Reference Range Number Line Format Preferred by African American Adults for Display of Asthma Control Status

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Disclosure

The authors have no conflicts of interest to disclose.
Introduction

- African Americans have disproportionate asthma burden
- Comprehension of asthma status needed for self-management
- Low health literacy possible barrier to comprehension
- Tailored information visualizations promising for patient-facing displays (e.g., portals)
- Best practices still emerging for optimal formats
- Does acceptability and appeal vary by demographic groups?
Objectives

Overall: Develop asthma control report as provider-client communication tool

This study: Evaluate acceptability and appeal of a reference range number line (RRNL) and a stoplight graphic to display asthma control status
Population – African American adults w/ persistent asthma & loved ones
Reference Range Number Line (RRNL)

Level of Asthma Control

Controlled

Not Controlled

Victor’s asthma is: NOT CONTROLLED
Control Score: 3.2

0 = totally controlled
6 = extremely poorly controlled
Reference Range Number Lines for Lab Values

Simple Line:

Platelet Count (Plt) Test Result

Your Result

135 x 10^9/L

0 100 200 300

Block Line:

Platelet Count (Plt) Test Result

Your Result

135 x 10^9/L

0 20 100 120 200

Very Low Low Borderline Low STANDARD RANGE Borderline High High

Gradient Line:

Platelet Count (Plt) Test Result

Your Result

135 x 10^9/L

0 100 120 200

Low Standard Range High

From: Graphics help patients distinguish between urgent and non-urgent deviations in laboratory test results

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Uses of Stoplight Graphics

- Asthma action plans
- Avoidance of sugary drinks
- Level of caregiver burden
- Blood pressure
- Breath alcohol self-rating

![Stoplight Graphics Example](image_url)

From: Sometimes more is more: iterative participatory design of infographics for engagement of community members with varying levels of health literacy
J Am Med Inform Assoc | © The Author 2015. Published by Oxford University Press on behalf of the American Medical Informatics Association. All rights reserved.
RRNL vs. Stoplight

RRNL Preferred for Blood Pressure

Stoplight Preferred for Blood Sugar Forecast

Context

Urgency
Theoretical Frameworks

Data-Frame Theory of Sensemaking

- Elaboration cycle:
  - Elaborate a frame
  - Add and fill slots
  - Seek and infer data
  - Discover new data/new relationships
  - Discard data

- Reframing cycle:
  - Reframe
  - Compare frames
  - Seek a new frame

- Data
  - Recognize/construct a frame

- Frame
  - Manage attention and define, connect, and filter the data

- Question a frame
  - Track anomalies
  - Detect inconsistencies
  - Judge plausibility
  - Gauge data quality

Health Belief Model

- Missed factors:
  - Demographic variables (age, sex, race, nationality, etc.)
  - Sociopsychological variables (personality, sociability, past and future group pressures, etc.)
  - Structural variables (knowledge about the disease, prior causal beliefs, etc.)

- Individual perceptions:
  - Perceived susceptibility to disease X
  - Perceived severity (severity) of disease X

- Perceived benefits of preventive actions

- Perceived barriers to preventive action

- Likelihood of action
  - Likelihood of taking recommended action


Tailored health infographics serve as cues to action in the Health Belief Model.

[Diagram of the Health Belief Model with connections and relevant factors such as individual perceptions, modifying factors, likelihood of action, and cues to action marked.]
Measures of Asthma Control

Based on self-report of symptoms

- Asthma Therapy Assessment Questionnaire (ATAQ)
- Asthma Control Test (ACT)
- Asthma Control Questionnaire (ACQ)

Research: 0 – 1.5 controlled   1.5 – 6.0 not controlled
Clinical: 0 – 0.75 controlled   0.75 – 6.0 not controlled
Methods

- IRB approved, Columbia University & University of Pennsylvania
- Two federally-qualified health centers
- 18+, Black/African American, w/ persistent asthma or loved one
- Control status: Asthma Control Questionnaire (ACQ)
- Health Literacy: Newest Vital Sign (NVS)
- Focus groups to inform brief motivational interviewing intervention on medication non-adherence
- ~15 min (range 10-22) spent on infographics
Stimuli

Asthma Control Report

Patient: Victor Benson
Date: April 2, 2017
Provider: J. Gordon, FNP

Level of Asthma Control

Victor's asthma is: NOT CONTROLLED
Control Score: 3.2
0 = totally controlled
6 = extremely poorly controlled
<table>
<thead>
<tr>
<th>Focus Group Prompts</th>
<th>Analytic Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. “What information do you think we are trying to convey with this image? What does it mean to you?”</td>
<td>Viewer perception of infographic meaning</td>
</tr>
<tr>
<td>2. “Which of the images do you prefer and why?”</td>
<td>Statements of preference</td>
</tr>
<tr>
<td>3. “How can the image be improved?”</td>
<td>Suggestions for potential design changes</td>
</tr>
<tr>
<td>4. “Would this image motivate you to address the health issue?”</td>
<td>Statements relating to (a)motivation or health self-management</td>
</tr>
<tr>
<td>5. “How much and what kind of information do you want?”</td>
<td>Sentiments about quantity, timing, and type of informational reports</td>
</tr>
</tbody>
</table>
Groups & Participants

- Six groups, April & May 2017
- Group size 2 – 10
- N = 46, African American adults
- 67% Female
- Age $M = 47$
- 72% marginal or inadequate health literacy
“He’s not getting no (sic) oxygen in his lungs.”

“He’s in great danger.”

“With the X, it’s over. I’m checking out. It’s over!”

“It’s just like stage four cancer. There’s nothing else to do.”

“He can either continue his bad habits and probably make it worse or you know, he’s got to do what he’s got to do to fix it.”

“It looks sort of half and half.”

“2.0 and below would be good and everything above is a problem.”
RRNL preferred for greater informativeness and motivational value. It gives a visual representation of where a value falls within the context of possible values and the goal.

“It’s a scale. You can see where you are and where you need to get to.”

“…if you’re taking your medicine and doing what you’re supposed to do, then you’ll notice it start to get close to the green and it makes you feel more like ‘I’m doing my job,’ you would feel more… yes, it would motivate you better.”
Results: Self-Management

• Perception of threat: “I’m in danger of losing my life”

• Self-management intentions
  ▪ Take medication
  ▪ Avoid triggers
  ▪ Follow up w/ healthcare provider

“I would be asking the doctor what other treatments are available—especially if I know that I’m taking it daily like I’m supposed to and they handed me something like this—it’s not working.”
Results: Design Changes

• Request for addition of tailored tips for improving asthma control.

“[It would be better] if they would’ve had something on there that tells you how you can control it.”
Results: Reports

- Amount of information: “It’s just right, actually”

- Prefer to see at the beginning of every visit:
  
  “So that way we could discuss what we’re going to do to correct it”

- Consider putting a poster in consultation rooms:
  
  “Stuff like this should be on the wall so that you can see and know so that you can ask.”
Discussion

- RRNL format overwhelmingly preferred to stoplight for asthma control status; easily adaptable to other instruments (e.g., ACT, ATAQ)
- Appealing/acceptable to African American adults
- Prior success among Hispanics for other data types
- Effectively cued self-management intentions as predicted by Health Belief Model
- Even with RRNL, threat perception still high
- Potential for undue alarm (e.g., unnecessary ED visits)
- We recommend that initial viewing be mediated by a clinician who can contextualize risk
Discussion

- RRNL format has undergone further refinement to support correct interpretation
  - Addition of interpretive statement (“Your asthma is not in control”)
  - Illustrations to anchor endpoints
  - Space for provider to write tailored plan of care
- Limitations: focus group setting; simulated data
- **Next step**: comprehension and acceptability of infographics tailored with participant’s own data
Acknowledgements