Measuring and assessing health literacy in the early years

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Outline of Talk

• Assessment of Health Literacy and Numeracy
• Assessing Health Literacy in Younger Children (Parents)
• Assessing Health Literacy in Older Children
• Future Opportunities
What is Health Literacy?

• Health literacy: “the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions”
Components of Literacy

Literacy

Cultural and Conceptual Knowledge

Listening

Speaking

Writing

Reading

Numeracy

Oral Literacy

Print Literacy

IOM, Health Literacy, 2004
Numeracy

- A component of overall literacy
- “The ability to understand and use numbers and math skills in daily life”
- Calculations, deduction/logic, interpretation of graphs/labels, time, probability, etc.

Rothman et al, J Health Comm, 2009
Numeracy vs Literacy

- Highly correlated with literacy, but not perfect

Calvin and Hobbs, Bill Watterson, Universal Press Syndicate, Released on: Friday, Oct 10th 1986.
Literacy Measurement in Pediatrics

Consider the 4D’s

• **Development**: Consider the developmental ability of the child, including his or her cognitive, emotional, and physical development.

• **Dependency**: Children depend on parents or other adults for accessing and receiving health care.

• **Differences in Epidemiology**: Children experience a unique pattern of health, illness, and disability that is different from that of adults.

• **Demographics**: Many children are living in poverty and have other socioeconomic issues that may affect their development and health care.

Forrest, Simpson et al. JAMA, 1997
Rothman et al, Pediatrics 2009
Literacy and Child Health

• Approximately 1/3 of adolescents and caregivers have low health literacy
• Approximately 1/3 of younger children (< 8) have literacy levels below grade level
• Limited studies have linked poor caregiver health literacy to worse knowledge, behaviors and outcomes related to child health
• A few small studies have demonstrated poor child literacy is linked to worse health related behaviors

Sanders et al, Archives of Peds, 2007
Assessing Health Literacy in Younger Children (0-8)

• Current health literacy assessment tools are geared towards adults or adolescents
• Adult Tools typically test adult health situations or adult related words
• Most tools assess print literacy (and possibly numeracy) but not other aspects of functional literacy
• Ceiling effects noted with use of current adult literacy tests for parents
• Limited tools available for non-English speaking families
Current Pediatric Health Literacy Tools

• Parental Literacy
  – PHLAT (Pediatric Health Literacy Assessment Test)
  – Parental Diabetes Numeracy Test

• Child Literacy
  – WRAT (Wide Range Achievement Test)
  – Other Literacy assessment tools (ex. Woodcock-Johnson, Burt Reading Test, PIAT, SORT, Key-Math, K-Tea, etc)
Parental Health Literacy Activities Test (PHLAT)

Kumar et al, Academic Pediatrics, 2010
Yin et al, Academic Pediatrics, 2011, in press
## Patient Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Avg or Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of Caregiver (yrs)</td>
<td>25.6</td>
</tr>
<tr>
<td>Latino or Hispanic</td>
<td>11%</td>
</tr>
<tr>
<td>Relationship to Child is Mother</td>
<td>87%</td>
</tr>
<tr>
<td>On WIC</td>
<td>78%</td>
</tr>
<tr>
<td>Education Level ≤ HS</td>
<td>58%</td>
</tr>
<tr>
<td>Adequate Literacy (STOFHLA)</td>
<td>99%</td>
</tr>
<tr>
<td>Numeracy Skills ≤ 8th grade (WRAT)</td>
<td>83%</td>
</tr>
<tr>
<td>Parental Health Literacy Test Score</td>
<td>68%</td>
</tr>
</tbody>
</table>
Reading a Thermometer

• You are told by your baby’s pediatrician to call him if the baby has a temperature of 100.4°F or greater.

• The thermometer looks like the following:

100.2°F

• Should you call the doctor?

  ___ YES
  ___ NO

• Correct Response: 69%
Mixing Formula

- Using the instructions provided on the Enfamil powder formula, how much water and formula would you add to make a 4oz. bottle?
  - Amount of water added: __4__
  - Number of scoops added: __2__
  - Correct Response: 90%

- Using the instructions provided for the Enfamil concentrated formula, how much water and formula would you add to make a 4oz. bottle?
  - Amount of water added: __2__
  - Amount of concentrate added: __2__
  - Correct Response: 47%
At your baby’s 2-month follow-up appointment, her doctor tells you that according to the infant growth curve, she is in the 25th percentile for weight. What does this percentile mean?

a) Out of 100 babies, your baby is bigger than 25 of them.
b) Out of 100 babies, your baby is smaller than 25 of them.
c) Out of 100 babies, your baby is bigger than 75 of them.
d) Out of 100 babies, your baby is bigger than 52 of them.

Correct Response: 51%
## Psychometrics

<table>
<thead>
<tr>
<th></th>
<th>Phlat Full (20 items)</th>
<th>Phlat-10</th>
<th>Phlat-8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Score</strong></td>
<td>68% / 70%</td>
<td>65% / 70%</td>
<td>70% / 75%</td>
</tr>
<tr>
<td><strong>KR – 20</strong></td>
<td>0.76</td>
<td>0.70</td>
<td>0.66</td>
</tr>
<tr>
<td><strong>STOFHLA (r)</strong></td>
<td>0.44</td>
<td>0.41</td>
<td>0.41</td>
</tr>
<tr>
<td><strong>WRAT-STD (r)</strong></td>
<td>0.55</td>
<td>0.54</td>
<td>0.51</td>
</tr>
<tr>
<td><strong>Income (r)</strong></td>
<td>0.33</td>
<td>0.28</td>
<td>0.27</td>
</tr>
<tr>
<td><strong>Education (r)</strong></td>
<td>0.28</td>
<td>0.24</td>
<td>0.27</td>
</tr>
<tr>
<td><strong>PHLAT – Full (r)</strong></td>
<td></td>
<td>0.91</td>
<td>0.87</td>
</tr>
</tbody>
</table>

p < 0.05 for all spearman (r) comparisons
Spanish PHLAT

- 176 Spanish speaking parents of children <3-0 months recruited
- 77% with adequate literacy on TOFHLA, <1% with >9th grade math skills.
- Mean PHLAT-10-Spanish score was 41.6%. KR-20 = 0.51
- PHLAT-10-Spanish correlated with higher years of education (r=0.49), S-TOFHLA (r=0.53) and WRAT-3 (r=0.55) scores (p<0.001 for all)
- 8 item version showed similar characteristics
OTC Cough and Cold Products

- 180 parents of young children at Vanderbilt, UNC, UMiami
- Over 80% would give products to children < 2 yrs of age
- Greatly influenced by pictures, claims on product
- Lower numeracy assoc with poorer understanding

• Lokker et al, Pediatrics, 2009
PHLAT Conclusions

• Significant parental deficits in skills related to early parenting
• Skill deficits are correlated to underlying literacy and numeracy
• Ceiling effects with TOFHLA, but still identified significant literacy issues in parents with PHLAT
• PHLAT appears to be valid/reliable in English and Spanish speaking families
• Opportunities to improve our communication efforts and parental education/anticipatory guidance
Color Coding of Growth Charts

- Recruited parents of children age 2-8
- Given plain and color coded growth charts to interpret

Numeracy Ability Based on WRAT Score

Oettinger, Academic Pediatrics, 2009
National Initiative (GreenLight)

- Project supported by NIH (NICHD). Collaboration between Vanderbilt, UNC, NYU, and UMiami.
- Will enroll 850 English and Spanish speaking families with children age 2 months and follow for 22 months. Intervention sites will focus on obesity prevention, while control sites will focus on injury prevention.
- Will train intervention Pediatric providers in improved health communication skills and give them a literacy sensitive toolkit to use with families to promote healthy lifestyles for their children.
Greenlight Measurement Opportunities

- Administered to parents
  - PHLAT at Baseline and 12 months
  - S-TOFHLA at Baseline
  - Subjective Literacy Scale (Chew et al) at Baseline
  - Newest Vital Sign at 9 months
  - WRAT-Arithmetic at 9 months
Current Adolescent Health Literacy Tools

- Adolescent Literacy
  - WRAT
  - Other literacy assessment tools (ex. SORT, PIAT, K-tea, Keymath)
  - REALM-Teen
  - Adolescent Diabetes Numeracy Test
Numeracy and Diabetes

Math phobic's nightmare!
Diabetes and Numeracy Study

• Developed adolescent scale from previously validated adult Diabetes Numeracy Test
• 2 Samples of adolescent patients with diabetes (61 and 72 participants)
• Mean score on Diabetes Numeracy Test was 75% (SD 22)
• Trouble Spots
  – Interpreting serving sizes
  – Fractions or decimals
  – Applying multi-step regimens (ex. sliding scale and carb-ratios)
  – Applying titration instructions

Huizinga et al, BMC Health Services Res, 2008
Cavanaugh et al, Annals of Internal Medicine, 2008
Mulvaney et al, in revision, JHC, 2011
Serving Size

Nutrition: Carbohydrate Counting

You ate 1 and 1/2 cups from the food labeled below. How many grams of carbohydrate did you eat?

ANSWER: 36 grams

Sample 1: 68% correct
Sample 2: 56% correct
Monitoring

• Your target blood sugar is between 60 and 120. Please circle the values below that are in the target range (circle all that apply):
  55
  145
  118

Correct Response: Circle 118 only
Percent Correct: 88% and 93%
Insulin Correction Scale (I)

• You are told to follow the sliding scale shown here. The sliding scale indicates the amount of insulin you take based upon your blood sugar levels:

<table>
<thead>
<tr>
<th>If Blood sugar is:</th>
<th>Units of Insulin</th>
</tr>
</thead>
<tbody>
<tr>
<td>130-180</td>
<td>0</td>
</tr>
<tr>
<td>181-230</td>
<td>1</td>
</tr>
<tr>
<td>231-280</td>
<td>2</td>
</tr>
<tr>
<td>281-330</td>
<td>3</td>
</tr>
<tr>
<td>331-380</td>
<td>4</td>
</tr>
</tbody>
</table>

• Percent Correct: 98 and 99%
## DNT and other measures

<table>
<thead>
<tr>
<th>SAMPLE 1</th>
<th>Self-Management (SSCA-R)</th>
<th>Diabetes Responsibility (adolescent)</th>
<th>Parent Education</th>
<th>WRAT3</th>
<th>HbA1c</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADNT-39</td>
<td>.12 (.350)</td>
<td>.09 (.506)</td>
<td>.29 (.028)</td>
<td>.40 (.001)</td>
<td>-.22 (.086)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SAMPLE 2</th>
<th>Self-Management (DBMS)</th>
<th>Diabetes Responsibility (parent)</th>
<th>Diabetes Problem Solving</th>
<th>HbA1c</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADNT-14</td>
<td>.03 (.820)</td>
<td>-.29 (.022)</td>
<td>.27 (.023)</td>
<td>-.34 (.004)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COMBINED</th>
<th>Child Age</th>
<th>Gender</th>
<th>Pump Use</th>
<th>Diabetes Duration</th>
<th>HbA1c</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADNT-14</td>
<td>.194 (.026)</td>
<td>.002 (.986)</td>
<td>.326 (.000)</td>
<td>-.005 (.951)</td>
<td>-.291 (.001)</td>
</tr>
</tbody>
</table>
Conclusions

• Performance on DNT was fair
• Disconnect between what is taught and what patients can do.
• Performance on DNT was correlated with literacy and math skills.
• Performance on DNT was also modestly correlated with A1C
Adolescents with Diabetes

- Web-based intervention to promote problem solving skills
Challenges and Opportunities

• Need to develop better assessment tools of parental literacy in the context of child care
• Need to develop better assessment tools of child health literacy
• Determine when to assess parent, child, or both
• Tools need to assess more than just print literacy
• Tools need to be validated longitudinally
• Develop tools for assessment in Non-English Patients
Questions

How many of you comprehend the term “follicular”?

What does “comprehend” mean?