



# Health Literacy and Numeracy in Diabetes Care: Overview and Insights

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# WHAT IS HEALTH LITERACY?

“The degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions.”

- Core: reading and writing
- Associated: speaking, listening, cultural knowledge, and understanding of specific concepts that are necessary to interpret health information (e.g. basic biology).

**NUMERACY** (quantitative skill) is independently associated with health behaviors and outcomes in diabetes and other contexts

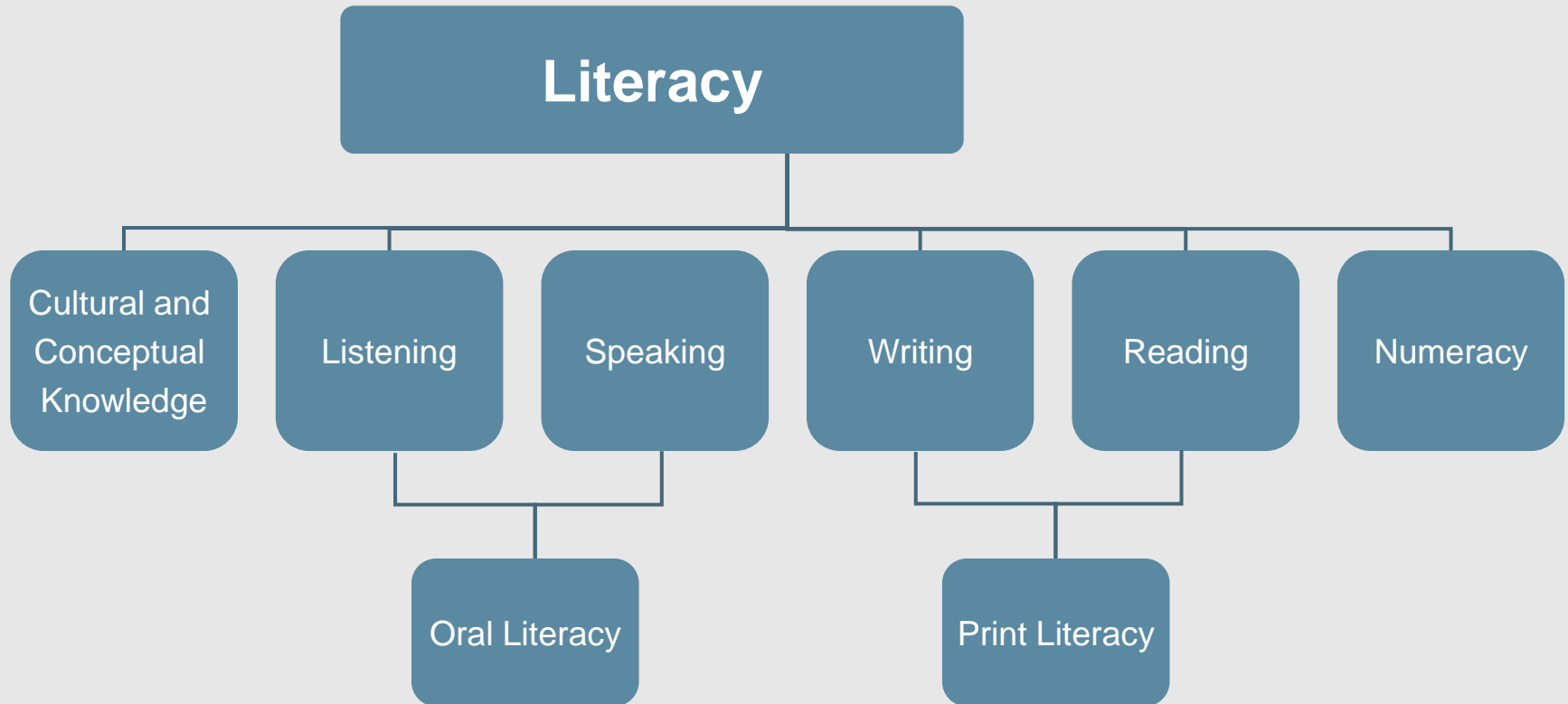
Institute of Medicine. Health Literacy: A Prescription to End Confusion. National Academies Press 2004.

Osborn et al. *Clinical Diabetes*. 2010;28(4):171-175.

Cavanaugh K et al. *Ann Intern Med*. 2008;148(10):737-746.

Rothman RL et al. *J Health Commun*. 2008;13(6):583-595.

# LITERACY IS A COMPLEX SKILL



# WHY IS LITERACY IMPORTANT IN HEALTH CARE?

Patients with low literacy may have difficulty:

- Reading prescriptions, following medical instructions
- Understanding educational materials
- Interpreting and applying numbers to health situations
- Consenting to research or procedures
- Answering survey items or other measures
- Following research protocols

# WHY IS NUMERACY IMPORTANT IN HEALTH CARE?

Patients with low numeracy may have difficulty:

- Understanding dosages of medications
- Understanding the timing of when to take medications or have them refilled
- Interpreting nutritional information
- Understanding volume status
- Interpreting blood sugars, adjusting insulin
- Understanding risks and probability

# MANY OUTCOMES ASSOCIATED WITH LITERACY

## Behaviors

- Breastfeeding
- Behavioral problems
- Adherence to medication
- Smoking, substance abuse

## Knowledge

- Food label and portion size understanding
- Birth control knowledge
- Emergency department instructions
- Asthma knowledge
- Hypertension knowledge

## Health Outcomes/Services

- General health status
- Hospitalization
- Mortality
- Emergency department use
- Depression
- Diabetes control
- HIV control
- Prostate cancer stage
- Body mass index
- Mammography
- Pap smear, STD Screening
- Immunizations
- Cost

**DeWalt, JGIM 2004; McCormack, Annals of Internal Medicine 2011**

From Rothman: Addressing Health Literacy and Health Communication in Diabetes and Obesity  
accessed July 1, 2015 from [slideplayer.com/slide/4130070/](http://slideplayer.com/slide/4130070/)

# LITERACY, NUMERACY AND DIABETES

## Literacy skills needed:

- Knowledge of disease prevention and disease
- Understanding of educational materials
- Performance of self-management tasks
- Interaction with medical system

## Numeracy skills needed:

- Understanding of risk and probability
- Understanding weight status
- Understanding medications
- Understanding nutrition information
- Understanding exercise
- Interpreting glucose and other measures

From Rothman: Addressing Health Literacy and Health Communication in Diabetes and Obesity  
accessed July 1, 2015 from [slideplayer.com/slide/4130070/](http://slideplayer.com/slide/4130070/)

# Polling Question

Based on a 2001 study of professional staff at Duke University hospitals, what percentage of the staff passed the basic numeracy scale test?

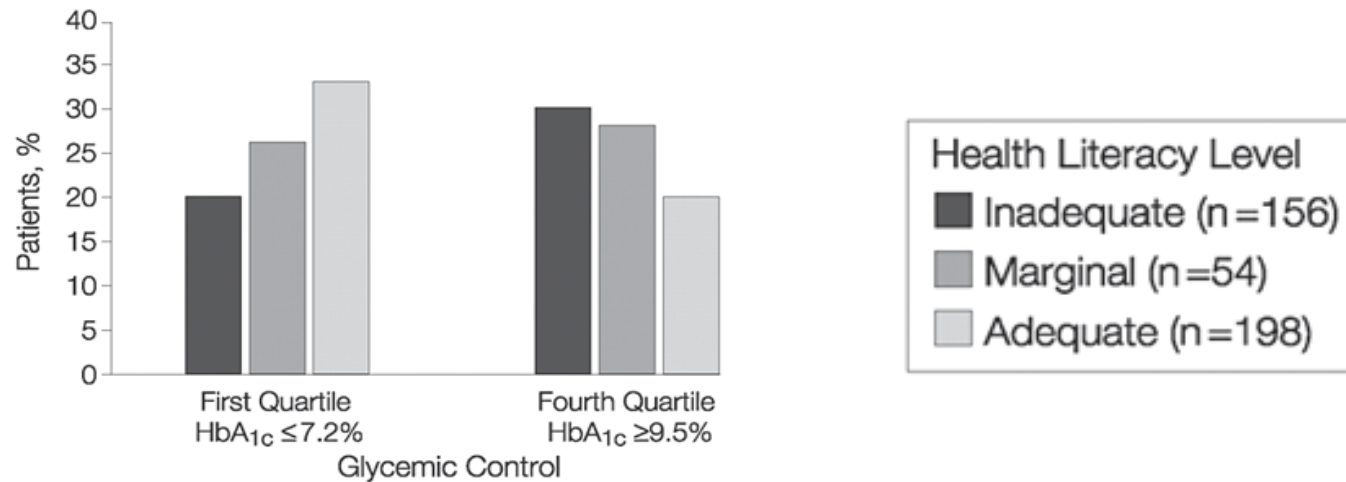
- A. 5% – 9%
- B. 15% – 24%
- C. 45% - 52%
- D. 75% - 88%



# NATIONAL ADULT LITERACY SURVEY - 1992

- Survey of 26,000 in the US
- Prose, document and quantitative literacy
- 21-23% of Americans scored in the lowest level of quantitative literacy
- Only 17% of those with graduate degrees or study scored in the highest level of quantitative literacy
- Lipkus, 2001: Study of Professional Staff at Duke University Hospitals
  - Only 15-24% could pass basic test (numeracy scale)

# LITERACY AND DIABETES OUTCOMES



Complication	Study Subjects With Complication, No.	Odds Ratio (95% Confidence Interval)	P Value
Retinopathy	111	2.33 (1.19-4.57)	.01
Nephropathy	62	1.71 (0.75-3.90)	.20
Lower extremity amputation	27	2.48 (0.74-8.34)	.14
Cerebrovascular disease	46	2.71 (1.06-6.97)	.04
Ischemic heart disease	93	1.73 (0.83-3.60)	.15

\*Adjusted for age, sex, race, education, insurance, language, social support, depression, treatment regimen, years with diabetes, and diabetes education, and accounting for clustering of patients within physicians. Hypertension was included in the models for retinopathy and nephropathy; hypertension and smoking were included for all others.

What can we learn from the risk communication research?

# Polling Question

A person with an expressive social style would be described as:

- A. Prefers to work alone, past oriented, avoids conflict
- B. Impulsive, creative, visionary
- C. Loyal, avoids change, wants to please
- D. Task oriented, likes to be in control, manages change

# TODAY'S PATIENT

Figure 3.1

## The Four Basic Social Styles of Patients

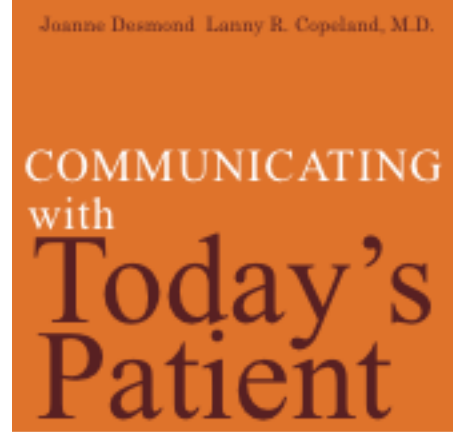
Task Focus: Doing and Thinking

- Less responsive
- Controls emotions

Less assertive	<p><b>Analytical Patient</b></p> <ul style="list-style-type: none"> <li>• Task-oriented</li> <li>• Prefers to work alone</li> <li>• Slow response; accuracy important</li> <li>• Likes to organize, solve puzzles</li> <li>• Likes details, precise measuring</li> <li>• Relationships are a lower priority</li> <li>• Past-oriented; likes tradition</li> <li>• Dislikes changes; prefers stability</li> <li>• Avoids conflict</li> </ul>	<p><b>Driving Patient</b></p> <ul style="list-style-type: none"> <li>• Task-oriented</li> <li>• Likes to be in control</li> <li>• Rapid response; quick decisions</li> <li>• Prefers immediate direct action</li> <li>• Wants bottom-line results ASAP!</li> <li>• Not tactful in relationships</li> <li>• Present or future-oriented</li> <li>• Seeks to manage change</li> <li>• More authoritarian under stress</li> </ul>
	<p><b>Amiable Patient</b></p> <ul style="list-style-type: none"> <li>• Relationship-oriented</li> <li>• Likes to be member of a group</li> <li>• Slower response; wants to please</li> <li>• Loyal, supportive, empathic</li> <li>• Senses others' needs and concerns</li> <li>• Good at on-on-one relationships</li> <li>• Focus on the present</li> <li>• Avoids change; prefers the familiar</li> <li>• Avoids conflict</li> </ul>	<p><b>Expressive Patient</b></p> <ul style="list-style-type: none"> <li>• Relationship-oriented</li> <li>• Likes to stand out in a group</li> <li>• Rapid, unique response; impulsive</li> <li>• Verbal, humorous, creative</li> <li>• Dislikes dullness or routine</li> <li>• Motivating and persuasive</li> <li>• Future focus, visionary</li> <li>• Enjoys change; sees opportunity</li> <li>• Uses personal attack in conflict</li> </ul>

Relationship Focus: Relating and feeling

- More responsive
- Emotes



Essentials to Save Time,  
Decrease Risk,  
and Increase  
Patient Compliance

APPROVED FOR 6 HOURS OF CME CREDIT

More assertive



Source: Adapted from Reid and Merrill (1981).

# FACTORS THAT INFLUENCE INDIVIDUAL PRECEPTION OF RISK

People tend to believe myths that help them feel that they are not at risk

- Acute myocardial infarction patient: “I’m not at risk for a subsequent event since I’ve been fixed. I’m one of the lucky ones.”
- “I smoke but I don’t eat fat and I exercise, so I won’t get cancer.”
- “I will just smoke for a little while and then I’ll quit (no problem).”

# ISSUES IN THE INTERPRETATION OF BENEFIT AND RISK

- Choice of comparator and context
- ‘Framing’
- Thresholds of interest
- Relative vs. absolute data
- Clinically vs. statistically meaningful
- Translating population-level to individual



## CONTEXT

- Compared to what?
- The same events may be perceived differently when –
  - Context is changed
  - Different people are exposed to them
  - They *may* occur in the distant future vs. soon
- **The average person is a poor intuitive statistician**
- **Language and numbers are cumbersome**
- The media acts as a risk amplifier
- Decision control is often ceded to the healthcare professional
  - However in diabetes, the patient **MUST** assume control



# Polling Question

Which is more likely to lead a patient to consent to angioplasty?

- A. '99% have no complications'
- B. 'Complications in 1 in 100 patients'



## FRAMING

'99% have no complications' vs. 'a risk in 1 in 100'

Which is more likely to lead a patient to consent to angioplasty?

>82%: '99% have no complications'

>50%: 'complications in 1 in 100 patients'

**Gurm and Litaker, Framing procedural risks to patients: is 99% safe the same as a risk of 1 in 100? Acad Med. 2000 Aug;75(8):840-2.**



## FACTORS IN RISK PERCEPTION:

Consider how they motivate behavior

- Dread (eaten by shark vs. heart attack)
- Control (driving vs. passenger while spouse drives)
- Natural or man-made
- Choice: risk smaller when we choose it
- Children vs. adults
- New vs. existing risk (SARS, west Nile)
- Familiar vs. unfamiliar (polio vaccine 30 years ago vs. now)
- Can it happen to me? (terrorism after 9/11)
- **Trust: the lower the trust, the higher the perceived risk**
- Catastrophic vs. not
- Equal vs. unequal benefit

# META-ANALYSIS OF THE CLINICIAN-PATIENT COMMUNICATION LITERATURE

The consistent message is that patient outcomes are enhanced when the clinician engages the patient comprehensively:

- Gives them information
- Personalizes it to their situation
- Supports them emotionally

(Hall, Roter, Katz, 1988)

# THE VISUAL COMMUNICATION OF RISK AND BENEFIT

- People may be wired biologically to learn through visual means (83%)
- Visual information can be processed quickly
- Can present complicated information
- Visual information can also provide context
- Overcomes issues in numeracy, literacy
- We are better at remembering pictures

# IS A PICTURE WORTH 1,000 WORDS?

Recommendation	Rank	Brand & model	Price	Overall score	Test results	Features
		Similar models, in small type, are comparable to tested model.			Low temperature High temperature Indirect Convenience Side burner Rotisserie burner Infrared Stainless grates Coated cast grates	

## A MEDIUM Most have a 340- to 490-square-inch cooking area and room for 16 to 30 burgers.

✓	1	Vermont Castings Signature Series VCS300SSP (1)	\$ 950	85	● ● ● ● ○	●
✓	2	Weber Genesis EP320 (1)	850	84	● ● ● ● ●	●
✓	3	Char-Broil Red 463250S11 (Home Depot) (1)	400	84	● ● ● ● ○	main ●
✓	4	Weber Genesis E320 E320 (1)	700	84	● ● ● ● ●	●
✓	5	Fiesta Blue Ember FG50069-U409 (2) FG50069-U404 (BJs), FG50069 (Sam's Club online)	450	80	● ● ● ● ○	● ●
✓	6	Weber Genesis E330 (1)	800	80	● ● ● ● ●	●
✓	7	Char-Broil Red 463250811 (Home Depot) (1)	550	80	● ● ● ● ○	main ●
✓	8	Weber Genesis S330 S330 (1)	950	79	● ● ● ● ●	●
✓	9	Brinkmann 810-2545-W (Walmart)	250	78	● ● ● ● ○	●
✓	10	Aussie Vantage Series 67C3	250	76	● ● ● ● ○	●
✓	11	Jenn-Air 720-0336C (BJs)	650	75	● ● ● ● ○	● ●
✓	12	Kenmore 16641 (2) 16134 (1)	350	75	● ● ● ● ○	●

## B LARGE Most have a 490-square-inch or larger cooking area and room for 30 or more burgers.

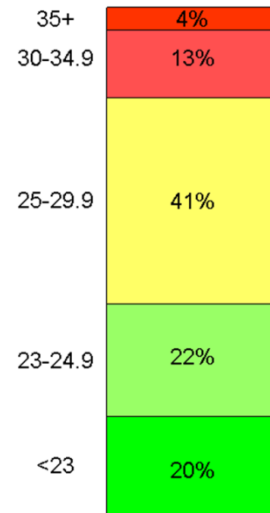
✓	1	Jenn-Air 720-0709 (Sam's Club)	850	78	● ● ● ● ○	● ● rotiss., searing
✓	2	Kenmore 16649 (1)	800	77	● ● ● ● ○	● ● rotiss., side
✓	3	Master Forge 3218LT [Item #221886] (Lowe's)	600	76	● ● ● ● ○	● ● rotiss., side
✓	4	Kenmore 16136 16137 (1)	600	76	● ● ● ● ○	● ● rotiss., side
✓	5	KitchenAid KFRS361TSS (2) KFRS361VSS (1)	2,200	74	● ● ● ● ○	● ● rotiss.
✓	6	Brinkmann 810-1575-W (Walmart) 810-1575-Q (1)	380	73	● ● ● ● ○	● ● rotiss., side

## C SMALL Most have a 340-square-inch or smaller cooking area and room for 10 to 15 burgers.

✓	1	Char-Broil Red Patio 463250211 (Home Depot) (1)	250	72	● ● ● ● ○	main ●
✓	2	Weber Q200 Q220 (2)	200	66	● ● ● ● ○	●
✓	3	Kenmore Patio Grill 16126	250	66	● ● ● ● ○	●
✓	4	Huntington 6666-64 [Item #221884] (Lowe's)	250	62	● ● ● ● ○	●
✓	5	Weber Spirit E210 (1)	400	61	● ● ● ● ○	●

(2) Discontinued, but similar model is available; price is for similar model. (1) Burners have a warranty for 10 years or more. (2) Portable.

BMI distribution in the Canadian population (2007)



Individual risk of diabetes over ten years → Population burden: new cases 2007 - 2017

x	32%	=	129,280 cases
x	21%	=	274,700 cases
x	10%	=	418,500 cases
x	7%	=	157,800 cases
x	3%	=	61,400 cases

Source of statistics: ICES Investigative Report, June 2010.  
\*How many Canadians will be diagnosed with diabetes between 2007 and 2017?\*

# WHICH OF THE FOLLOWING CONVEYS INFORMATION TO MOTIVATE ACTION?



Copyright Kurt Jones 2003





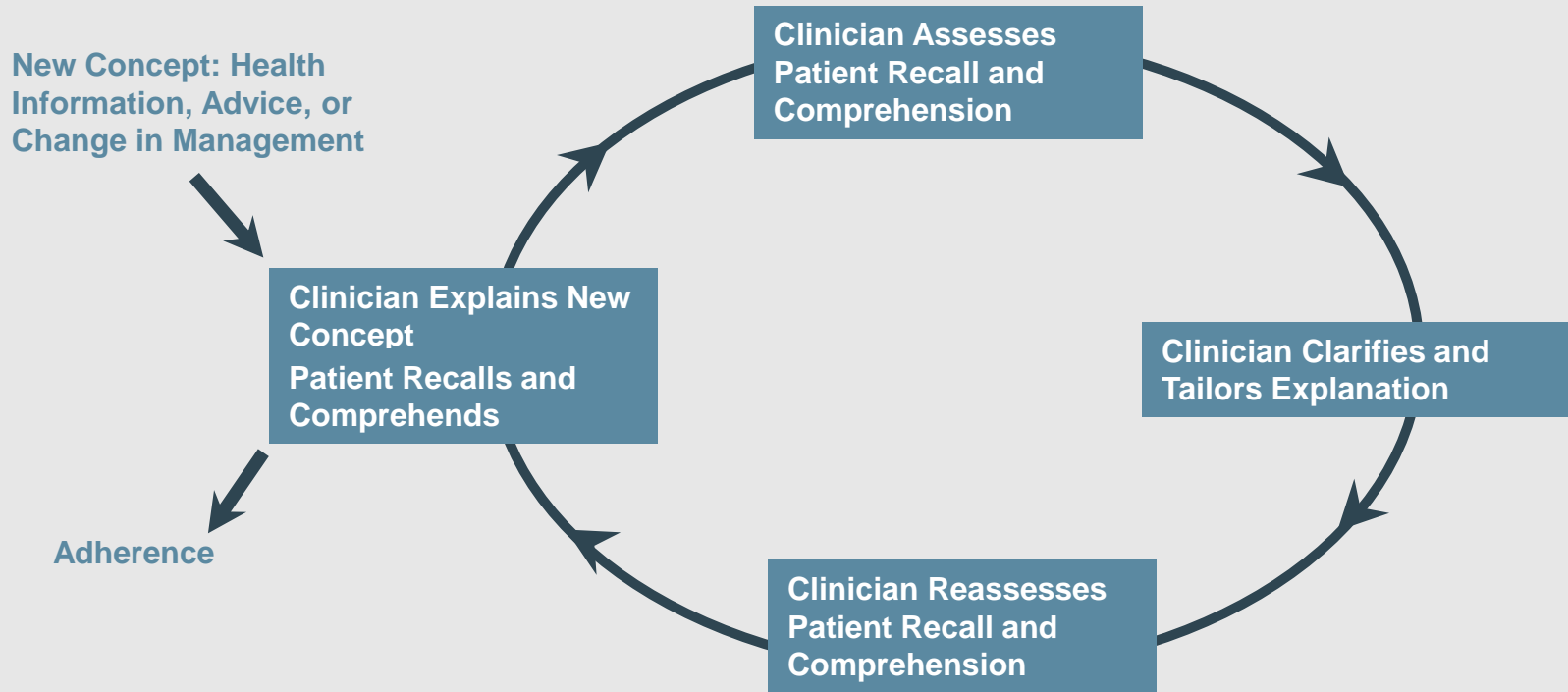


# TEACHING CONCEPTS

- Limit advice to key concepts and focus on behaviors and actions
- Focus on one concept at a time; partition information
- Use concrete terms and examples
- Make info culturally relevant and personal
- Avoid jargon!
- Practice patient centered communication and shared goal setting

From Rothman

# TEACHBACK TECHNIQUE



Schillinger, Arch Int Med, 2003

# SHARE GOAL SETTING

## Let patient or family initiate

- Practice reflective listening
- Provide affirmation of positive behaviors
- Show empathy for challenges

## Choose goal that is realistic and attainable

- Can offer a few choices and settle on goals together
- Roll with resistance (don't challenge patients who resist change; instead ask them to come up with solutions)
- Assess their confidence in achieving the goal

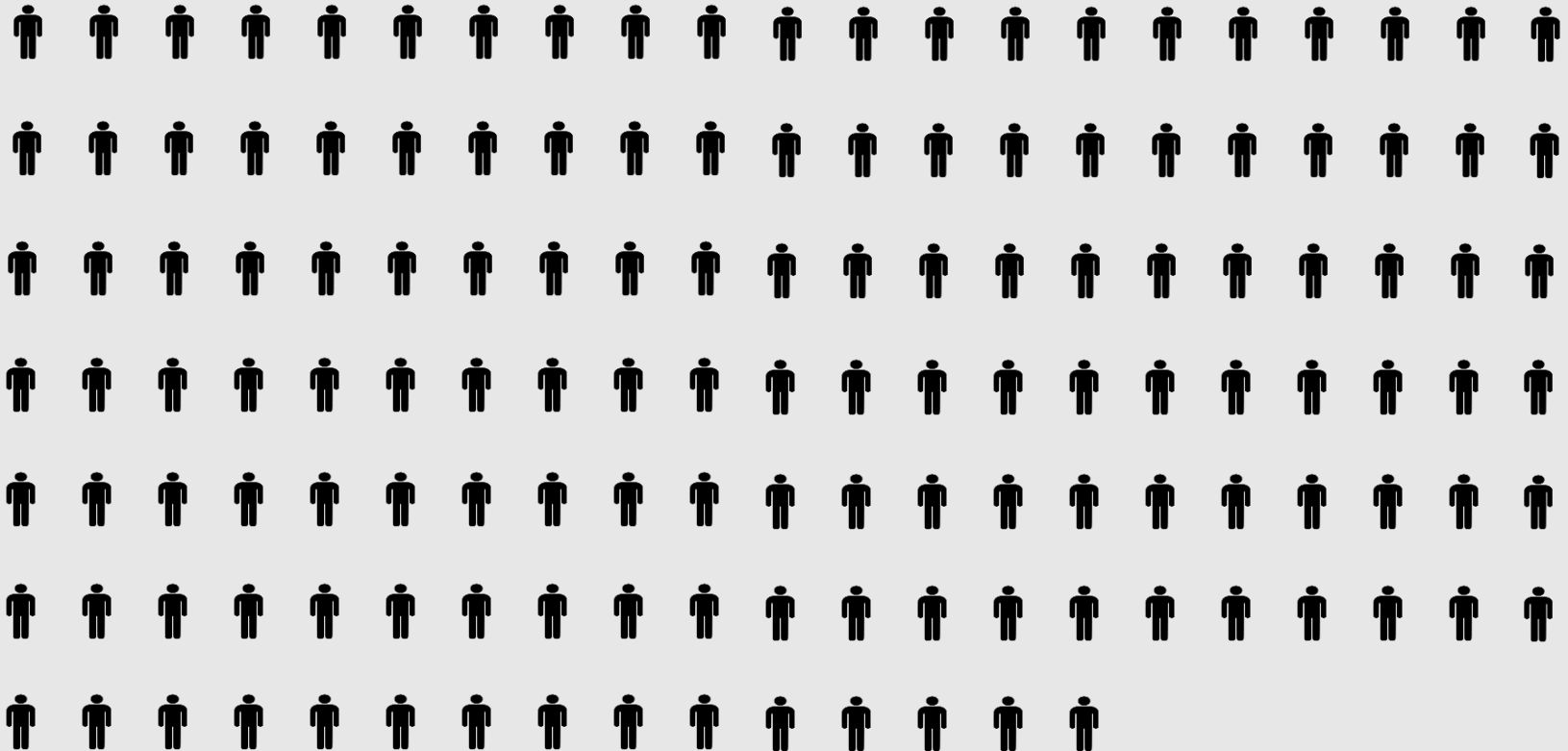
## Be concrete

## Set a time for accomplishing goal

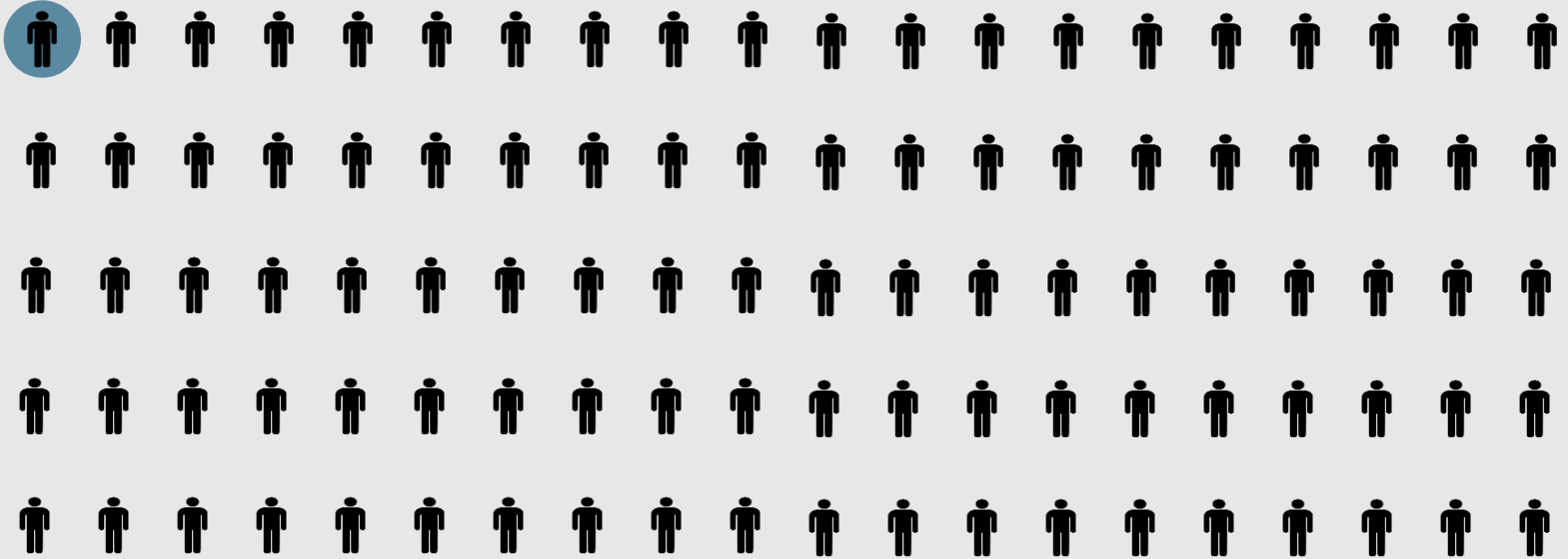
- Let them know it is up to them to make change!
- Promote a “you can do it” approach!

How can visualizations achieve these goals?

# 141 PATIENTS EXPOSED IN PIVOTAL STUDY TO METFORMIN

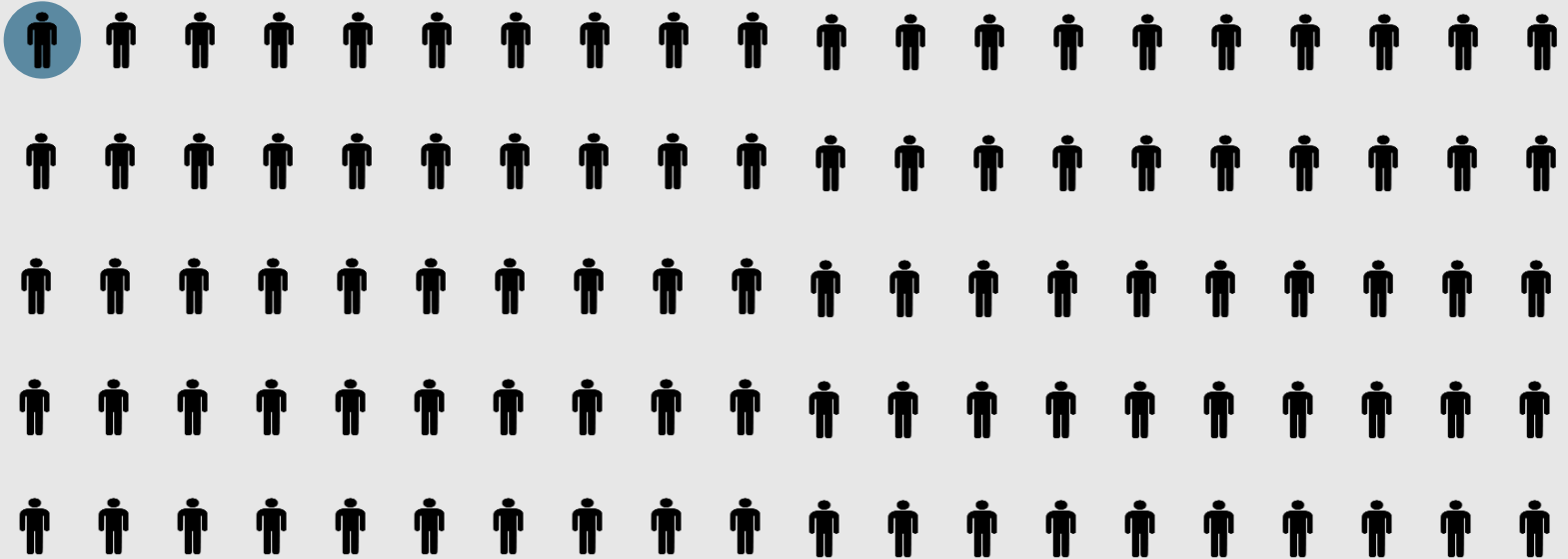



# >10,000 PATIENTS EXPOSED ACROSS NEWER DIABETES DRUGS: Clinical Development Program



 = 100

# >1,000,000 NEW USERS OF METFORMIN IN ONE ADMINISTRATIVE CLAIMS DATABASE



 = 10000

# POPULATION-LEVEL ESTIMATES OF EFFECTS ARE PART OF THE STORY



The trial found that, **on average**, patients on Metformin had larger reductions in fasting plasma glucose than patients on placebo ...

... but any given patients may not benefit from the drug and some may experience other 'side' effects.

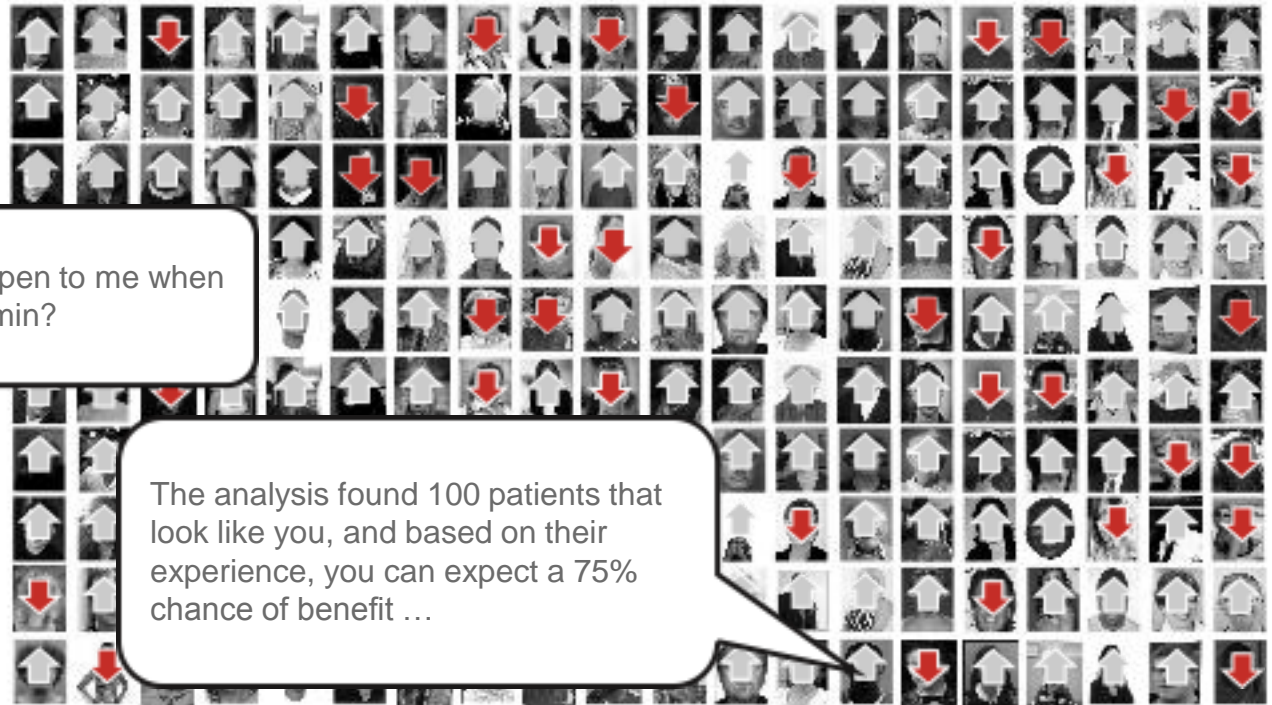


# PATIENT-LEVEL PREDICTION MODELING PERSONALIZES RISK AND BENEFIT



What will happen to me when I start Metformin?

The analysis found 100 patients that look like you, and based on their experience, you can expect a 75% chance of benefit ...



## IN THE END ...

We need just understand that there are learnings from the research that should inform how we engage patients

- Personalization ... linking behavior with achievement of goals/outcomes
- Not just verbal but enduring material that is clear and directive
- Numeracy is a strong driver that proper graphics can overcome
- Need not MEASURE literacy and NUMERACY but instead use materials that communicate the messages effectively
  - consumer reports
  - examples from Rothman
- I HAVE A PHD in a statistical discipline and I can't understand most basic numeric representations (e.g. financial)!!!!

# CONCLUSION

- Low literacy and numeracy common
- Good literacy and numeracy do not necessarily guarantee success in self-care or ability to understand material
- Patients with lower literacy/numeracy have worse knowledge, behavior, and outcomes
- Interventions that use low literacy materials and improved communication skills can improve outcomes **BUT SHOULD NOT BE LIMITED TO THOSE WITH POSSIBLE LOW LITERACY or NUMERACY**

Questions?