



How Virtual Health Assistants Engage Patients and Transform Behavior

A more strategic and comprehensive approach to mHealth and successful behavior change

Thomas Morrow MD
Chief Medical Officer
Next IT

Using Virtual Assistant Technology To Improve Outcomes, Adherence

Advances in computer technology have placed us on the threshold of a new way of delivering care that is both economical and incredible

Thomas Morrow, MD



Robots and computers have fascinated most of us for decades. I fondly remember programming in Fortran using 88-character punch cards and being amazed at how rapidly a computer could solve equations that would take hours to solve manually. My fascination with the computer continued to be stoked by movie characters such as C3PO and R2D2 in the *Star Wars* series, by HAL in *2001: A Space Odyssey*, and by Captain Kirk's conversations with the Enterprise's computer. More recently, Hollywood treated the world to a bio-computer humanoid in *Avatar*.

Computers are not only tools to work on. They also interact with us, by talking us through a purchase at a grocery, for example. They have made our transactions easier by eliminating waiting for boarding passes at the airport and by taking our payment in a parking garage. They also entertain us in increasingly sophisti-

cated video games, help us teach our children with online interactive education, and help us troubleshoot computer problems by using a voice-recognition-driven help desk.

Other computers reach to global positioning satellites (GPS), facilitating travel in unfamiliar areas. In most cases these applications are delivered by impersonal machines — albeit, machines with plenty of raw processing power.

Medicine lags

Medicine has lagged many industries in its use of computers, perhaps because of the very personal nature of medical care or the enormous variability of the human condition.

Raw processing power and software sophistication have reached the point that human emulation is now possible. I predict that computers will soon take over many of the repetitive data gathering and educational tasks that humans now perform in medical interactions.

In 2007, John W. Bachman, MD, wrote in *Family Practice Management* about his experience in having patients enter their own historical data in his electronic health record. It saved time and money and, he thinks, resulted in more accurate data.

A much more advanced model described in a PhD thesis by Timothy Bickmore in 2003. Relational agents (conversational computer image-recognition capability) had conversations with patients. Bickmore's relational agent, Laura, demonstrated both v

Thomas Morrow, MD, is the past president of the National Association of Managed Care Physicians and has over 20 years of managed care experience at the national, state, or health plan level. Contact: TMorrow@ManagedCare.com



Conversational virtual nurse agent conducts a bedside dialogue with a patient. "She" points to a medication and describes it; the patient clicks the "right" box, meaning, Right, I understand.



CIO Network
INSIGHTS AND IDEAS FOR TECHNOLOGY LEADERS.

TECH | 3/13/2013 @ 12:31AM | 2,409 views

How Virtual Health Assistants Can Reshape Healthcare

Eric Savitz, Forbes Staff

Guest post written by Thomas Morrow

Thomas Morrow, M.D., has 25 years experience across the healthcare industry. He currently serves as an unpaid advisor to *Next IT*, and a medical director at *Genentech*.

Advanced data analytics tools, voice recognition and new user interfaces are a few of the technologies buzzing with promise to cure our healthcare system — but **all of these new tools** overlook a critical stakeholder: The patient.

Providers, payers and physician groups are expected to spend more than **\$69 billion** on healthcare-related IT by 2017. For the most part, solutions designed to improve efficiency have taken center stage.

But making lots of small, incremental efficiency gains in hospitals or physician offices will not be enough to ensure proper care for all those who seek it. Consider this: There's just **one licensed physician** for every **370 people in the U.S.**

Addressing this problem in a vacuum is not only misguided, it's unsustainable. The U.S. population will continue to outpace the capacity of the physician community, regardless of the most promising physician-focused technologies.



Thomas Morrow

Why Don't People Take Their Medication?

- Forgetfulness
- I don't think it is working
- It causes me to have _____
- I don't really think I need it
- It affects my nature
- I took it for a month...
- I just don't want to deal with it now
- I cannot afford it
- I have no transportation
- It's just a touch of _____ right?

My Dr. said I needed it,
but I really don't believe I need it.

If he asks, I'll just tell him I am
taking it.

Keep a watch...on the faults of the patients, which often make them lie about the taking of things **prescribed**. For through not taking disagreeable drinks, purgative or other, they sometimes die.

Hippocrates, Decorum – more than 2,000 years ago

The *New York Times*
BESTSELLER

Foreword by **Stephen R. Covey**

Author of *THE 7 HABITS OF HIGHLY EFFECTIVE PEOPLE*

crucial conversations



From the
authors of
Influencer

Tools

for talking
when stakes
are high

KERRY PATTERSON, JOSEPH GRENNY, RON MCMILLAN, AL SWITZLER



Engaging the Patient

“Health-care providers want patients to take a more active role in their own care because it leads to lower costs and better outcomes.”

The Wall Street Journal,
June 9, 2014

JOURNAL REPORT | UNLEASHING INNOVATION
HEALTH CARE
THE WALL STREET JOURNAL.
Monday, June 9, 2014

Follow The Experts
An Online Conversation
DETAILS, P. 2

BY LAURA LANDRO

IT'S THE LAST MILE IN THE RACE to fix health care—getting patients more involved.

Hospitals, doctors and public health officials are pushing patients to keep track of their medical data, seek preventive care and stay on top of chronic conditions. They're measuring how motivated patients are to manage their own health and adopting a wide range of strategies to help them do better, a concept known as patient engagement. The federal government, for in-

The Unengaged Patient

Health-care providers want patients to take a more active role in their own care because it leads to lower costs and better outcomes. A review of 31 national surveys suggests it has been an elusive goal.

50% Medicare patients who usually don't bring a list of questions to doctors' appointments	60% Adults who don't tell health professionals they have drug allergies unless specifically asked	30% Adults who have never compared a medication they received from a pharmacist against their doctor's order	61% Americans who don't maintain their own medical record (paper or electronic)
--	---	--	---

Source: Center for Advancing Health, 2010
The Wall Street Journal



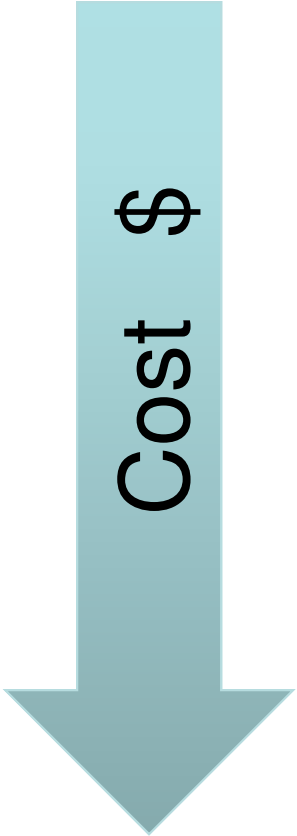
Ways to Engage Patients

Conversation

- Office Visit
- Telemedicine
- Group Visit
- Phone Call
- Apps
- Text Message
- Letter



Effectiveness



Cost \$

Patient Engagement = Facilitating...

“actions individuals must take to obtain the greatest benefit from the health care services available to them.”

➤ The True Meaning of Patient Engagement

- Focuses on **behaviors** of individuals relative to their health care that are critical and proximal to health outcomes



WHO Definition of Adherence

- The extent to which a person's behavior-taking medicine, following a diet, and/or executing lifestyle changes, corresponds with *agreed* recommendations from a health care provider

ENGAGEMENT

“Patient Engagement is the
Blockbuster Drug of the
Century.”

Leonard Kish, Health IT Strategy Consultant

Behavioral Change:

The Science

Wellbeing = Healthy Behavior

- Is the result of a complex interaction of influences both good and bad on a persons health
- Encompass multiple dimensions
 - Education
 - Socio-economic factors
 - Cultural influences
 - Interpersonal determinants
 - Age, life-stage, time
 - Societal Influences

Both Conscious and Unconscious Influences in Behavior

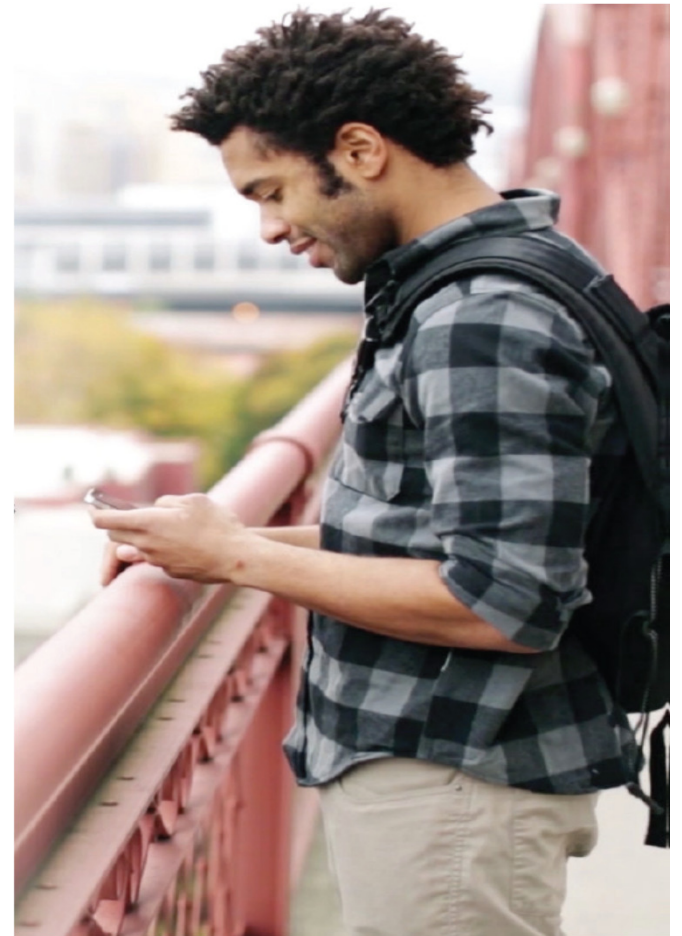
- Not every health decision is a result of a logical progression of thought
- Must take into account the unconscious determinants of health!

Most Popular Used Theories in Behavioral Health

- Social Cognitive Theory
 - Human behavior is a product of dynamic interplay of personal, behavioral and environmental influences
- Trans-theoretical Model/Stages of Change
 - Behavior change is a process that unfolds over time through a sequence of changes
 - Precontemplation, contemplation, preparation, action, maintenance, termination
- Health Belief Model
 - People's actions are dependent upon their feelings of susceptibility, seriousness, benefits and barriers to behavior, triggers to action and conviction that action will produce expected outcome

➤ It's All About the Relationship

- Interpersonal communication is one of the most critical factors in changing health behavior
 - Fosters Healing
 - Enhances Information Exchange
 - Responds to Emotion
 - Manage Uncertainty
 - Decision Making
 - Enables Patient Self Management



Motivational Interviewing

- ...a collaborative, person-centered form of guiding to elicit and strengthen motivation for change” *Miller and Rollnick 2009*
- Patient Centered
- Develops Rapport
- Allows Patients to Remain in Control
 - Open ended questions
 - Empathy
 - Affirmations
 - Reflections
 - Summaries
- Key to empowering patients to become self motivated

Asking Permission

- Ambivalence and resistance are normal parts of the change process
- Patients who grant permission have a greater emotional stake in the discussion.
- May I give you my opinion? Would you like to know what I think about this situation?
- Ensure they know what you meant
- Then asking if there is more information that they would like to know about

Questioning

- What's good about your behavior?
What's not so good?
- How would your life be different if you weren't doing X?
- What would you need to change to achieve your goals?

Empathy

- Behavior change is tough. Expressing empathy is important
- When patients feel understood and not judged, they are more apt to open up
 - I know how hard this is.
 - I understand what you're saying.
 - That must have been hard for you.

Ambivalence

- Patients who are noncompliant are typically ambivalent about changing chronically unhealthy behavior
- By recognizing and discussing patients' ambivalence in a nonjudgmental way, you help them to acknowledge the problem
 - Has your behavior ever caused problems for you or anyone else?
 - What was life like before you started having problems with X?
 - If you keep doing what you're doing, how do you see things turning out?

Using Scales

- AGENT: Mr. Jones, I just want to get a sense of where you're at with the smoking On a scale of 0-10, how important would you say it is for you to consider stopping now?
- Mr. Jones: about a 2
- AGENT: Mr. Jones, right now quitting smoking doesn't sound very important, what would have to happen for your 2 to go to a 6 or 7

Planting Seeds of Change

- AGENT: Concludes with the VHA summarizing the solutions that the patient has verbalized, and then asking the patient what he or she thinks is possible to accomplish by some time in the future... sets goals



But, What About Apps?

➤ An Epidemic of Nomophonephobia

HOW DID YOU FEEL WHEN YOU MISPLACED YOUR PHONE?



73%
PANICKED



14%
DESPERATE



7%
SICK



6%
RELIEVED

➤ Apps: Love 'em or Leave 'em

- **102 BILLION apps downloaded last year**

- App benchmark is 30/10/10
 - 30% will use app each month
 - 10% will use the app daily
 - 10% will use app at any given time



- Apple & Google marketplaces have more than 1.5 million apps, **60% have never been downloaded once**

➤ Of the 43,700 alleged health or medical apps on iTunes

- **Only 54% are genuine healthcare apps**
 - 69% of which targeted consumers/patients
- Most focus on overall wellness, are “simple in design and do little more than provide information”
- **Only 159 can track or capture user-entered data**
- **Fewer than 50 relate to condition management** or provide tools and calculators for users to measure vitals
- **90% scored less than 40 out of a possible 100** for functionality
- **50% have been downloaded less than 500 times**
- Patients and Physicians have to find and navigate the maze with little guidance

Patient Apps for Improved Healthcare: From Novelty to Mainstream
IMS Institute for Healthcare Informatics



Another app or a strategic solution?



56% of people own a smart phone

More mobile devices on earth than people

80% of time on mobile is spent inside apps

So why hasn't the explosion in smart phones and medication adherence apps had a more meaningful impact on adherence?

50% of mobile phone users, use it as their primary internet source

More than 31,000 health, fitness, and medical related apps

About 95 million Americans use their mobile phone as a healthcare tool or to find health information

Courtesy of AF-Studio.pl & Super Monitoring

Life with a Virtual Health Assistant

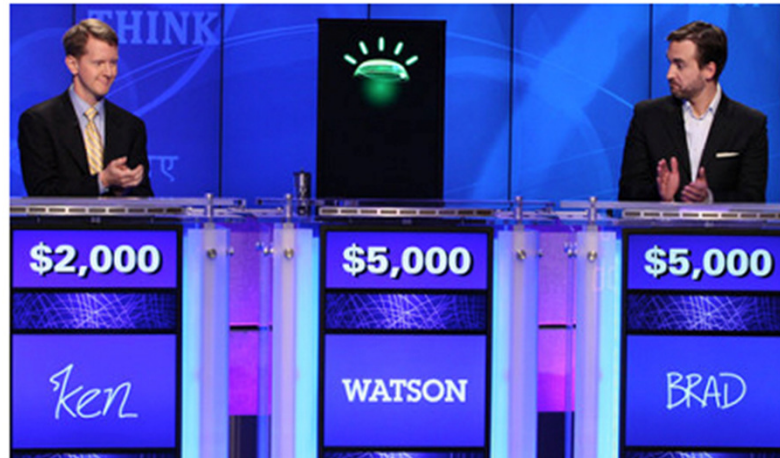
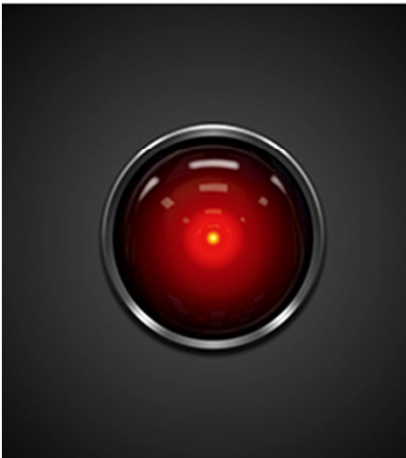
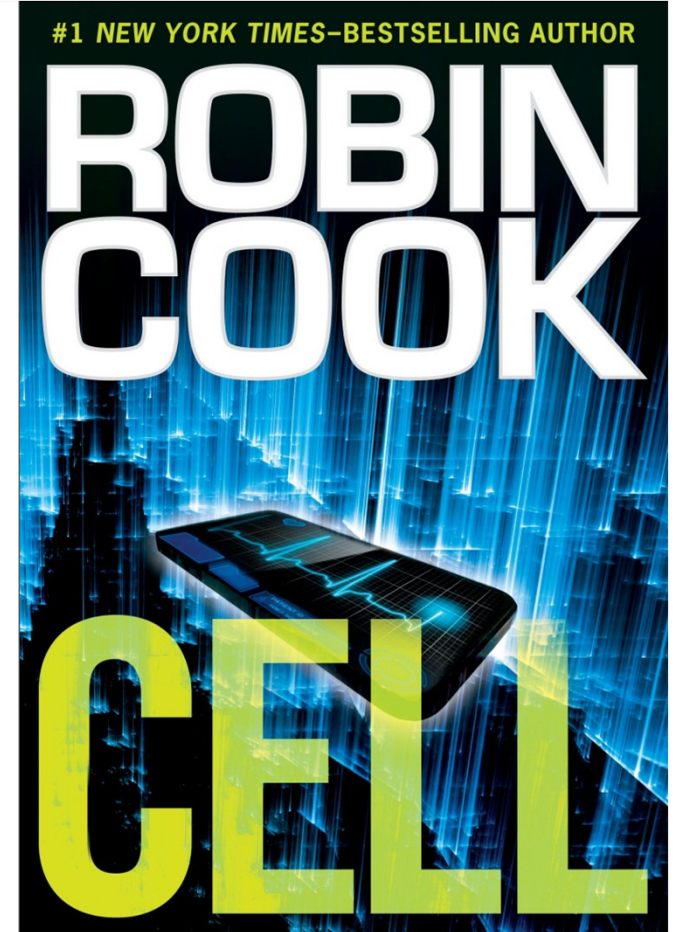
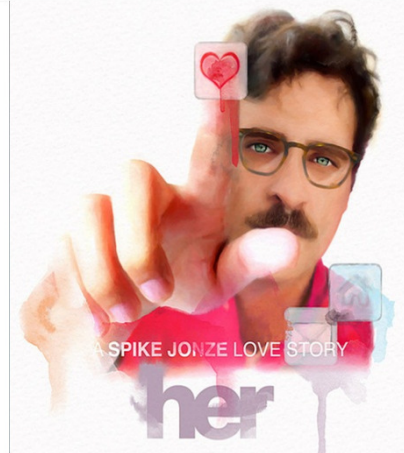
https://www.youtube.com/watch?v=jYsgm_jqc48&list=UUQTTwD5jl1xmG1o6wGniEOQ

➤ Natural Language Virtual Health Assistants

A specialized form of artificial intelligence that engages humans by combining the ability to understand natural – or everyday – language with the ability to utilize a variety of internal or external data sets to characterize human intent, deliver resolutions and/or facilitate tasks in a highly contextual manner



➤ Famous (and infamous) Virtual Assistants



“Patient engagement is a negotiation”

Bruce Berger, Ph.D. Co-Author
***Motivational Interviewing for Health Care Professionals:
A Sensible Approach***

Why Don't People Take Their Medication?

- Forgetfulness
- I don't think it is working
- It causes me to have
- I don't think I need
- It affects
- I took
- I don't know
- I'm
- I can't
- I have no transportation
- It's just a touch of sugar, right

**THE FACT IS, YOU DON'T
KNOW UNTIL THEY TELL
YOU!!**

The *New York Times*
BESTSELLER

Foreword by **Stephen R. Covey**

Author of *THE 7 HABITS OF HIGHLY EFFECTIVE PEOPLE*

crucial conversations



Tools

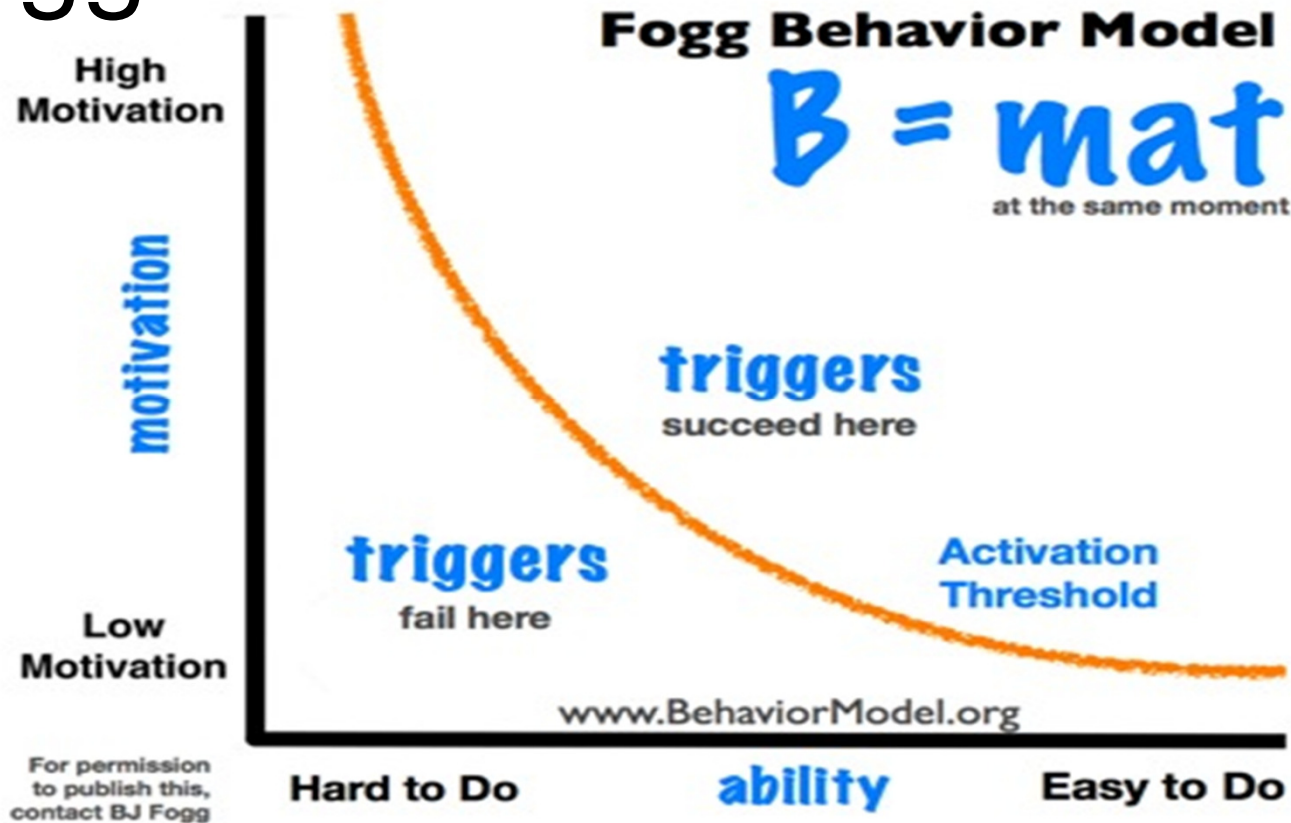
for talking
when stakes
are high

From the
authors of
Influencer

KERRY PATTERSON, JOSEPH GRENNY, RON MCMILLAN, AL SWITZLER

“At the core
of every
successful
conversation
lies the free
flow of
relevant
information.”

➤ Fogg Behavior Model



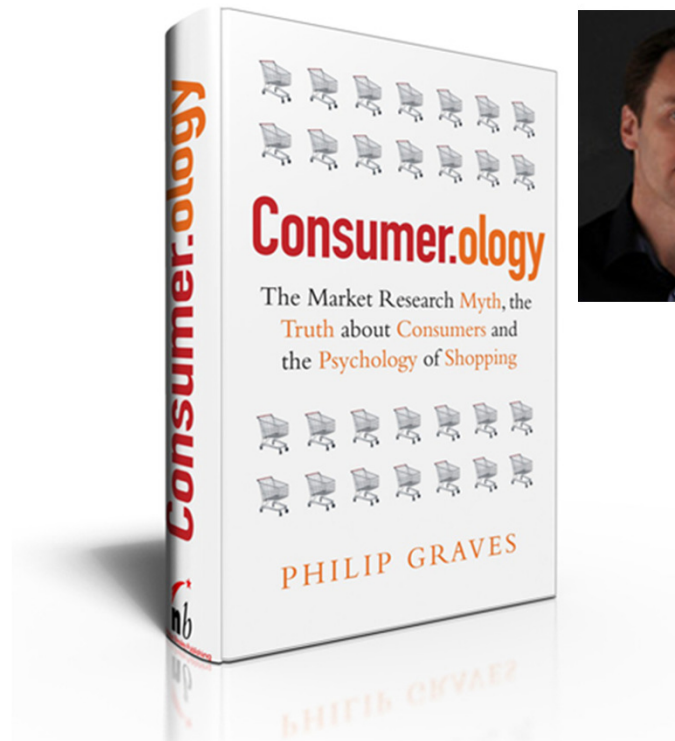
Three elements must converge at the same moment for a behavior to occur:

- Motivation
- Ability
- Trigger

When a behavior does not occur, at least one of those three elements is missing.

➤ Both Conscious and Unconscious Influences in Behavior

- Not every health decision is a result of a logical progression of thought
- Must take into account the unconscious determinants of health!



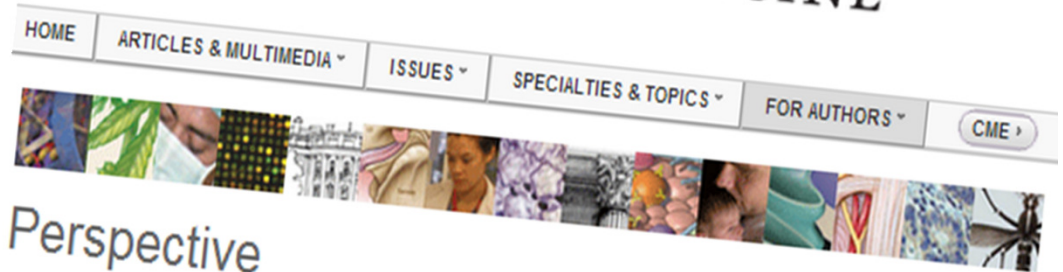
Automated Hovering

VHA facilitates opportunity for:

- ✓ Behavior change
- ✓ Motivational Interviewing
- ✓ Patient-generated data
- ✓ Disease management
- ✓ Adherence protocols
- ✓ Side effect management
- ✓ Health literacy
- ✓ Quality of life metrics
- ✓ Virtual coaching
- ✓ Setting appointments
- ✓ Pharmacovigilance



The NEW ENGLAND
JOURNAL of MEDICINE



Perspective

Automated Hovering in Health Care — Watching Over the 5000 Hours

David A. Asch, M.D., M.B.A., Ralph W. Muller, M.A., and Kevin G. Volpp, M.D., Ph.D.
N Engl J Med 2012; 367:1-3 | July 5, 2012 | DOI: 10.1056/NEJMp1203889

Share:     

Article **References** Citing Articles (1)

The dominant form of health care financing in the United States supports a reactive, visit-based model in which patients are seen when they become ill, typically during hospitalizations and at outpatient visits. That care model falls short not just because it is expensive and often fails to proactively improve health, but also because so much of health is explained by individual behaviors,¹ most of which occur outside health care encounters. Indeed, even patients with chronic illness might spend only a few hours a year with a doctor or nurse, but they spend 5000 waking hours each year engaged in everything else — including deciding whether to take prescribed medications or follow other medical advice, deciding what to eat and drink and whether to smoke, and making other choices about activities that can profoundly affect their health.

The increasing attention being paid to those 5000 hours takes various forms. Employers are focusing more on employees' wellness — how they eat, sleep, and exercise.

➤ The VHA doubled exercise activity!!!

...and no demographic is off limits

Ages
62 – 84

Low Reading Literacy
86%

Never Used a Computer
36%

Used a Computer “a few
times”
27%

African-American
73%

Obese or Overweight
77%

Acceptance and Usability of a Relational Agent Interface by Urban Older Adults

Timothy W. Bickmore
Medical Information Systems Unit
Boston University School of Medicine
720 Harrison Ave. #1102, Boston, MA
bickmore@bu.edu

Lisa Caruso, Kerri Clough-Gorr
Geriatrics
Boston University School of Medicine
88 E Newton St. B-2103, Boston, MA
lisa.caruso@bmc.org, kmcclough@bu.edu

ABSTRACT

This study examines the acceptance and usability of an animated conversational agent designed to establish long-term relationships with older, mostly minority adult users living in urban neighborhoods. The agent plays the role of an exercise advisor who interacts with subjects daily for two months on a touch-screen computer installed in their homes for the study. Survey results indicate the eight subjects who completed the pilot study (aged 62-82) found the agent very easy to interact with, even though most of them had little or no previous experience using computers. Most subjects also indicated strong liking for and trust in the agent, felt that their relationship with the agent was more similar to a close friend than a stranger, and expressed a strong desire to continue working with the agent at the end of the study. These results were also confirmed through qualitative analysis of post-experiment debrief transcripts.

Author Keywords

Relational agent, embodied conversational agent, social agent, older adult, health, longitudinal study.

ACM Classification Keywords

H5.2 [Information Interfaces and Presentation]: User Interfaces—Evaluation/methodology; Graphical user interfaces; Interaction styles; Natural language; Theory and methods; Voice I/O.

INTRODUCTION

Automated systems are being increasingly used to deliver tailored health information using a variety of media including printed materials, telephony, video, and interactive computer-based systems, in order to effect health behavior change [7]. Although some researchers have found that many older adults readily accept new

technologies such as computers, this segment of the population lags behind all other age groups with respect to computer ownership (only 25.8% of senior households have a computer) and Internet access (14.6% of all senior households have Internet access) [2]. Further, more than one-third of U.S. adults over 65 have inadequate or marginal functional health literacy, and among indigent and minority patients in urban areas this number rises to over 80% [9].

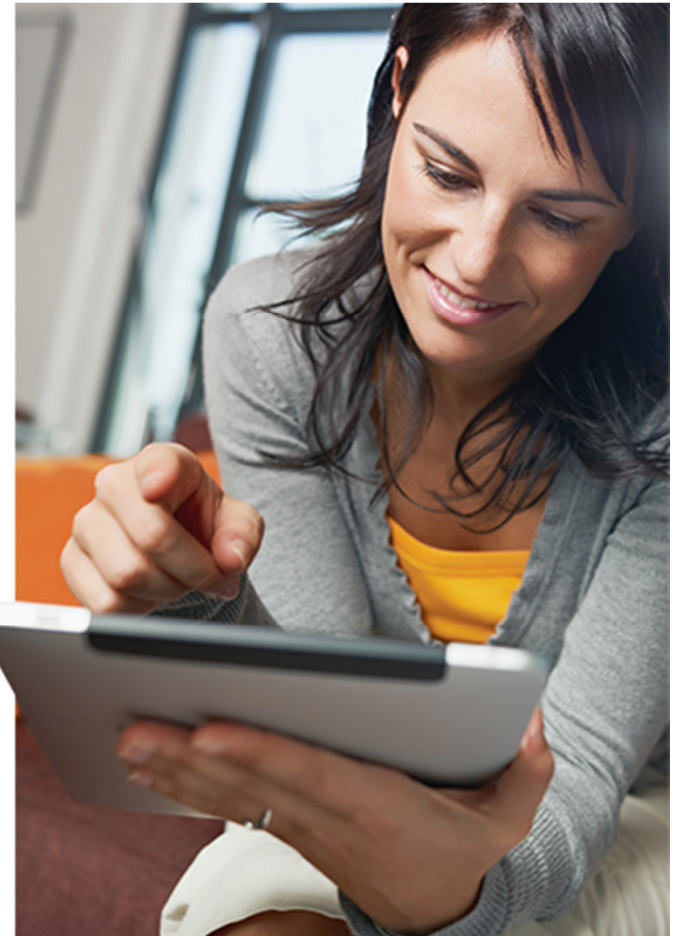
While older adults are disadvantaged with respect to their access to advanced computing and communication technologies, they arguably are in the most need of them when it comes to delivery of health information and automated interventions. For example, only 12% of adults over 75 get the minimum level of physical activity currently recommended by the Centers for Disease Control and Prevention, and 65% report no leisure time activity [1].

Relational agents—computational artifacts designed to build long-term social-emotional relationships with users using simulated face-to-face conversation [4]—may provide an accessible user interface for much of the older adult population, and an especially effective channel for health communication and behavior change interventions. The interface relies only minimally on text comprehension and uses the universally understood format of face-to-face conversation, thus making it less intimidating and more accessible for patients with low literacy skills. The agent's use of certain nonverbal conversational behaviors—such as hand gestures that convey specific information through pointing or through shape or motion—also provides redundant channels of information for conveying semantic content also communicated in speech, thus enhancing the likelihood of message comprehension. Further, by using appropriate social behavior to establish trust and social bonding with the user, the agent is more effective at gaining user adherence to prescribed behavior change regimens, and more effective at keeping users engaged with the communication.

➤ Changing the Communication Model with Patients

VHA's are trained to:

- Know the clinical guidelines
- Handle adverse events
- Operate within medical-legal boundaries
- Reflect your branding
- Get smarter over time



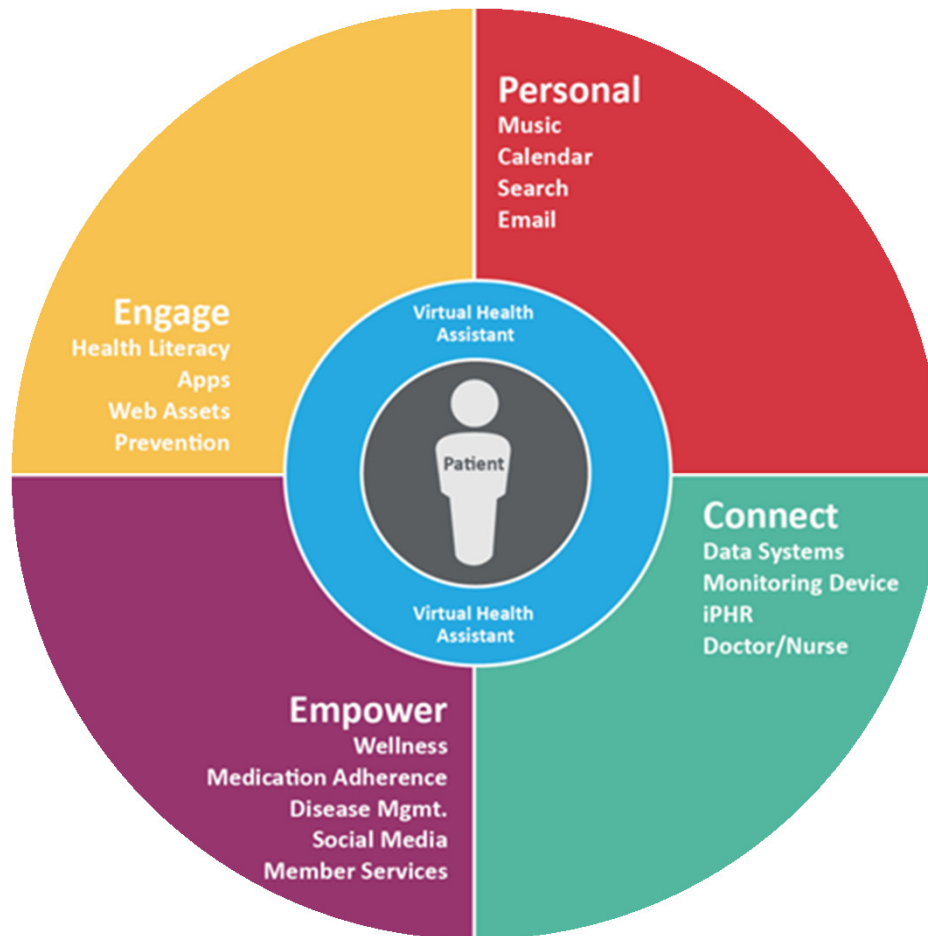


And a VHA Can Ask Questions!

- Could you share with me your thoughts about why you are having problems following your physician's instructions?
- If you had access to the world's expert on your condition, what would you ask him/her?
- What are the biggest issues you face because of your condition?

The future is about simplicity.

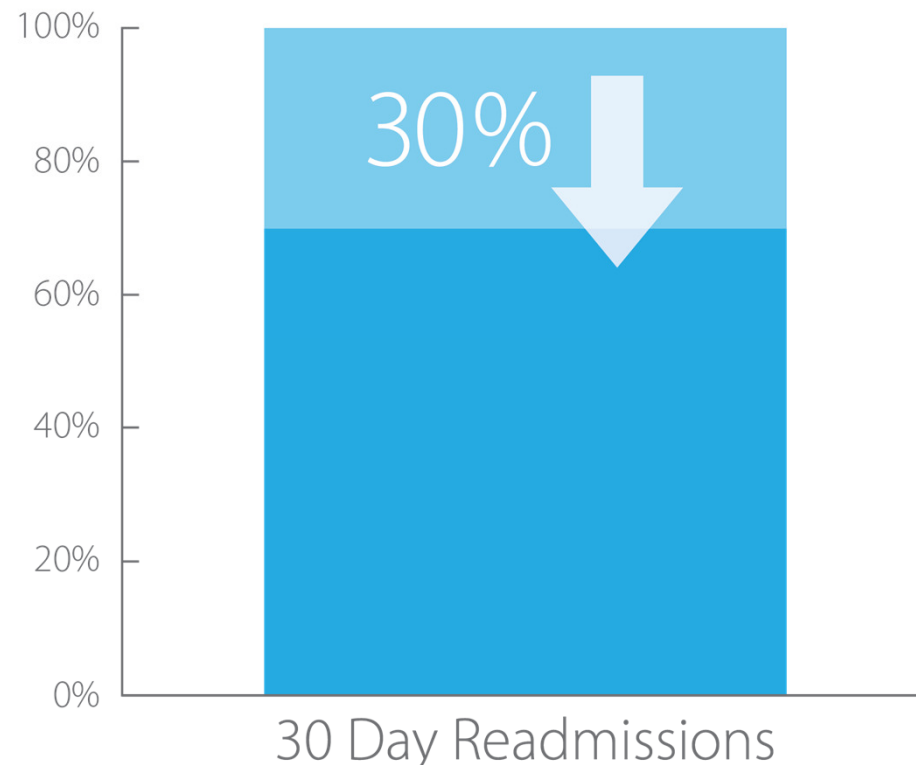
➤ A VHA facilitated comprehensive, connected, scalable personalized ecosystem



➤ Clinical Results

A virtual discharge nurse reduced hospital readmissions at the 30-day mark, by 30%

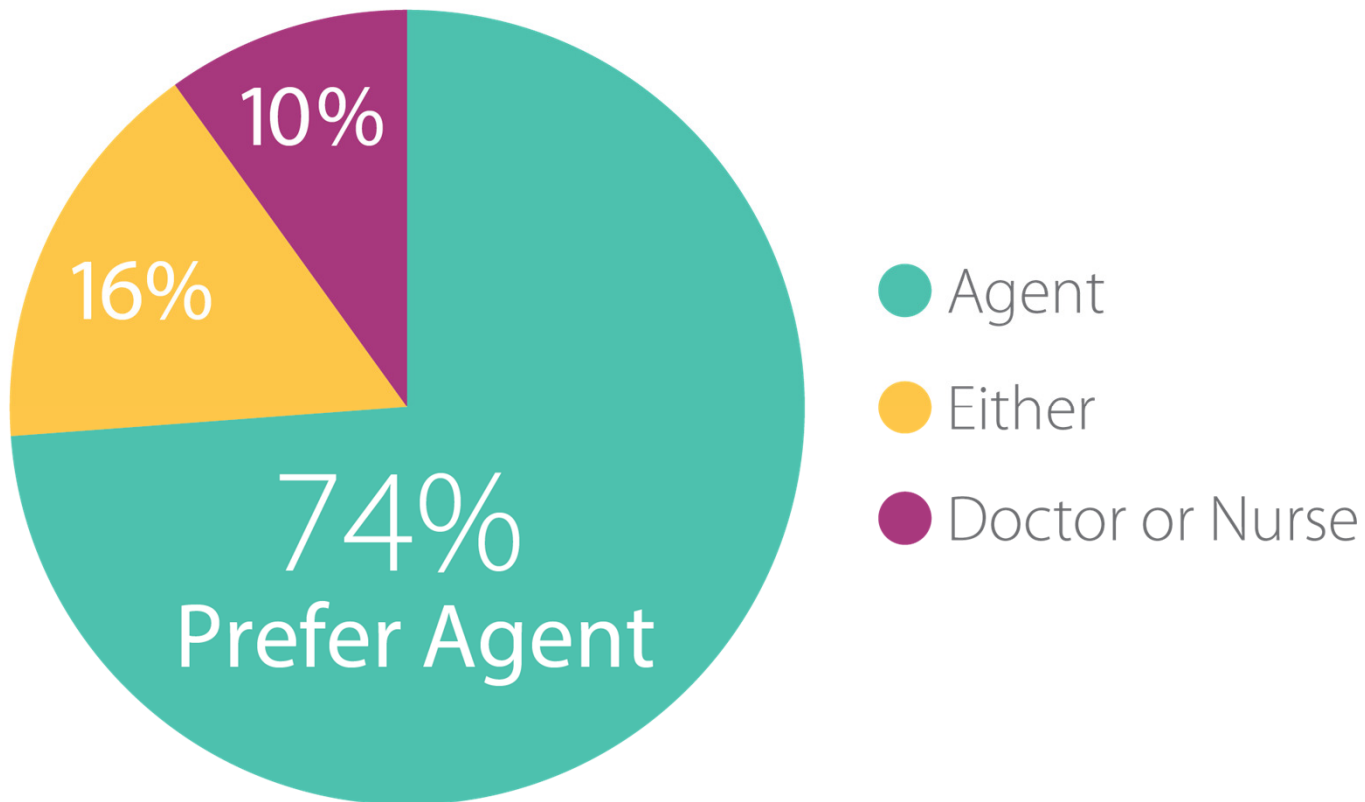
Virtual Nurse Effectiveness



Timothy Bickmore, Intelligent Caring Machines: FHTI Virtual Healthcare Workers Initiative fhti.org

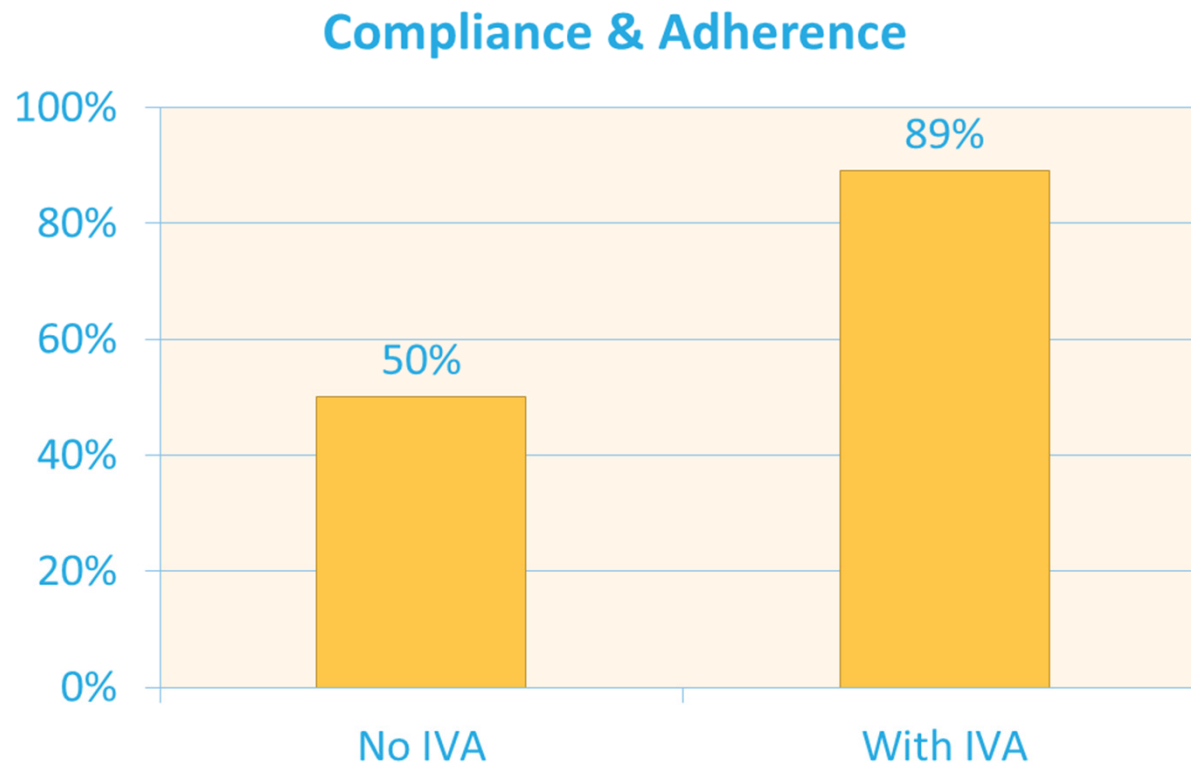
➤ Patients preferred the virtual discharge nurse

74% of pilot-study hospital participants would rather interact with an intelligent virtual assistant than an actual human being



➤ VHA facilitated adherence

Anti-psychotic medication adherence increased to 89% from the historical rate of 50%



Bickmore, T. & Pfeifer, L. (2008) Relational Agents for Antipsychotic Medication Adherence

VHA's, Not Just For Clinical Interactions

A virtual patient services contact center

- **Replicate**
 - 80% of human interactions with 99% accuracy
- Integrate
 - With current contact center
 - Multiple Apps
 - Robust Digital Content
- **Exponentially expand**
 - Reach and frequency
 - Personalized engagement
 - Real-time behavior based discernment & interventions
 - Monitoring and tracking capabilities
 - Prior auth
 - Refills



So, let me ask...

- Are there any other scalable, viable, affordable, acceptable options for improving behavior and adherence that has the potential of a VHA?
- Questions?



Thank you for your time.
Please let us know if you
have any questions or
need further information.

Thomas Morrow MD
Chief Medical Officer
Next IT
404-583-6028
Tmorrow@nextit.com

www.NextIT.com
© Next IT Corporation. All rights
reserved.