Identifying Symptoms Clusters among Pediatric Chronic Kidney Disease Patients Using PROMIS® Computer Adaptive Tests

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SYMPTOM CLUSTERS

• A symptom cluster is two or more co-occurring, inter-related symptoms

• Symptoms may have additive or interactive effects that exacerbate impact on HRQOL

• Cluster-based management: May intervene on multiple symptoms that share a biological mechanism

CHRONIC KIDNEY DISEASE

• Progressive, chronic illness leading to kidney failure

• Associated with multiple physical and mental symptoms
PEDIATRIC PROMIS - CKD

• Large study to develop and validate multi-dimensional set of item banks for children and parent proxies
• Data collected from 384 pediatric CKD patients, aged 8-17 in the Midwest Pediatric Nephrology Consortium
  – Mean Age= 13 (range: 8-17)
  – 42% female
• Item banks developed using rigorous PROMIS multi-stage approach
• Scored on T-score metric (mean = 50, SD = 10), and higher scores indicate more of the measured construct
  – Referenced to the general US population
• Administered as computer adaptive tests
STUDY OBJECTIVES

• Use multiple statistical approaches to identify symptom clusters in pediatric CKD patients using PROMIS CAT scores
PROMIS PEDIATRIC DOMAINS

- Mobility
- Upper Extremity Function
- Fatigue
- Depression
- Anxiety
IDENTIFYING SYMPTOM CLUSTERS

• Modeled SCs at the domain level using two statistical approaches:
  – Bifactor exploratory analysis (oriented toward correlations among symptoms)
  – Latent profile analysis (oriented towards identifying profiles of patients in which symptoms co-occur)

• Each PROMIS domain T-score was entered into each model.
BIFACTOR EFA

Gen

DEP
0.8
0.9
0.5
0.4
0.5

ANX

FAT

UE

MOB

F1
0.6

F2
0.4

F3
-0.5
-0.5

Omega Hierarchical: 0.72
Explained Common Variance: 0.67
LATENT CLASS ANALYSIS

Vuong-Lo-Mendell-Rubin Likelihood Ratio Test for 2 vs. 3 classes, p<0.002
CONCLUSIONS & NEXT STEPS

• PROMIS CATs are a clinically-feasible method for determining whether pediatric CKD patients experience high vs. low symptom burden.

• Symptom Clusters were identified with PROMIS CAT scores by characterizing patients with severity-based profiles.

• Additional research will model symptoms longitudinally and causally to determine symptom relationships.
Thank you!

Questions?
# PROMIS DOMAIN T SCORES

<table>
<thead>
<tr>
<th></th>
<th>Mobility</th>
<th>Upper Extremity</th>
<th>Fatigue</th>
<th>Anxiety</th>
<th>Depression</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>51.5</td>
<td>50.1</td>
<td>47.3</td>
<td>45.8</td>
<td>46.3</td>
</tr>
<tr>
<td><strong>Standard Deviation</strong></td>
<td>8.3</td>
<td>8.3</td>
<td>9.1</td>
<td>10.8</td>
<td>10.9</td>
</tr>
<tr>
<td><strong>Minimum</strong></td>
<td>15.1</td>
<td>25.8</td>
<td>24.0</td>
<td>31.6</td>
<td>31.7</td>
</tr>
<tr>
<td><strong>25th percentile</strong></td>
<td>46.1</td>
<td>43.9</td>
<td>45.9</td>
<td>35.9</td>
<td>35.5</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>52.3</td>
<td>52.4</td>
<td>50.0</td>
<td>44.6</td>
<td>45.1</td>
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<tr>
<td><strong>75th percentile</strong></td>
<td>58.5</td>
<td>57.5</td>
<td>50.0</td>
<td>52.5</td>
<td>54.3</td>
</tr>
<tr>
<td><strong>Maximum</strong></td>
<td>61.5</td>
<td>61.9</td>
<td>75.9</td>
<td>84.8</td>
<td>81.6</td>
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</tbody>
</table>
## DOMAIN CORRELATIONS

<table>
<thead>
<tr>
<th></th>
<th>Mobility</th>
<th>Upper Extremity</th>
<th>Fatigue</th>
<th>Anxiety</th>
<th>Depression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobility</td>
<td>1.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Upper Extremity</td>
<td>0.44</td>
<td>1.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Fatigue</td>
<td>-0.36</td>
<td>-0.30</td>
<td>1.0</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Anxiety</td>
<td>-0.48</td>
<td>-0.37</td>
<td>0.48</td>
<td>1.0</td>
<td>-</td>
</tr>
<tr>
<td>Depression</td>
<td>-0.43</td>
<td>-0.32</td>
<td>0.50</td>
<td>0.72</td>
<td>1.0</td>
</tr>
</tbody>
</table>
## SYMPTOM CLUSTERS

<table>
<thead>
<tr>
<th>Class</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1</td>
<td>High physical function, low emotional distress, low fatigue</td>
</tr>
<tr>
<td>Class 2</td>
<td>Average physical function, low emotional distress, average fatigue</td>
</tr>
<tr>
<td>Class 3</td>
<td>Poor phys function, high emotional distress, average fatigue</td>
</tr>
</tbody>
</table>