Numeracy in health care: A clinician’s perspective

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Components of Literacy

- Cultural & conceptual knowledge
- Listening
- Speaking
- Writing
- Reading
- Numeracy

Health Literacy, A Prescription to End Confusion, Institute of Medicine, National Academy of Sciences 2003
Numeracy

• “The ability to interpret, apply, and communicate mathematical information in commonly encountered situations.” Adult Literacy & Life Skills Survey

• Golbeck’s 4 overlapping categories of numerical information
  – Basic: identify and read numbers
  – Computational: counting, arithmetic
  – Analytical: inference, estimation, proportion, percentage, frequencies, basic graphs
  – Statistical: probability, statistics, error, risk

• Demand: Patients encounter numeracy concepts when they receive, follow, and pay for medical care.

Managing a Chronic Disease

- Understand disease
- Participate in development of management plan
- Follow plan
- Monitor symptoms
- Use measurement devices and record readings
- Take medicine as prescribed
- Note changes in status
- Present the story and exchange information with the clinician

Rima Rudd, PhD
Patient’s visit

- Copay
- Vital signs
- Spirometry
- How is the patient feeling? Frequency of symptoms? Comorbidities, context
- Discussion: advice, risk, prevention
- At the end: medications, action plan
## Asthma Action Plan

### Doing Well

**GREEN ZONE**

- No cough, wheeze, chest tightness, or shortness of breath during the day or night
- Can do usual activities

And, if a peak flow meter is used,

- Peak flow: more than
  
  (80 percent or more of my best peak flow)

- My best peak flow is:

**Take these long-term control medicines each day (include an anti-inflammatory).**

<table>
<thead>
<tr>
<th>Medicine</th>
<th>How much to take</th>
<th>When to take it</th>
</tr>
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<tbody>
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</tbody>
</table>

Before exercise

- 2 or 4 puffs

5 minutes before exercise

### Asthma Is Getting Worse

**YELLOW ZONE**

- Cough, wheeze, chest tightness, or shortness of breath, or
- Walking at night due to asthma, or
- Can do some, but not all, usual activities

- Or-

- Peak flow: ______ to ______

  (50 to 79 percent of my best peak flow)

Add: quick-relief medicine—and keep taking your GREEN ZONE medicine.

- 2 or 4 puffs, every 20 minutes for up to 1 hour
- Nebulizer, once

**First**

- Or-

If your symptoms (and peak flow, if used) return to GREEN ZONE after 1 hour of above treatment:

- Continue monitoring to be sure you stay in the green zone.

**Second**

If your symptoms (and peak flow, if used) do not return to GREEN ZONE after 1 hour of above treatment:

- Take: ______ (short-acting beta-2-agonist)

- Add: ______ (oral steroid) mg per day. For ______(3–10) days

- Call the doctor before/within ______ hours after taking the oral steroid.

### Medical Alert!

**RED ZONE**

- Very short of breath, or
- Quick-relief medicines have not helped, or
- Cannot do usual activities, or
- Symptoms are same or got worse after 24 hours in Yellow Zone

- Or-

- Peak flow: less than ______

  (50 percent of my best peak flow)

Take this medicine:

- 4 or 6 puffs or Nebulizer

- Short-acting beta-2-agonist

- Oral steroid

Then call your doctor NOW. Go to the hospital or call an ambulance if:

- You are still in the red zone after 15 minutes AND
- You have not reached your doctor.

### Danger Signs

- Trouble walking and talking due to shortness of breath
- Lips or fingernails are blue

Take 4 or 6 puffs of your quick-relief medicine AND

Go to the hospital or call for an ambulance ______ now!

(phone)

See the reverse side for things you can do to avoid your asthma triggers.

NHLBI, 2007
A 55 year old man is hospitalized for an exacerbation of chronic bronchitis. He is discharged with a bottle of prednisone tablets, each 5 mg. He is told to take 30 mg in the morning for 5 days. When asked how many pills he should take, he is unsure.
A 22-year old woman with unstable asthma is asked to record peak flow readings in the grid provided with the device. She is afraid to tell her doctors that she does not understand how to graph the numbers.

<table>
<thead>
<tr>
<th>Date</th>
<th>Jan 18</th>
<th>Jan 19</th>
<th>Jan 20</th>
<th>Jan 21</th>
<th>Jan 22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drugs</td>
<td>7 a.m.</td>
<td>7 p.m.</td>
<td>7 a.m.</td>
<td>7 p.m.</td>
<td>7 a.m.</td>
</tr>
<tr>
<td>Time</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

Instructions:

- **Green zone** (80-100%)
- **Yellow zone** (50-80%)
- **Red zone** (<50%)

* On black & white copies of this chart, green is represented by light gray, yellow by medium gray and red by dark gray.
The Standard Gamble
A cancer patient is asked to give preferences for treatment by stating whether she would rather remain in a state of ill health for a period of time, or undergo a medical intervention which has a chance of either restoring perfect health, or killing her.

Time trade-off
A cancer patient is asked to choose between living a shortened amount of time with perfect health and living longer with impaired health.
National Assessment of Adult Literacy 2003

ADULT LITERACY PERFORMANCE: Percentage of adults scoring at each achievement level in prose, document, and quantitative literacy: 2003

- Prose: Below Basic 14%, Basic 29%, Intermediate 44%, Proficient 13%
- Document: Below Basic 12%, Basic 22%, Intermediate 53%, Proficient 13%
- Quantitative: Below Basic 22%, Basic 33%, Intermediate 33%, Proficient 13%
ANQ Question 1

Here are some examples of statements or questions patients might hear in a doctor’s office.

1. Your doctor asks you to take 30 mg of prednisone every day for a week. The pharmacist gives you a bottle of 5 mg tablets. How many pills should you take each day?

1 1

61/73 (84%) correct
ANQ Question 2

If a patient has a 1% chance of developing osteoporosis or bone loss, that means

a. Out of 1000 patients, one will develop bone loss
b. Out of 100 patients, one will develop bone loss
c. Out of 10 patients, one will develop bone loss
d. Out of 5 patients, one will develop bone loss
e. The patient will develop bone loss
f. The patient will never develop bone loss

1 28/73 (38%) correct
ANQ Question 3

You have a peak flow meter.
Your Danger or Red Zone is 50% of your best reading.
Your best reading is 400 L/min. What is your Danger Zone?

111 L/min or less

52/73 (71%) correct
ANQ Question 4

You are told the Green Zone (the OK zone) is a reading between 80% and 100% of your best reading. Your Worry Zone is between 50% and 80% of your best reading. Your best reading is 400 L/min. When are your readings in the Worry Zone?

a. Between 300 and 400 L/min
b. Between 200 and 320 L/min
c. Between 200 and 300 L/min
d. Between 240 and 320 L/min
e. Between 100 and 300 L/min

21/73 (29%) correct
# Numeracy Questions Correct vs S-TOFHLA Score

![Graph showing the relationship between the number of numeracy questions correct and S-TOFHLA score.](image)
Numeracy and Asthma Severity (Hospitalizations, ED visits)

- Hospitalizations and ED visits for asthma were significantly and negatively associated with ANQ controlling for age, sex, educational attainment, and household income.
  - Hospital OR 0.55 (95% CI 0.34, 0.88), p=0.012
  - ED OR 0.56, (95% CI 0.38, 0.84), p=0.004

- No association between S-TOFHLA

Apter et al. J Asthma 2006; 43;705-710.
Outcomes by numeracy over time
What do we do?

• As Society?
• As Clinicians?
• As Patients?

Consider
• Demand
• Communication
A Matrix for Simplifying Patient-Provider Communication

<table>
<thead>
<tr>
<th>Numeracy element</th>
<th>Level of Patient Mastery Required (demand on patient)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Describe</td>
</tr>
<tr>
<td>Reading numbers, counting, telling time</td>
<td></td>
</tr>
<tr>
<td>Arithmetic operations</td>
<td></td>
</tr>
<tr>
<td>Estimation of size, trend</td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td></td>
</tr>
<tr>
<td>Problem-solving &amp; inferring the mathematical concepts to be applied</td>
<td></td>
</tr>
<tr>
<td>Logic</td>
<td></td>
</tr>
<tr>
<td>Reading tables</td>
<td></td>
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<tr>
<td>Reading graphs</td>
<td></td>
</tr>
<tr>
<td>Reading maps</td>
<td></td>
</tr>
<tr>
<td>Estimation of error, uncertainty, variability</td>
<td></td>
</tr>
<tr>
<td>Relative versus absolute</td>
<td></td>
</tr>
<tr>
<td>Risk (cumulative, relative, conditional)</td>
<td></td>
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</table>

Apter et al, J GIM 2008
Other techniques

• Framing- packaging and presenting
  – positive versus negative, time-frame, etc

• Several formats: visual, graphs, tables, pictographs, examples
  – Type of graph: for understanding part of a whole - pie or histogram, for comparison – bar, for trend-line
Communication

- “Less is more” E Peters
- Remove nonessential information
- “Plain language” R Rudd
- Framing
- Problem-solving: “What to do if…” R Rudd
- Teach-back
- The patient advocate
- Use the entire office
Components of Literacy

- Cultural & conceptual knowledge
- Listening
- Speaking
- Writing
- Reading
- Numeracy
- Electronic Literacy

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Lessons Learned:
Demands, challenges, finding solutions

- There are significant unrecognized numeracy demands for adults with chronic diseases.
- Poor numeracy is associated with poor health outcomes.
- Limited numeracy can impair ability to communicate and understand health information, e.g. shared decision making.
- It is essential to equalize & enhance educational opportunities.
- How do we account for limited educational opportunities and limited numeracy so that patients have adequate access to health care and effective communication of information?
- Electronic literacy is becoming increasingly important and has increasing amounts of quantitative information.
- Research is needed to explore ways to account for numeracy in improving health.