new knowledge
- Operationalize the new mix of resources
- Repeat the Cycle on the next opportunity

Check: Study the Results
- Observe what you learned about the improvement of the process

Repeat the Cycle on the next opportunity
QUALITY

The race for quality has no finish line—so technically it’s more like a death march.

www.despair.com
CQI Approaches (1)
Focus on individuals

Probability Distribution

Performance Curve
Practice Pattern or Outcome

Name, Blame, Shame
BLAME

The Secret to Success is Knowing Who to Blame for Your Failures.
CQI Approaches (2)
Focus on the team, the system, and the process of care

Probability Distribution

Performance Curve
Practice Pattern or Outcome

Mean t1
Mean t2
Where are we at?

Toddler Stage

baby in womb  baby  child  teenager  adult  pensioner

NB: Most hospital departments and other specialty areas are at the infant stage.
Evolution

Operational                                Strategic

Quality Control

Quality Assurance

Total Quality

Integrated Management System

Prevention

Detection

Inspection and correction

Operational

Strategic

Perry and associates
Continuous Improvement Drivers

- Leadership & Planning
- Patient Focus
- People Management
- Process Management
- Results (Levels and Trends)
Optimization of Renal Care

Focus on the team
Improve the process of care

Renal Delivery System

CQI
Data
Guidelines
Federal Express

Error rate is 1: 1,000,000

What is the error rate in health care or dialysis settings?
The future of dialysis?

We can only manage things better if we think in a different way.
How do we reconcile the empowerment of the autonomous and expert clinician operating within the powerful doctor – patient relationship with the clear imperative to improve hemodialysis care systems and processes in a factory like manner?

Perhaps by quantifying patient satisfaction and psychosocial elements of care

Mendelssohn and Benaroia. NDT March 2008
Lessons from the US Dialysis Industry

- 1990 – for profit facilities were felt to compromise quality of care for cost containment
- 1995 – for profit chains take control
- 2005 – Davita buys Gambro
- 2006 – Fresenius buys RCG
- 2006 – DSI enters the picture
  - For profit chains are now leading the industry in CQI
  - Independents cannot invest in software and infrastructure, cannot achieve economies of scale and are a doomed species
Standard Quality Indicators

- Kt/V or URR
- Hemoglobin
- Calcium and phosphorus

- Most units can report on these at least
- Some can report on more than this
- These are unidimensional, and do not tell the whole story about quality in a facility
Quality of Care in the USA

15 years ago, America recognized that mortality outcomes were poor, and there was concern that quality was compromised by the for profit industry.

Dramatic change has occurred:

- Annual facility reports
- ESRD networks mandated to improve care
- Self interest of providers
-USRDS report, CPM report
Quality in the USA

- Information flows to and from facilities, chains, networks, USRDS and to the public
- This is mandated and linked to reimbursement
- Public accountability
  - [www.cms.hhs.gov/dialysisfacilitycompare](http://www.cms.hhs.gov/dialysisfacilitycompare)
- Objective evidence of success
  - Fistula first initiative
  - KDOQI
  - DOPPS
Some is not a number,
Soon is not a time

DM Berwick
2006 ANNUAL REPORT
ESRD CLINICAL PERFORMANCE MEASURES PROJECT

OPPORTUNITIES TO IMPROVE CARE FOR IN-CENTER HEMODIALYSIS AND PERITONEAL DIALYSIS PATIENTS

JANUARY 2007

Data on adult and pediatric in-center hemodialysis patients are from October–December 2005.

Data on adult and pediatric peritoneal dialysis patients are from October 2005–March 2006.
USRDS

- 2007 report is published
- 12 chapters, one entirely devoted to quality indicators, with 51 slides
- Trends since 1991
- 2007 reports focuses on anemia management, HbA1C, lipids, diabetic eye exams, comprehensive diabetic care, vaccinations, vascular access
- Another whole chapter on CVD
Mean monthly hemoglobin & mean EPO dose per week

Period prevalent dialysis patients with EPO claims; monthly hemoglobin includes all claims with a hematocrit value between 10 & 50; weekly EPO dose includes all claims for patients with an average number of administrations per month of ≤ 20. EPO doses prior to are adjusted for inpatient days.
Guidelines should not be set into stone!
DaVita Clinical Outcomes – Adequacy

% of Patients with Kt/V < 1.2

2003 national average was 11%
DaVita Clinical Outcomes – Anemia Mgmt

% of Patients with Hct < 33

2003 national average was 24%

2001: 21%
2002: 18%
2003: 16%
2004: 14%
DaVita Clinical Outcomes – Phosphorous

% of Patients with Phosphorous >6.0

2002: 42%
2003: 39%
2004: 35%
DaVita Fistula Access
DaVita Quality Index (DQI)

Function of:
- Kinetics (Kt/V)
- Anemia (Hgb x 3)
- Albumin
- Phosphorous
- PTH
- Mortality (SMR)
- Vascular Access

Emphasis on Aggregation of Standardized Measures
DaVita Quality Index Formula

1. Kinetics (Kt/V) – 20 points
   • % above 1.4 less below 1.2
2. Anemia (Hgb x 3) – 20 points
   • % above 33 less below 33
3. Albumin – 15 points
   • % above 4.0 less below 3.0
4. Phosphorous – 15 points
   • % below 6.0 (*15) less above 8.0 (*10)
5. PTH – 15 points
   • % below 300 less above 800
6. Mortality (SMR) – 5 points
   • 1 minus SMR
7. Vascular Access – 10 points
   • 1 minus % catheters, no score if >50% catheters
   90 days in the system
DaVita DQI Trajectory

DaVita Quality Index Score

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2-02</td>
<td>54.1</td>
</tr>
<tr>
<td>Q3-02</td>
<td>54.9</td>
</tr>
<tr>
<td>Q4-02</td>
<td>56.4</td>
</tr>
<tr>
<td>Q1-03</td>
<td>57.8</td>
</tr>
<tr>
<td>Q2-03</td>
<td>57.2</td>
</tr>
<tr>
<td>Q3-03</td>
<td>60.2</td>
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<tr>
<td>Q4-03</td>
<td>62.2</td>
</tr>
<tr>
<td>Q1-04</td>
<td>63.9</td>
</tr>
<tr>
<td>Q2-04</td>
<td>61.0</td>
</tr>
<tr>
<td>Q3-04</td>
<td>66.5</td>
</tr>
<tr>
<td>Q4-04</td>
<td>67.4</td>
</tr>
</tbody>
</table>
58 poorest performing facilities with DQI < 45, SMR 1.04, were closely monitored.
**A summary of the DaVita Quality Index (DQI) scoring system**

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Formula</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kt/V</td>
<td>(% ≥1.4 x 15) minus (% &lt;1.2 x 15)</td>
<td>= points earned of 15 possible</td>
</tr>
<tr>
<td></td>
<td>– Weighting reduced from 20 points</td>
<td></td>
</tr>
<tr>
<td>Hgb x3</td>
<td>(% ≥33 x 15) minus (% &lt;33 x 15)</td>
<td>= points earned of 15 possible</td>
</tr>
<tr>
<td></td>
<td>– Weighting reduced from 20 points</td>
<td></td>
</tr>
<tr>
<td>PTH</td>
<td>(% 50-150 x 15) minus (% ≥400 x 15)</td>
<td>= points earned of 15 possible</td>
</tr>
<tr>
<td></td>
<td>– Range adjusted (&lt;300 or &gt; 800)</td>
<td></td>
</tr>
<tr>
<td>Phosphorus</td>
<td>(% ≤6.0 x 20) minus (% ≥8.0 x 10)</td>
<td>= points earned of 20 possible</td>
</tr>
<tr>
<td></td>
<td>– Increased weighting from 15 points</td>
<td></td>
</tr>
<tr>
<td>Albumin</td>
<td>(% ≥4.0 x 10) minus (% &lt;3.0 x 10)</td>
<td>= points earned of 10 possible</td>
</tr>
<tr>
<td></td>
<td>– Weighting reduced from 15 points</td>
<td></td>
</tr>
<tr>
<td>SMR</td>
<td>(1 – SMR) x 5</td>
<td>= points earned of 5 possible</td>
</tr>
<tr>
<td>CVC</td>
<td>(1 – % CVC) x 10 plus (1 + % FIS)x10</td>
<td>= points earned of 20 possible</td>
</tr>
<tr>
<td></td>
<td>– Rewards for fistulas are added, increased weighting from 10 points</td>
<td></td>
</tr>
</tbody>
</table>

*if %CVC is ≥50%, then 0 points are scored*
Davita Quality Index
Strengths

- I love the concept!
- An index to describe quality
- An environment that nurtures and rewards staff based on quality
- Used in > 600 facilities
- Allows for sequential internal and external comparisons
- It seems to work well as a driver of CQI, and improved patient outcomes
Davita Quality Index
Weaknesses

- I hate the execution of it!
  - Many of the formulas and targets are arbitrary, opinion based and counterintuitive
  - Only based loosely on KDOQI
  - SMR should not be part of it, SMR may be a tool for validation

- We can do better!
I have no doubt that technically, we could reduce injuries to patients by 99% or more, saving tens of thousands of lives every year. But the changes required to get there are so profound that most hospitals and clinics will not find their own way.

DM Berwick
Amgen Canada Nephrology CQI Advisory Committee

- D. Mendelssohn (Chair)
- A. Levin
- K. Jindal
- G. Mortis
- G. Pylypchuk
- K. Bernstein
- L. Moist
- S. Soroka
- P. Magner
- C. Delziel
- M. Leblanc
- B. Barrett
- K. Yeates
- M. Vasilevsky
- M. MacKinnon
- M. Benaroia
- D. Churchill Jr, L. Boyle (Amgen)

Amgen provides unrestricted funding to support this investigator initiated project
A New Approach

A Practice – Related Risk Score (PRS): A DOPPS Derived Aggregate Quality Index for Hemodialysis Facilities

David C. Mendelssohn, MD, Ronald L. Pisoni, PhD, Charlotte J. Arrington, MPH, Karen E. Yeates, MD, Martine Leblanc, MD, Clement Deziel, MD, Takashi Akiba, MD, PhD, Mahesh Krishnan, MD, Shunichi Fukuhara, MD, Norbert Lameire, MD, Friedrich K. Port, MD, and Robert A. Wolfe, PhD.

NDT advance access
Aggregate Index Development

• Elements should be based on modifiable practices
• Should be measurable
• Should have well defined relationships to outcomes
• Should make sense to busy clinical staff
<table>
<thead>
<tr>
<th>Measures Included in PRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• % patients with Kt/V ≥ 1.2</td>
</tr>
<tr>
<td>• % patients with Hgb ≥ 11 g/dl</td>
</tr>
<tr>
<td>• % patients with Albumin ≥ 4.0 g/dl</td>
</tr>
<tr>
<td>• % patients with catheters</td>
</tr>
</tbody>
</table>

Based on a prevalent cross-section of DOPPS I patients. Also tested but not significant: calcium, phosphorus, calcium-phosphorus product, treatment time, shortened treatments, multivitamin use, vaccination.
Variables examined and rejected

1) calcium
2) phosphorus
3) calcium phosphate product
4) treatment time
5) shortened treatments
6) multivitamin use
7) vaccination
### Table 2: Calculating PRS Based on Facility Model Results

<table>
<thead>
<tr>
<th>Facility Factor</th>
<th>N facilities</th>
<th>RR* Death</th>
<th>Example Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kt/V ≥1.2, 0-40%</td>
<td>15</td>
<td>1.46</td>
<td></td>
</tr>
<tr>
<td>Kt/V ≥1.2, 40-60%</td>
<td>49</td>
<td>1.33</td>
<td>a</td>
</tr>
<tr>
<td>Kt/V ≥1.2, 60-80%</td>
<td>99</td>
<td>1.06</td>
<td></td>
</tr>
<tr>
<td>Kt/V ≥1.2, 80-100%</td>
<td>113</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Hgb ≥11 g/dl, 0-20%</td>
<td>67</td>
<td>1.26</td>
<td></td>
</tr>
<tr>
<td>Hgb ≥11 g/dl, 20-60%</td>
<td>191</td>
<td>1.18</td>
<td></td>
</tr>
<tr>
<td>Hgb ≥11 g/dl, 60-100%</td>
<td>47</td>
<td>1.00</td>
<td>a</td>
</tr>
<tr>
<td>Cath use, 20-100%</td>
<td>61</td>
<td>1.13</td>
<td></td>
</tr>
<tr>
<td>Cath use, 10-20%</td>
<td>63</td>
<td>1.12</td>
<td>a</td>
</tr>
<tr>
<td>Cath use, 0-10%</td>
<td>182</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Alb ≥4.0 g/dl, 0-20%</td>
<td>68</td>
<td>1.18</td>
<td></td>
</tr>
<tr>
<td>Alb ≥4.0 g/dl, 20-40%</td>
<td>87</td>
<td>1.06</td>
<td></td>
</tr>
<tr>
<td>Alb ≥4.0 g/dl, 40-100%</td>
<td>127</td>
<td>1.00</td>
<td>a</td>
</tr>
</tbody>
</table>

Example: Total Score = 1.33 * 1.00 * 1.12 * 1.00 = 1.49

*RRs based on Cox model adjusting simultaneously for all four facility factors and patient age, gender, black race, years with ESRD, 13 summary comorbid conditions, and unit type; analysis was stratified by country, and accounted for facility clustering effects.
Figure 1: Adjusted relative risk of death by quartiles of PRS – DOPPS II

Adjusted for age, gender, race, time on dialysis, 13 summary comorbid conditions, and unit type; stratified by country.

Continuous: RR = 1.05 per 0.1 point higher PRS (p<0.0001)
Figure 2: Design of the facility-based Delta-Delta analysis method

DOPPS I
(1996-2000)

1.5 yr f/up = SMR1

PRS1

DOPPS II
(2002-2004)

1.5 yr f/up = SMR2

PRS2

$\Delta$SMR (SMR2 – SMR1) vs. $\Delta$PRS (PRS2 – PRS1)
Figure 3: Delta-Delta analysis: Decrease in PRS significantly related to decrease in SMR*

- PRS
  - 0.2 point decrease
- All facilities N=119
  - p=0.006
- SMR
  - 0.19 point decrease
  - e.g. SMR 1.0 $\rightarrow$ 0.81

*Restricted to facilities in both DOPPS I and II
Discussion

- Traditional DOPPS results are observational and so are hypothesis generating
  - Critics of DOPPS cite this limitation loudly and frequently
- Delta – delta analysis is a major validation of the DOPPS approach and brings it closer to proving causality
- Simulates an RCT
- Supports a strong link between achieving targets and hard outcomes
Next Steps for PRS?

Improve the PRS
Improve the PRS

Preliminary ideas

- Substitute HD dose/HD treatment time for dose (Pisoni)
- Substitute ESA resistance index (Hb/ESA dose) for Hb (Jindal)
- Incorporate patient satisfaction
- Incorporate depression +/- Q of L
- Incorporate staff satisfaction
- Is delta PRS associated with delta QOL? (Moist)
BWH: A hospital’s balanced scorecard

Service Excellence
- Patient Satisfaction
- Referring MD & Community Satisfaction

Quality & Efficiency of Care
- Operational Efficiency
- Patient & Staff Safety
- Quality Clinical Outcomes
- System Integration & Network Development

Employee Development & Clinical Innovation
- Quality of Work Life
- Clinical Innovation & Research
- Teaching Excellence

Financial Health
- Revenue Enhancement
- Operating Margin
- Expense Control
With Pearl, DSI is ideally positioned to be an industry wide leader in quality of dialysis.

Drs Tannenbaum, Rotstein and Michael are all committed to using the PRS across the chain and in helping to improve it.

ARCH/DOPPS is supporting this new partnership.

The roll out plan for DSI will be coming soon: Stay tuned!
We are 90 years behind Ford, so let's get on with it!

In 1914, the world's first automatic conveyor belt could churn out a car every 93 minutes.
Why waste time learning, when ignorance is instantaneous?