Chronic Kidney Disease in the Elderly Patient: Less May Be More

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Disclosures

• No relevant scientific conflicts of interest
• Part-ownership of dialysis centers
Overview

• Elderly
• Chronic Kidney Disease
• Uremia
• Dialysis
• Paradigm
Outcomes in Elderly Dialysis Patients

• Intuition
  – Older
  – Greater Comorbidity

• Anecdotes
  – Some do very well
  – Some do very poorly

• Evidence
Who is Elderly?

• Elderly?
  – >65
  – >75

• “Extreme” elderly?
  – >80
  – >90
Creatinine Physiology

Production
Dietary
Biosynthesis
• Liver
• Kidney

Bloodstream
Creatine

Active transport of creatine into muscle cell

Creatine Kinase

Phospho-creatine

Creatinine

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Dietary
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Excretion
• Urine
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Dehydration of creatine to creatinine: Physiochemical, non-enzymatic

Creatine

Active transport of creatine into muscle cell

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Creatinine

Excretion
• Urine
• Stool

Dehydration of creatine to creatinine: Physiochemical, non-enzymatic
Plasma Creatinine Concentration

Plasma Cr = $F_x \ [ \text{generation / elimination} \ ]$

- With aging
  - Decreased muscle mass & Cr generation
  - Decreased functional renal mass & GFR
  - Roughly proportional

- Net effect = no change in plasma creatinine concentration
eGFR from Modification of Diet in Renal Disease Study (1997)

\[ eGFR = 186 \times [P_{Cr}]^{-1.154} \times [Age]^{-0.203} \]

x 0.742 if females, x 1.212 if black

- MDRD study
  - Primarily white subjects
  - Mean age of 51 years plus/minus 12.7 years
  - Nondiabetic kidney disease
  - Mean GFR of 40 mL/min per 1.73 m²
MDRD eGFR

– Not well validated in all groups
  • Elderly
  • Malnourished
– Not well validated at all levels of renal function
  • GFR >60 ml/min
  • GFR <15 ml/min
DOPPS Data: Elderly Dialysis

Indications for Dialysis

- Volume overload
- Hyperkalemia
- Metabolic Acidosis

*Not readily controlled by medical & dietary interventions*
Indications for Dialysis: Uremia

- Not high BUN or Creatinine alone
  - “Azotemia”
- Signs & symptoms
  - “Clinical” diagnosis
Uremia in the Elderly

- Kidney Disease
- Depression
- Dementia

- Sleep
- Appetite
- Weight
- Energy
- Cognition
- Sex
Indications for Initiation of Dialysis

• Low GFR alone?
  – Stage-5 CKD
  – eGFR <15 ml/min

• “Early” initiation before severe uremic signs or symptoms
Initiating Dialysis Early And Late “IDEAL” Trial

The NEW ENGLAND JOURNAL of MEDICINE

A Randomized, Controlled Trial of Early versus Late Initiation of Dialysis

Early vs. Late Initiation Dialysis
Cooper, et al. NEJM 2010

- Australia
- Randomized trial
  - 828 patients CKD-5
  - Early initiation
    - eGFR 10-14 ml/min
  - Late initiation
    - eGFR 5-7 ml/min
- Primary outcome
  - Death
Association between estimated glomerular filtration rate at initiation of dialysis and mortality

William F. Clark MD, Yingbo Na MSc, Steven J. Rosansky MD, Jessica M. Sontrop PhD, Jennifer J. Macnab PhD, Richard J. Glassock MD, Paul W. Eggers PhD, Kirby Jackson BSc, Louise Moist MD MSc

• Canadian Retrospective
  – 2001-2007
  – 25,910 patients
• Early versus Late Start Dialysis
  – Early start
    • eGFR > 10.5 ml/min
  – Late start
    • eGFR ≤ 10.5 ml/min
• Outcome measure
  – Death

CMAJ, January 11, 2011, 183(1)
Association between estimated glomerular filtration rate at initiation of dialysis and mortality

CMAJ, January 11, 2011, 183(1)
Early Initiation of Dialysis

• eGFR >10 ml/min
• Multiple studies
  – NO outcome benefit
  – Probably detrimental
• Not specific to elderly
  – Applicable
Dialysis vs. Very Low Protein Diet
Brunori, et al., AJKD 2007

- Randomized trial
  - Dialysis vs.
  - Very Low Protein Diet
    - Vegan
    - 0.3 gm/kg/day
    - Supplemented

- Subjects
  - >70 years old
  - Non-diabetic
  - eGFR 6-7 ml/min
Figure 2. Survival of octogenarians and nonagenarians at dialysis initiation by age group (top), ambulatory status (middle), and number of comorbid conditions (bottom).

Comorbid conditions include:
- Albumin <35 g/L
- Anemia
- Underweight
- Congestive heart failure
- Diabetes
- Ischemic heart disease
- COPD
- Cancer, cerebrovascular disease
- Peripheral vascular disease.
Outcomes in Elderly Nursing Home Patients Starting Dialysis

The New England Journal of Medicine

Original Article

Functional Status of Elderly Adults before and after Initiation of Dialysis

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Subjects:</th>
</tr>
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<tbody>
<tr>
<td>Age (yr)</td>
<td>73.4±10.9</td>
</tr>
<tr>
<td>Estimated glomerular filtration rate (ml/min/1.73 m² of body-surface area)</td>
<td>10.7±4.9</td>
</tr>
<tr>
<td>Albumin (g/dl)</td>
<td>2.9±0.6</td>
</tr>
<tr>
<td>Female sex (%)</td>
<td>60</td>
</tr>
<tr>
<td>Race (%)‡</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>64</td>
</tr>
<tr>
<td>Black</td>
<td>32</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
</tr>
<tr>
<td>Coexisting condition (%)</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>68</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>66</td>
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<tr>
<td>Coronary artery disease</td>
<td>44</td>
</tr>
<tr>
<td>Peripheral vascular disease</td>
<td>37</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>39</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>24</td>
</tr>
<tr>
<td>Cancer</td>
<td>12</td>
</tr>
<tr>
<td>Dementia</td>
<td>22</td>
</tr>
<tr>
<td>Depression</td>
<td>35</td>
</tr>
<tr>
<td>Hemodialysis (vs. peritoneal dialysis) (%)</td>
<td>95</td>
</tr>
<tr>
<td>Hospitalized at initiation of dialysis (%)</td>
<td>69</td>
</tr>
</tbody>
</table>
Figure 2. Change in Functional Status after Initiation of Dialysis.

Data were missing for 549 nursing home residents at 3 months, 696 residents at 6 months, 823 residents at 9 months, and 787 residents at 12 months from the full analytic cohort of 3702 residents.
The Association of Initial Hemodialysis Access Type With Mortality Outcomes in Elderly Medicare ESRD Patients
Jay L. Xue, DVM, PhD, David Dahl, MD, James P. Ebben, BS, and Allan J. Collins, MD
Survival in dialysis patients with systolic heart failure, 2010–2011

USRDS 2012 Figure 4.28 (Volume 2)

January 1, 2009 point prevalent dialysis patients, diagnosed with heart failure in 2009, & surviving & staying on the same modality for all of 2009.
High Cost and Low Survival Rate in High Comorbidity Incident Elderly Hemodialysis Patients

Yi-Ting Lin¹,³, Ping-Hsun Wu²,⁴, Mei-Chuan Kuo²,⁵, Ming-Yen Lin², Tzu-Chi Lee³, Yi-Wen Chiu²,⁵, Shang-Jyh Hwang²,⁵, Hung-Chun Chen²,⁵

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Table 1. Basic demographics and characteristics of incident elderly hemodialysis patients.

<table>
<thead>
<tr>
<th></th>
<th>N, mean</th>
<th>%, SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>79.9</td>
<td>3.9</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75-79</td>
<td>6,342</td>
<td>59.0</td>
</tr>
<tr>
<td>80-84</td>
<td>3,210</td>
<td>29.8</td>
</tr>
<tr>
<td>85-89</td>
<td>1,000</td>
<td>9.3</td>
</tr>
<tr>
<td>≥90</td>
<td>207</td>
<td>1.9</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>4,982</td>
<td>46.3</td>
</tr>
<tr>
<td>Female</td>
<td>5,777</td>
<td>53.7</td>
</tr>
</tbody>
</table>
Survival vs. Age

Log rank $p < 0.001$

- 75-79
- 80-85
- 86-89
- $>=90$

survival probability vs. follow-up years
Survival vs. Comorbidity Index

Log rank $p < 0.001$
Elderly Dialysis Patients
Survival vs. Comorbidity & Age

Figure 2. Increase mortality with increased age and CCI in incident elderly hemodialysis cohort. The bars represent hazard ratios by age group and CCI.
Hospitalization Days by Age & Comorbidity Index
Hospitalization Cost by Age & Comorbidity Index

Total hospitalization cost

Age

- 75-79
- 80-84
- 85-89
- ≥90

Comorbidity Index Levels:
- ≤3
- 4-6
- 7-9
- ≥10
Dialysis in the Elderly: Conclusion

- Older & sicker patients with ESRD have poor outcomes with dialysis treatment
How to Approach Dialysis in Elderly Patients

- **Educate:** Patient, family, providers
  - Realistic goals & expectations, data
- **Plan:** Avoid “crashing” into dialysis
  - Establish AV access for hemodialysis
  - Avoid venous catheter access
- **Promote** peritoneal dialysis when suitable
- **Manage** uremia “conservatively” as long as safely possible
  - No advantage of early dialysis initiation
Who may not benefit from initiation of dialysis?

- Nursing home
- Dementia
- Non-ambulatory
- Multiple advanced comorbidities
  - CHF
Dialysis in the Elderly: What is the end-game?

- “Trial” of dialysis
- Withdrawal from dialysis
  - Soon if no benefit
  - Later when advanced comorbidities
- Palliative care
Is 90 the new 60?