Making Measurements Meaningful

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Assumptions In Science Communication

Assumption: People Lack Information (The Deficit Model)

Assumed Solution: Give them more!
Barriers

- Language
- Literacy
- Numeracy
- Emotionality of Health Situations
- Volume of Relevant Information
More ≠ Better!
Evaluability
Good or Bad?

Good or Bad?

Evaluability of Risk Information
Imagine Robert
Imagine Robert

Your 10-year risk of cardiovascular disease is: 11.22%
“Am I at high risk, or not?”
Evaluability of Laboratory Test Results
Can Patients *Use* This?

<table>
<thead>
<tr>
<th>Component</th>
<th>Your Value</th>
<th>Standard Range</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC Count</td>
<td>5.2</td>
<td>4.0 - 10.0</td>
<td>K/MM3</td>
</tr>
<tr>
<td>Hemoglobin</td>
<td>15.8</td>
<td>13.5 - 17.0</td>
<td>g/dl</td>
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<td>40.0 - 50.0</td>
<td>%</td>
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<td>145</td>
<td>150 - 400</td>
<td>K/MM3</td>
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<tr>
<td>RBC Count</td>
<td>4.71</td>
<td>4.40 - 5.70</td>
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<tr>
<td>Mean Corpuscular Volume</td>
<td>94.9</td>
<td>79.0 - 99.0</td>
<td>fl</td>
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<tr>
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<td>11.7</td>
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“Am I at high risk, or not?”
Evaluability of Exposure Information
Buying a Home…

Radon:
6 pCi/L
Drinking Water…

Lead:

7 ppb
“Am I at high risk, or not?”
Problem #1: Numbers
Problem #2: Lack of Meaning
So now what?

What can we do to help?
Step 1:
Visual information
Robert’s Risk

Your 10-Year Risk of Cardiovascular Disease

11 out of 100 people like you will develop cardiovascular disease
89 out of 100 people like you will NOT develop cardiovascular disease

Created at iconarray.com
Welcome to Clinician.IconArray.com

1 Risk/Benefit
Use one risk/benefit to show the effect one treatment option.

Get Started >>

2 Risks/Benefits
Use two risks/benefits to compare 2 treatment options side-by-side.

Get Started >>

3 Risks/Benefits
Use three risks/benefits to compare multiple treatment options.

Get Started >>

## Tables

Table:

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<tr>
<th>Test</th>
<th>Your Result</th>
<th>Standard Range</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>Platelet Count (PLT)</td>
<td>135</td>
<td>150-400</td>
<td>x10^9/L</td>
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Table vs. Number Line

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Simple Line:

Platelet Count (PLT) Test Result

Your Result

135 \(x10^9/L\)

Lines with More Meaning

Near-Normal Results vs. Extreme Results

Near-Normal

Table 26.5

<table>
<thead>
<tr>
<th></th>
<th>Platelets (135 vs 25 x10⁹/L)</th>
<th>ALT (80 vs 360 U/L)</th>
<th>Creatinine (2.2 vs 3.4 mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>26.5</td>
<td>56.3</td>
<td>43.7</td>
</tr>
<tr>
<td>Simple Line</td>
<td>17.5</td>
<td>21.3</td>
<td>27.7</td>
</tr>
<tr>
<td>Block Line</td>
<td>19.0</td>
<td>20.2</td>
<td>28.7</td>
</tr>
<tr>
<td>Gradient Line</td>
<td>15.8</td>
<td>14.8</td>
<td>24.0</td>
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Step 2:
Gist-full information
Fuzzy Trace Theory
(Brainerd and Reyna, 1995)

Verbatim memory vs Gist
Fuzzy Trace Theory
(Brainerd and Reyna, 1995)

Verbatim vs Gist memory

What the heck is “gist”??
Know Your “Commander’s Intent”

Heath & Heath, Made to Stick, 2007
Cancer Screening Test Decisions
Colorectal Cancer Screening
Colorectal Cancer Screening

... at age 50
Colorectal Cancer Screening

... at age 50

... vs. at age 75

(with multiple comorbidities)
Benefits vs. Harms

Image from study materials for “Promoting Veteran-Centered Colorectal Cancer Screening” (I01 HX001278-01); SD Saini, PI.
Gist Processing

Image from study materials for “Promoting Veteran-Centered Colorectal Cancer Screening” (I01 HX001278-01); SD Saini, PI.
Setting the Context in Visual Displays
Hemoglobin A1c

Your Result
6.7%

4.0 4.5 5.7 6.5 8.0
Borderline Low STANDARD RANGE Borderline High High Very High

Unpublished graphic from 1 R01 HS021681, BJ Zikmund-Fisher, Principal Investigator.
Same (?!?) Result

Unpublished graphic from 1 R01 HS021681, BJ Zikmund-Fisher, Principal Investigator.
Scale Matters

Your Result
6.7%

Unpublished graphics from 1 R01 HS021681, BJ Zikmund-Fisher, Principal Investigator.
Test Results for Diagnosed Patients
Goals for Test Results

Goals for Test Results

Goals for Test Results

Goals for Test Results

Test Results for Monitoring
Harms

Alanine Aminotransferase (ALT):

80 IU/L

Standard Range: 10-40
Harm Anchors

Harm Anchors

Many doctors are not concerned until here

Increased Sensitivity with Harm Anchors

One Last Example
Hemoglobin A1c

Central Message: Varies
Varies!
Varies!

Stable!

Percent

Months

0 10 20

0 10 20

Percent

Stable!

Percent

Months

0 10 20

0 10 20

VARIES!
Varies!

- Months: 0, 10, 20
- Percent: 7, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7

Stable!

- Months: 0, 10, 20
- Percent: 8

High!
Scaled to data variations

Varies!

Stable!

High!
Scaled to data variations

Sided to population variations

Varies!

Stable!

High!
Scaled to data variations

Scaled to population variations

Scaled to zero

Varies!

Stable!

High!
Good or Bad?
Good or Bad?

Standard Range

0 5 10 15 20
Good or Bad?

Target Range for Patients with Type 2 Diabetes
My Commander’s Intent
“We need to design for the way people ARE, not the way we wish they were”

- Holly O. Witteeman
People only process or remember one thing
You can’t change this fact!
BUT...
BUT...
You get to choose!
Use **context** to create ONE message based on THEIR needs
Thank You!

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