

# Numeracy and health

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2009 federal mandate (“Meaningful Use Program”) to provide electronic copies of data to patients upon request

Home / Weill Cornell Connect Home / Health Summary

▶ My Medical Record  
▶ Communication Center  
▶ Appointments  
▶ My Family's Records  
▶ Preference

**Search Health Information on**  
Healthwise® Knowledgebase:  
  
**Search**

## Health Summary

 Print

The Health Summary provides you with a convenient summary of important information in your health record. Your summary includes up-to-date information concerning your current health issues, medications, allergies, immunizations, and preventive care.

### Current Health Issues

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*You have no health issues on file.*

### Medications

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AMLODIPINE BESYLATE 10 MG TAB  
[About This Medication](#)

Instructions: 1 tablet daily

Prescribed by [James P Hollenberg](#) on 11/16/2010

[Request a refill](#)

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[About This Medication](#)

Instructions: 1 tablet daily

Prescribed by [James P Hollenberg](#) on 11/16/2010

[Request a refill](#)

### Y Ztest

[Logout](#)

Read your new message from Weill Cornell CONNECT Admin.  
Subject: Welcome To Weill Cornell CONNECT!!

Review the preventive care services we recommend you schedule soon.

### Your Providers



**Adam David Cheriff**  
Weill Cornell Connect Participant



**James P Hollenberg**  
Weill Cornell Connect Participant



**Sameer Malhotra**



**B Robert Meyer**

### ABC WITH DIFF

Date	Test	Result	Deviation
Jan 29, 2009 : 06:30 AM	WBC	12.5 10 <sup>9</sup> /l	
	RBC	4.69 10 <sup>12</sup> /l	
	HGB	10.8 g/dl	
	HCT	32.0 %	L
	MCV	68.2 fl	
	MCH	23.0 pg	L
	MCHC	33.8 g/dl	
	RDW	18.6 %	H
	PLT	168 10 <sup>9</sup> /l	
	MPV	10.4 fl	
	NRBC	0.0 /100 WBC	
	ABSOLUTE NRBC COUNT	0.00 10 <sup>9</sup> /L	
	% NEUTROPHILS	85 %	
	% LYMPHS	8 %	L
	% MONOS	6 %	
% EOS	0 %		
% BASOS	0 %		

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### PT/INR

Date	Test	Result	Deviation
Jan 29, 2009 : 06:30 AM	PT	18.7 sec	
	INR	1.48	H

[Back to top ^](#)

### APTT

Date	Test	Result	Deviation
Jan 29, 2009 : 06:30 AM	APTT	33.1 sec	

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### BASIC METABOLIC PANEL

Date	Test	Result	Deviation
Jan 29, 2009 : 06:30 AM	SODIUM	137 mM/l	
	POTASSIUM	5.8 mM/l	H
	CHLORIDE	113 mM/l	
	CO2	22 mM/l	L
	BUN	21 mg/dl	
	GLUCOSE	163 mg/dl	H
	CREATININE	1.0 mg/dl	
	CALCIUM	7.3 mg/dl	L



*“BP = 140/90”*

*“Your blood pressure  
is high”*  
(comparison)

*“High blood pressure  
puts you at risk of having  
a stroke”*  
(consequences)

*“Here are some  
very effective ways  
to help you lower  
your blood  
pressure”*  
(developing and  
applying  
generalizable rules  
and theories)

# Increasing expectations for health literacy and numeracy

- Health literacy: Ability to comprehend and make use of written and oral information for one's own health
  - Low/marginal health literacy estimated in nearly half of US population  
Paasche-Orlow 2005
- Health numeracy: Ability to comprehend and make use of quantitative information for one's own health
  - Poor numeracy even more prevalent     Ancker, Kaufman *JAMIA* 2007

# Numeracy

Questionnaire about bladder infection administered to 600 women -- “Please circle which rate is higher.”

1. 2.6 per 1000 women, or 8.9 per 1000 women

- 73% of respondents got it right
- $\leq 9$  years of education: 50%

2. 1 in 384 women, or 1 in 112 women

- 56% of respondents got it right
- $\leq 9$  years of education: 30%

# Evidence about importance of numeracy

- Poor numeracy skills associated with poorer medical decisions (Peters et al, 2006)
- Poor numeracy skills associated with worse health:
  - asthma (Apter 2006)
  - anticoagulation (Estrada 2004)
  - diabetes (Osborn 2009)



# Numeracy: How people think it works

healthcare  
provider



“Take 50 mg 3 times  
a day”

numerate  
patient



comprehends,  
takes appropriate  
action

# Numeracy: How people think it works

healthcare  
provider



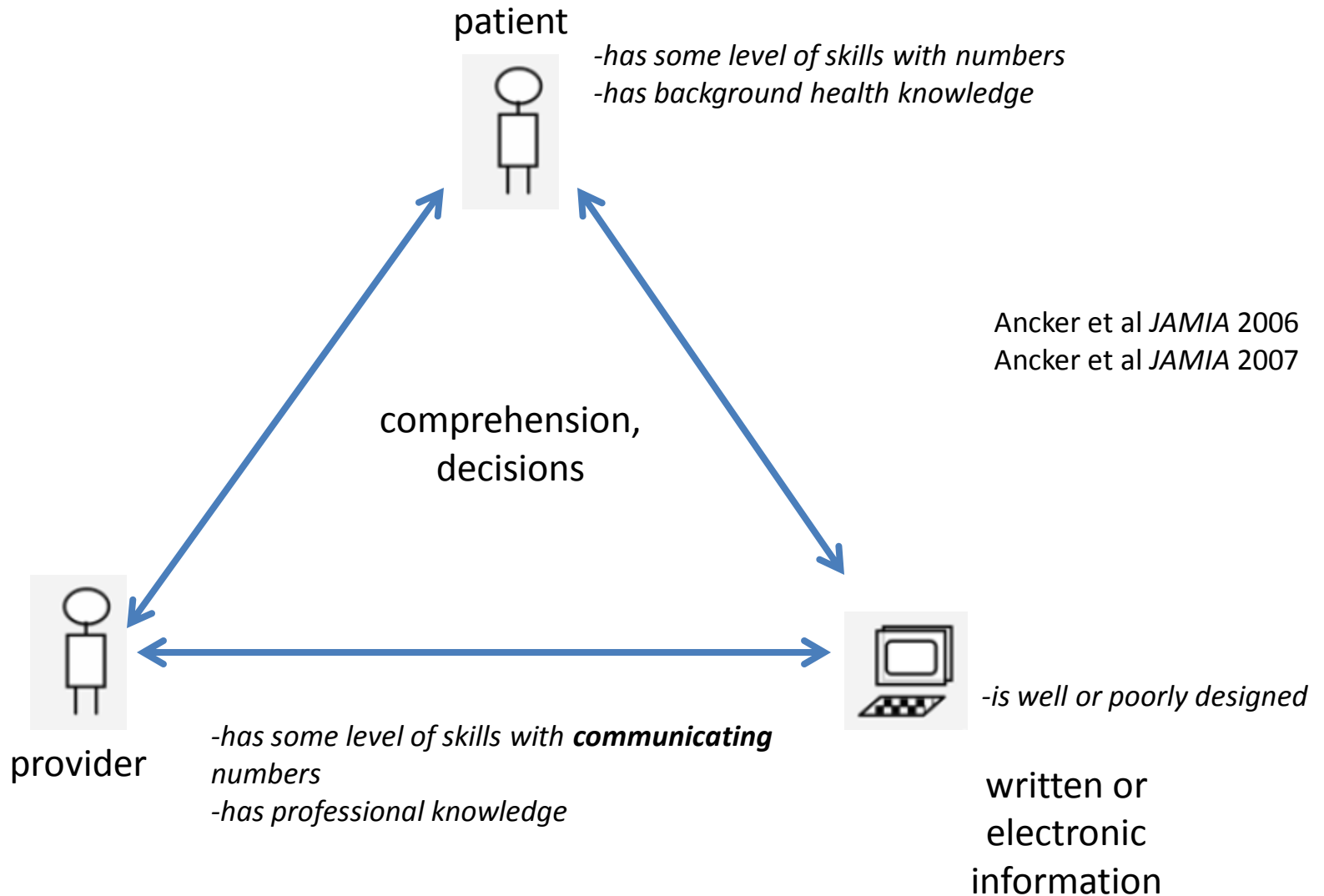
“Take 50 mg 3 times  
a day”

numerate  
patient

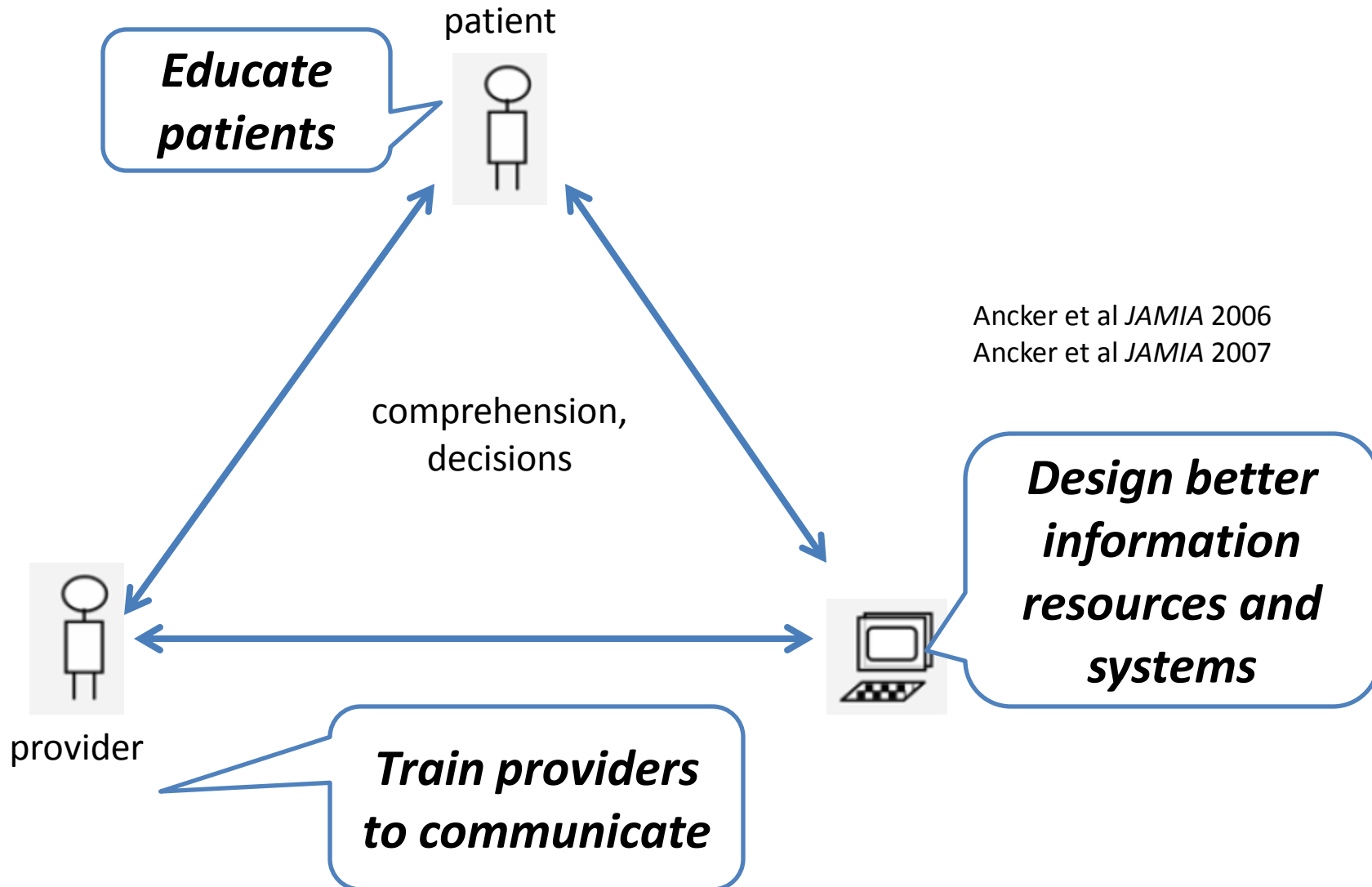


↓  
doesn't  
understand,  
takes no action –  
or wrong action!

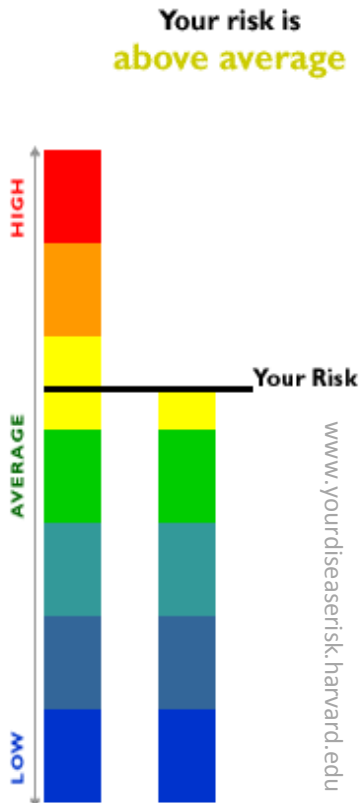
# Numeracy: How it really works



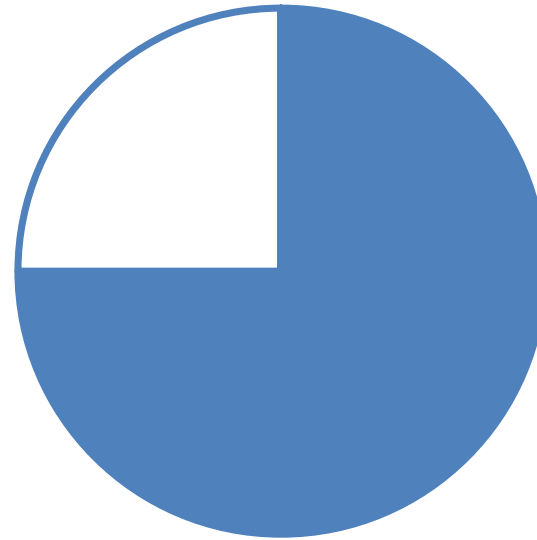
# Improving patients' ability to use information



# Good information design helps people use information



The chance that you have this mutation is 25%.  
The chance that you do not have the mutation is 75%.

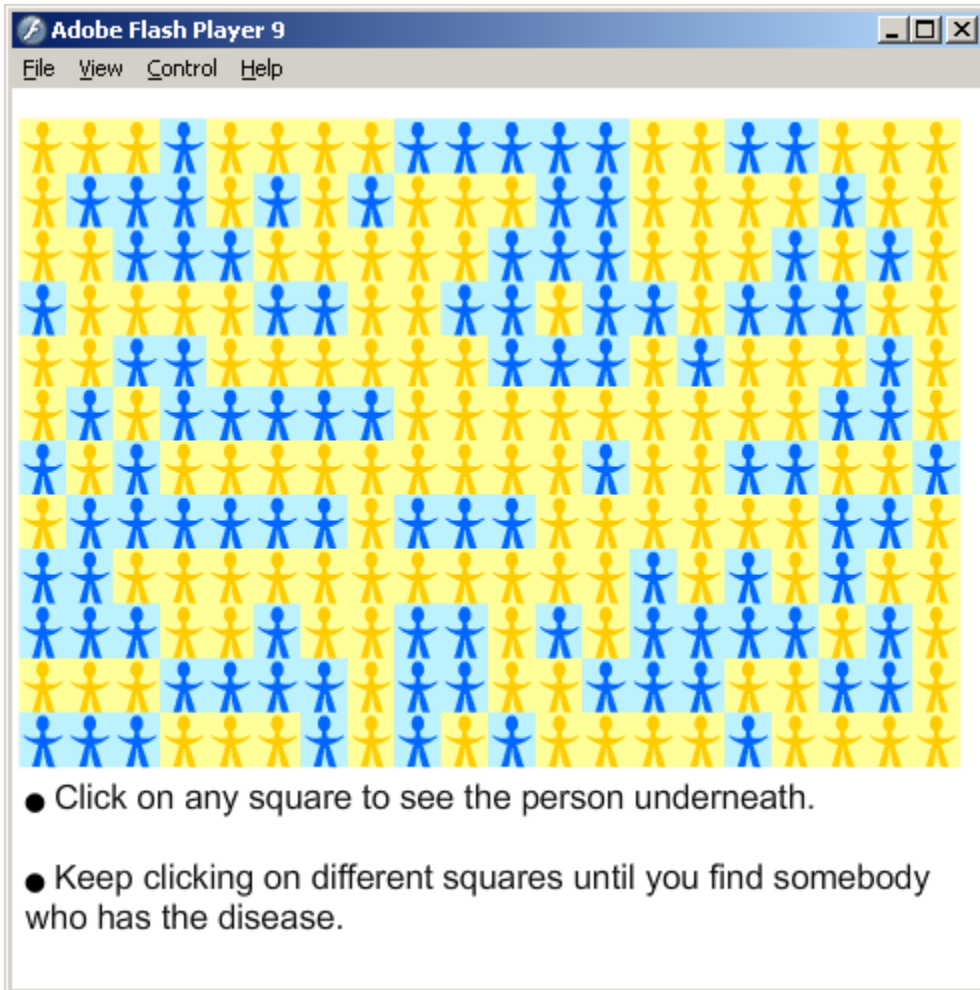


Rimer, Glassman, 1999

# Opportunity for innovation

Adobe Flash Player 9

File View Control Help

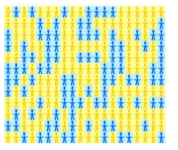
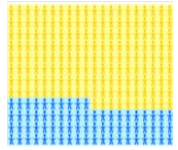
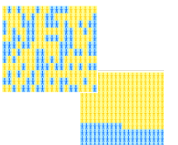
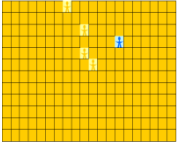


● Click on any square to see the person underneath.

● Keep clicking on different squares until you find somebody who has the disease.

Ancker et al *Medical Decision Making*  
2011

# Participants (n = 160) liked interactive graphics

Strongly agreed that the graphic...					p
Helped me understand the risks					
all participants	33%	41%	44%	<b>60%</b>	.08
low numeracy only	46%	50%	46%	<b>78%</b>	.46

# Graphics affected perceived risk and intention to take protective measures

- Searchers clicked 2-51 times before finding a blue person
- Number of clicks was
  - correlated with feeling vulnerable ( $\rho = -0.52$ ,  $p=.03$ )
  - correlated with qualitative risk ( $\rho = 0.67$ ,  $p=.003$ )
  - not correlated with numeric risk estimate ( $\rho = 0.001$ ,  $p>0.9$ )
- Interactive graphic substantively *reduced* the difference between high-numeracy and low-numeracy patients
  - feelings of vulnerability
  - qualitative descriptions of risk



# Summary

- Numeracy is associated with health outcomes
  - plausible causal relationship
- Patient understanding of quantitative information is strongly affected by information design as well as numeracy
- Opportunities for research and innovation into creative and effective ways of presenting medical data to patients
  - data -> information -> knowledge

Thank you!

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