

eHealth: Interactive Technologies to Improve Health Behavior Change

David K. Ahern, Ph.D

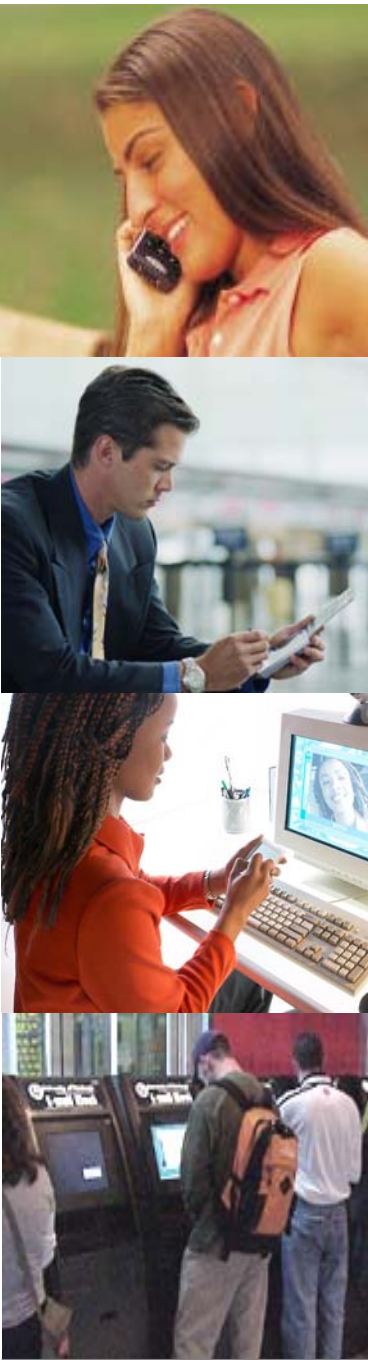
Health e-Technologies Initiative
Brigham and Women's Hospital
Harvard Medical School

Senior Scientist
The Abacus Group

March 11, 2009

AAHB American Academy of Health Behavior.

A Multidisciplinary Society of Health Behavior Scholars and Researchers



Overview

Health e-Technologies Initiative

What is eHealth?

Is there an evidence-base for eHealth programs for health behavior change?

What is the future of eHealth programs for health behavior change?



Success Story

University of
Washington,

Outcome Evaluation
Grantee

*A Randomized
Controlled Trial of
Diabetes Disease
Management Over
the Internet*

Joint Commission [Journal](#) on Quality and Safety

Patient Centeredness

Using an Internet Comanagement Module to Improve the Quality of Chronic Disease Care

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Paul J. Alford, MBA

Disabetes mellitus is the second most prevalent chronic medical condition in adult primary care practices. Randomized controlled trials have shown that intensive therapy aimed at nearly normalizing blood glucose levels—with “normal” defined as a glycohemoglobin (HbA_{1c}) level between 4.0% and 6.0%—can decrease the development and progression of macrovascular complications such as blindness and kidney failure. Improvements of 1.0% have been associated with 25%-30% declines in end-organ damage.^{1,2} Unfortunately, the majority of patients with diabetes in the United States are not adequately treated. One recent survey concluded that only 14% of patients met the optimal target HbA_{1c} of < 7.0%.³

Quality improvement efforts in diabetes have largely focused on enhancing the content of care during office visits. Two recent trials of traditional outreach, however, did demonstrate lowered HbA_{1c} outcomes on average in intervention versus control patients. In one of these trials, which was conducted at our own “firm” (group practice), patients inadequately treated or lost to follow-up were called by a clinical pharmacist and encouraged to make appointments.⁴ Mixed improvement over time, however, was limited to patients with the poorest glycemic control at baseline (HbA_{1c} > 8.0%). This may be due in part to the fact that only the subset patients with diabetes able to be reached either by invitation or time for office visits. Thus, it may be time to consider changes in how health care systems deliver chronic disease services.

Article-at-a-Glance

Background: Web-based applications have the potential to support the ongoing care needs of patients with chronic diseases. At the University of Washington, a diabetes care module was developed, and the feasibility of allowing patients with type 2 diabetes to manage their disease from home was pilot tested.

Methods: The disease management module consisted of five Web sites that enabled patients to access their electronic medical records, upload blood glucose readings, enter medication, activities, and exercise data to an online diary, communicate with providers by using clinical e-mail, and browse an educational site with evidence-based content. All data could be viewed by patients and providers in online trended displays that a remote pharmacist was management to review cases weekly.

Results: “Proof-of-concept” was demonstrated by the three pilot participants who were the most non-compliant (glycohemoglobin [HbA_{1c}] from 8.0% to 8.7%). The treatment was evaluated by exchanging 44 e-mails based on the 231 glucose-meter readings sent from home without requiring a person follow-up visit.

Conclusions: The Internet offers the opportunity to involve patients and providers in collaborative management of chronic disease between office visits.

Web-Based Collaborative Care for Type 2 Diabetes

A pilot randomized trial

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OBJECTIVE — To test Web-based care management of glycemic control using a shared electronic medical record with patients who have type 2 diabetes.

RESEARCH DESIGN AND METHODS — We conducted a trial of 83 adults with type 2 diabetes randomized to receive usual care plus Web-based care management or usual care alone between August 2002 and May 2004. All patients had GHb $\geq 7.0\%$, had Web access from home, and could use a computer with English language–based programs. Intervention patients received 12 months of Web-based care management. The Web-based program included patient access to electronic medical records, secure e-mail with providers, feedback on blood glucose readings, an educational Web site, and an interactive online diary for entering information about exercise, diet, and medication. The primary outcome was change in GHb.

RESULTS — GHb levels declined by 0.7% (95% CI 0.2–1.3) on average among intervention patients compared with usual-care patients. Systolic blood pressure, diastolic blood pressure, total cholesterol levels, and use of in-person health care services did not differ between the two groups.

CONCLUSIONS — Care management delivered through secure patient Web communications improved glycemic control in type 2 diabetes.

Diabetes Care 32:234–239, 2009

Health care limited to clinic visits does not meet the needs of many patients with diabetes. Care systems that use Web-based communication provide an opportunity to shift the focus in health care away from the office and toward patients' daily lives at home. Patient interaction with online care plans and electronic medical records may further enhance the effectiveness of chronic care (1,2). Little is known, however, about the impact of using Web communications and shared electronic medical records in the primary care of patients with diabetes.

We present the results of a randomized trial examining a Web-based diabe-

tes support program that aimed to improve glycemic control for patients with type 2 diabetes. The program consisted of access from home to the electronic medical record, secure electronic communications between patients and providers, and interactive disease management tools. We hypothesized that glycemic control would improve in the group receiving the intervention.

RESEARCH DESIGN AND METHODS

Between August 2002 and May 2004, we enrolled participants in a 12-month open, randomized, single-center, controlled trial with a parallel

group design. Patients with type 2 diabetes were randomly assigned to a group receiving usual care or a group receiving usual care plus Web-based care management. Participants, physicians, and care managers could not be feasibly blinded to group assignment after randomization. The study was approved by the University of Washington (UW) Institutional Review Board.

We conducted the trial at the UW General Internal Medicine Clinic (GIMC), a teaching clinic that provides care to 7,707 patients. The clinic is staffed by 25 faculty and 48 resident providers and employs a nurse practitioner to provide case-management services to chronic-disease patients.

Electronic medical record data were used to identify potential participants 18 to 75 years old, whose most recent GHb in the prior 12 months was $\geq 7\%$, and who had made at least two visits to GIMC during the prior year. We excluded patients who had participated in the pilot study of the intervention, had major psychological illness, were non-English speaking, had a resident as a primary physician, or were followed primarily in a specialty clinic.

Following an invitation letter, the study coordinator contacted potential participants by phone to assess study eligibility. Exclusion criteria assessed during the phone interview included lack of Internet access and cognitive, language, or hearing impairment severe enough to preclude participation. At the end of the recruitment phone call, the study coordinator invited eligible participants to participate. Participants initially provided oral consent over the phone.

Allocation to the study group was concealed from the study coordinator and the participant until after the recruitment phone call. Following initial oral consent, the study coordinator consulted the allocation assignment table. Participants were randomly assigned in equal numbers to the two groups. The study's statistician used a computer random number generator to create a random number table in a nonblocked sequence. For participants in

Follow-up Pilot RCT

Results Show Improved Glycemic Control for Type 2 Diabetics

Ralston, JD, Hirsch, IB, et al. *Diabetes Care*, 2009.

From the ¹Center for Health Studies, Group Health Cooperative, Seattle, Washington; the ²Division of Endocrinology, Metabolism and Nutrition, Department of Medicine, University of Washington, Seattle, Washington; ³Medical Center Information Services, University of Washington, Seattle, Washington; the ⁴Division of General Internal Medicine, Department of Medicine, University of Washington, Seattle, Washington; and the ⁵School of Public Health and Community Medicine, University of Washington, Seattle, Washington.

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See accompanying editorial, p. 370.



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WOMEN'S HOSPITAL

Our Mission

- Foster research on eHealth for health behavior change and chronic disease management
- Advance discovery of scientific knowledge about eHealth for diverse populations
- Use eHealth to support consumer engagement about quality





Clearinghouse for Data, Tools, Results

- Collaboration Community fosters linkages between and among researchers and users of eHealth information
- Literature Library, industry events, eHealth Landscape, funding opportunities and news headlines
- Users are encouraged to provide content

www.hetinitiative.org

Health e-Technologies Initiative - Microsoft Internet Explorer provided by Partners HealthCare System

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Back Forward Stop Home Search Favorites Media Print

Address <http://www.hetinitiative.org/>

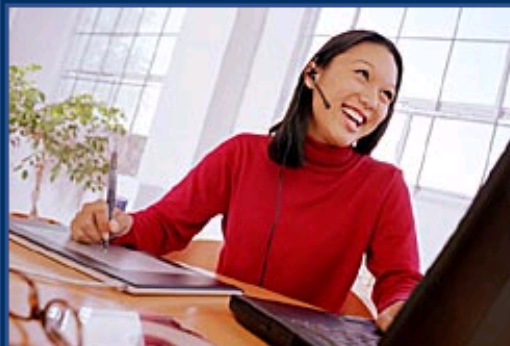


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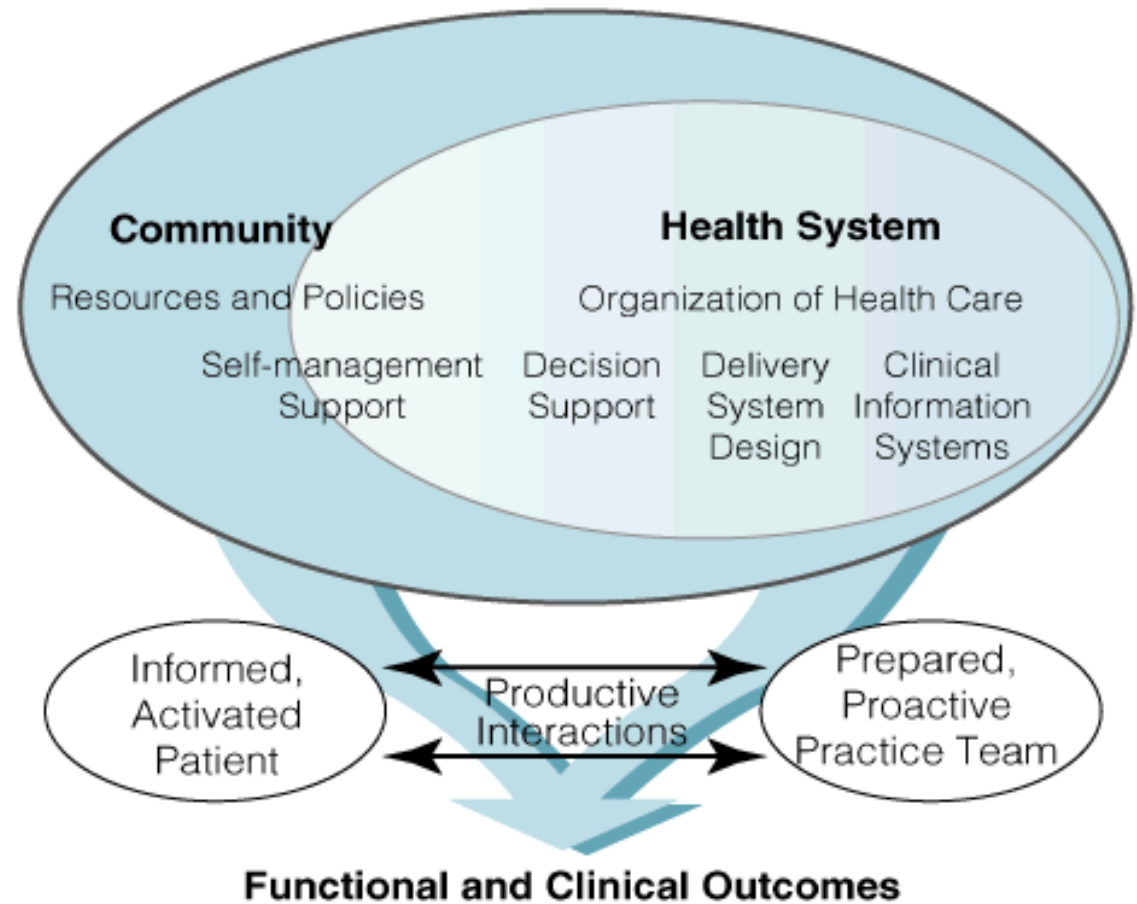
ABOUT HEALTH e-TECHNOLOGIES INITIATIVE

The Health e-Technologies Initiative is a \$10.3-million National Program Office of [The Robert Wood Johnson Foundation](#)[®]. Our program of funded research will advance the discovery of scientific knowledge regarding the effectiveness of interactive applications (i.e., Internet, interactive TV and voice response systems, kiosks, personal digital assistants, CD-ROMs, DVDs) for health behavior change and chronic disease management. Our overarching goal is to find out whether or not these applications improve processes and outcomes of care for culturally diverse groups of patients/consumers and support provider adherence to evidence-based care.

To learn more about the history of the Initiative's development, read [Online Behavior Change and Disease Management: A Research Dialogue](#).

Relevance of eHealth to Chronic Care Model

Chronic Care Model



WHAT IS eHEALTH?

Editorial

What is e-health?

G Eysenbach

(J Med Internet Res 2001;3(2):e20) doi:[10.2196/jmir.3.2.e20](https://doi.org/10.2196/jmir.3.2.e20)

Introduction

Everybody talks about e-health these days, but few people have come up with a clear definition of this comparatively new term. Barely in use before 1999, this term now seems to serve as a general "buzzword," used to characterize not only "Internet medicine", but also virtually everything related to computers and medicine. The term was apparently first used by industry leaders and marketing people rather than academics. They created and used this term in line with other "e-words" such as

characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication

Original Paper

What Is eHealth (6): Perspectives on the Evolution of eHealth Research

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Abstract

Background: The field of eHealth holds promise for supporting and enabling health behavior change and the prevention and management of chronic disease.

Objective: In order to establish areas of congruence and controversy among contributors to the early development, evaluation, and dissemination of eHealth applications, as well as the desire to inform an evaluation research funding agenda, 38 semistructured, qualitative interviews were conducted among stakeholders in eHealth between May 2002 and September 2003.

Definition

eHealth is the use of emerging interactive technologies (tools, platforms, programs) to enable health improvement and health care services.

- Electronic health records with decision support (EMRs, PHRs)
- Computerized Tailored Interventions (CTIs)
- Internet-enabled mobile devices (cell phones and PDAs)
- Web 2.0 applications




Effective eHealth Programs

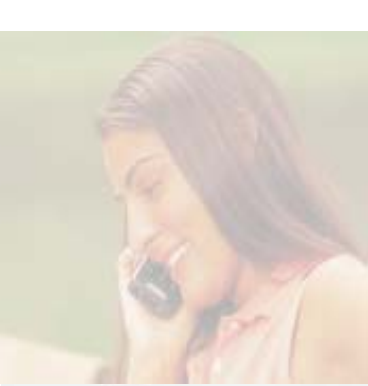
- QuitNet
- CHES
- Pro-Change
- HealthMedia
- My HealthVet
- ACOR
- Chronic Disease Self-Management Program





Where is the evidence for eHealth programs?

- 
- 
- 
- Research demonstrating health behavior change
 - Smoking cessation
 - Cobb, N.K., et al. Initial Evaluation of a real-world Internet smoking cessation system. *Nicotine Tob Res* Apr;7(2):207-216, 2005.
 - Physical activity
 - Marcus, B.H., et al. A comparison of internet and print-based physical activity interventions. *Arch Intern Med*;167:944-949, 2007.



Where is the evidence for eHealth programs?(cont.)




- Nutrition

- Thomson, D., et al. Feasibility of an 8-week African American web-based pilot program promoting healthy eating behaviors: Family Eats. *Am J Health Behav.* Jan-Feb;32(1):40-51, 2008.



- Weight loss

- Hunter, C.M., et al. Weight management using the internet a randomized controlled trial. *Am J Prev Med.* Feb;34(2):119-26, 2008.
- 



Where is the evidence for eHealth programs? (cont.)

- Research demonstrating improved chronic illness care and disease management
 - Chronic disease
 - Lorig, K.R., et al. Internet-based chronic disease self-management: a randomized trial. *Med Care*. Nov;44(11):964-71, 2006 . Erratum in: *Med Care*. Mar;45(3):276, 2007.
 - PHR use for influenza prevention
 - Bourgeios, F.T., et al. Evaluation of influenza prevention in the workplace using a personally controlled health record: randomized controlled trial. *J Med Internet Res* 10(1);e5:1-11, 2008.

Example



Baylor University Study:
*Factors Influencing Log-On Rates in an eHealth Obesity Prevention Program
Promoting Healthy Eating and Physical Activity to 8-10 Year Old African American Girls*

eHealth Tools and Platforms

Electronic Medical Records (EMR)

Personal Health Records (PHR)

Electronic Health Records (EHR)

Web Portals

Mobile Devices

Medical Devices

Ubiquitous Computing



Paper-Based Records

Arundel 4 mg po qd

- Prone to error
- Lots of information but no data
- Limited decision support
- Do not integrate with eHealthcare

Quality Problems in Healthcare related to lack of Technology

Medical error, patient safety, quality and cost issues

- Patient data unavailable in 81% of cases in one clinic, with an average of 4 missing items per case
- 18% of medical errors are estimated to be due to inadequate availability of patient information
- Patients receive only 54.9% of recommended care

Personal Health Records

Project HealthDesign

www.projecthealthdesign.org

Project HealthDesign:
Rethinking the Power and Potential
of Personal Health Records

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Project HealthDesign supports technology pioneers to design the next generation of personal health record systems in ways that empower patients to better manage their health and health care.

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Web Portals

The screenshot shows a Microsoft Internet Explorer browser window titled "Tour of Patient Gateway - Prescription Renewal - Microsoft Internet Explorer provided by Partners HealthCare System". The address bar shows "http://www.patientgateway.org/ptgw/fgon.htm". The page header features the "PATIENT GATEWAY" logo and navigation buttons for Home, Feedback, Site map, Logout, and Policies. A secondary navigation bar includes Mail, Requests ~ Prescription, Health Record, Health Library, Practice, My Profile, and Help. Below this, a breadcrumb trail shows "Demonstration Patient MRN: 6005" and a dropdown menu for "My Profile" with options: Address and Phone Number, Insurance and Providers, Mail Settings, Contact Info, Pharmacy Settings (highlighted by a mouse cursor), Appointment Settings, and Change Password. The main content area is titled "Instructions to the Practice" and contains a section "Where should the prescription go?" with radio button options: "Phone or fax into Pharmacy", "Mail it to me", "Mail it to Pharmacy", and "Hold it for pick-up". Under "Select a pharmacy:", there are two radio button options: "From My Profile" (selected) and "Other Pharmacy". The "From My Profile" option is linked to a dropdown menu currently showing "CVS Pharmacy #1866". The "Other Pharmacy" option is linked to a form with input fields for Name, Address, City, State (set to MA), Zip, and Phone.

Important features of eHealth Programs



- Content aimed toward personal demographics
- Cultural Relevance
- Salient and timely messaging
- Support for self-management
- Remote Monitoring
- Social support
- Incentives

Tailored Messaging

Can be based upon such personal characteristics as:

- Age
- Race
- Gender
- Ethnicity
- Cultural Background
- Primary Language



Addressing Health Disparities

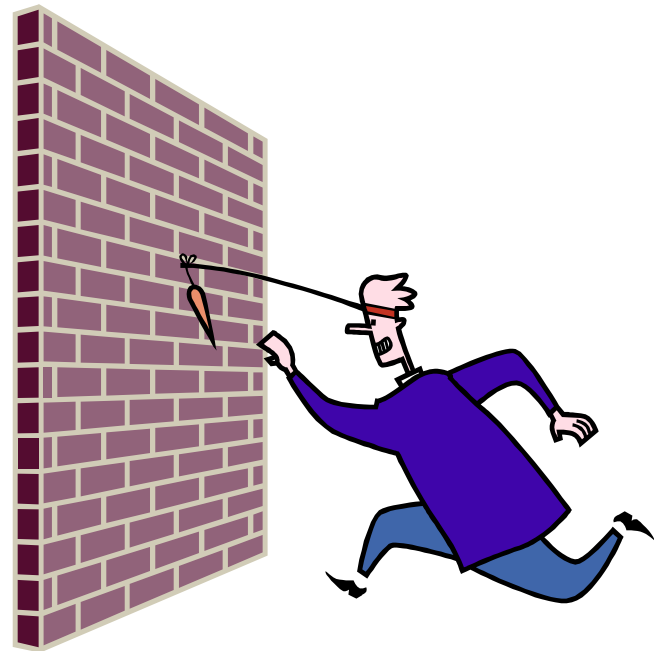
Targeting and Tailoring Incentives
Translating Research
into Practice



Photo Source: USDA/ARRS


Barriers to Adoption of eHealth Programs

- Limitations of Access
- Cultural Relevance
- Health and Technology Literacy



Example of eHealth Program

Enhanced Patient Activation and Provider Communication/Guideline Implementation



The advertisement features the HeartAge logo at the top left, which includes a red heart icon and the text "HeartAge™". Below the logo, the text "TAKE A FEW MINUTES" is displayed in blue. The central part of the ad contains three vertical panels: the first shows a man in a pink shirt talking on a white corded telephone; the second shows a woman in a colorful patterned dress smiling; the third shows a firefighter in full gear. Below these panels, the text "SAVE A FEW YEARS" is written in blue. At the bottom of the ad, a blue link says "Click [HERE](#) to take a brief [HeartAge](#) Survey".

Recommended Diets




Physical Activity



Quitting Smoking



Cholesterol Medications



Proportion of US Adults at Recommended Lipid Levels

Population	LDL cholesterol, % at goal	Non-HDL cholesterol, % at goal	HDL cholesterol, % at goal	Triglycerides, % at goal	All lipids, % at goal
Overall	71.9	71.2	73.2	73.6	47.4
No disease	84.5	85.9	85.9	88.6	66.7
Cardiovascular disease	36.7	36.3	65.0	56.3	17.3
—Coronary heart disease	40.5	40.0	73.2	54.1	20.3

Michael O’Riordan, theheart.org by WebMD. AUGUST 19, 2008.

User-Centered Design

Patients' Perceptions of Cholesterol, Cardiovascular Disease Risk, and Risk Communication Strategies

Roberta E. Goldman, PhD^{1,2}

Donna R. Parker, ScD^{1,2}

Charles B. Eaton, MD^{1,2}

Jeffrey M. Borkan, MD, PhD^{1,2}

Robert Gramling, MD^{1,2}

Rebecca T. Cover, BA^{2,3}

David K. Abern, PhD⁴

ABSTRACT

PURPOSE Despite some recent improvement in knowledge about cholesterol in the United States, patient adherence to cholesterol treatment recommendations remains suboptimal. We undertook a qualitative study that explored patients' perceptions of cholesterol and cardiovascular disease (CVD) risk and their reactions to 3 strategies for communicating CVD risk.

METHODS We conducted 7 focus groups in New England using open-ended questions and visual risk communication prompts. The multidisciplinary study team performed qualitative content analysis through immersion/crystallization

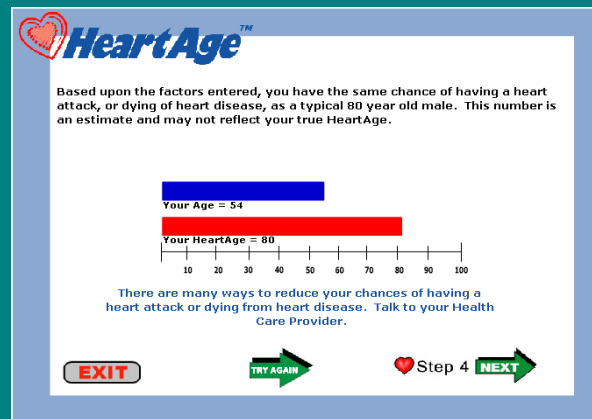
Effective Behavior Change Process

- Define & target
- Reduce barriers
- Observe and measure
- Feedback, coaching, & support
- Positive reinforcement



Laptop computers placed in 15 intervention office/ waiting rooms throughout Rhode Island and Southeastern Massachusetts


Software uses Framingham Risk Equation
and determines 10-yr risk of CHD, converts
this risk into equivalent risk adjusted age





Heart AgeTM

Follow 4 Easy Steps

 **Step 1** Please enter your age in the box. Then, enter your gender by clicking on the button.

Age: Gender: Male Female

 **Step 2** Select "Yes" or "No" to the following five questions.

Have you smoked any cigarettes in the past 30 days? Yes No

Are you currently taking any medication for high blood pressure? Yes No

Do you have Diabetes? Yes No

Have you ever had a heart attack or heart surgery? Yes No

Do you have a family history of heart disease? Yes No Don't Know

EXIT



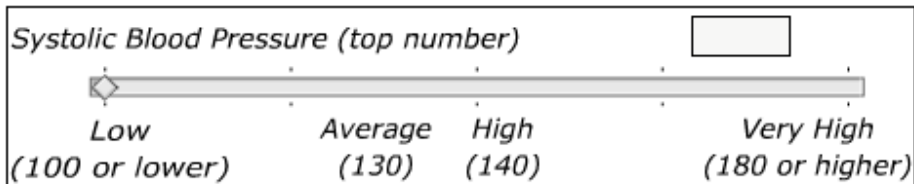
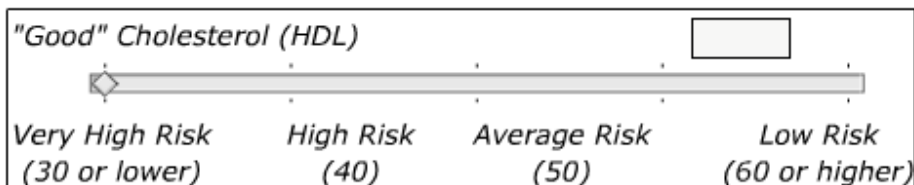
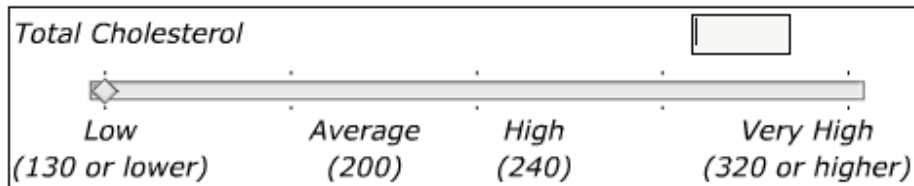
Step 3

NEXT 



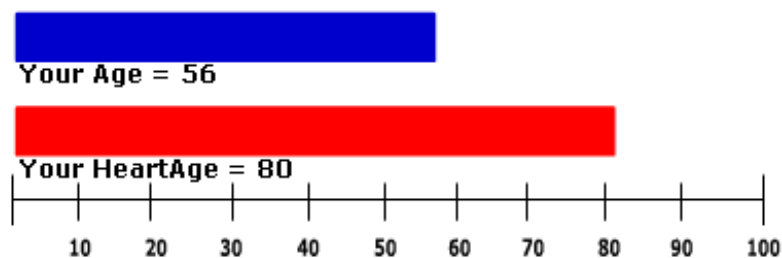
HeartAgeTM

Step 3: Move the diamond on the bars, or use the keyboard, to enter your numbers for the risk factors below. If you do not know your numbers, either pick up a HeartAge card and ask your health care provider or take a guess and see the effect on your HeartAge.





Based upon the factors entered, you have the same chance of having a heart attack, or dying of heart disease, as a typical 80 year old male. This number is an estimate and may not reflect your true HeartAge.



There are many ways to reduce your chances of having a heart attack or dying from heart disease. Talk to your Health Care Provider.

EXIT

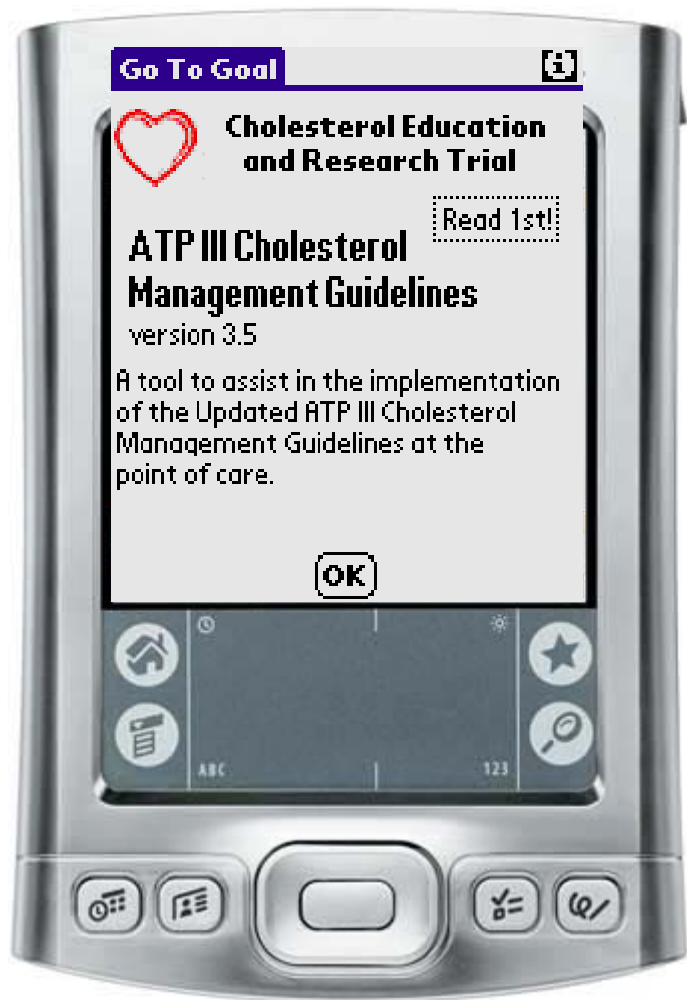
TRY AGAIN



Step 4

NEXT

PDAs given to 32 Primary Care Providers (PCPs) representing 15 intervention practices



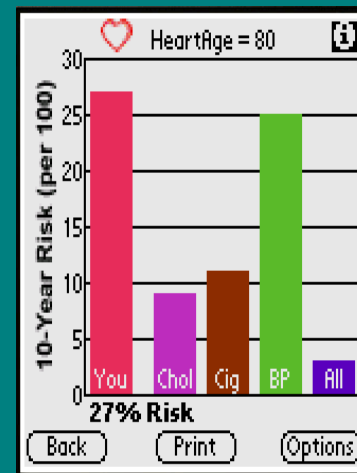
Go To Goal 

PDA Decision Support Tool with Patient Education Screen

Go To Goal

TC: 310 HDL: 55 TG: 150
 LDL: 225 Gender: M F
 Age: 50 Systolic BP: 152

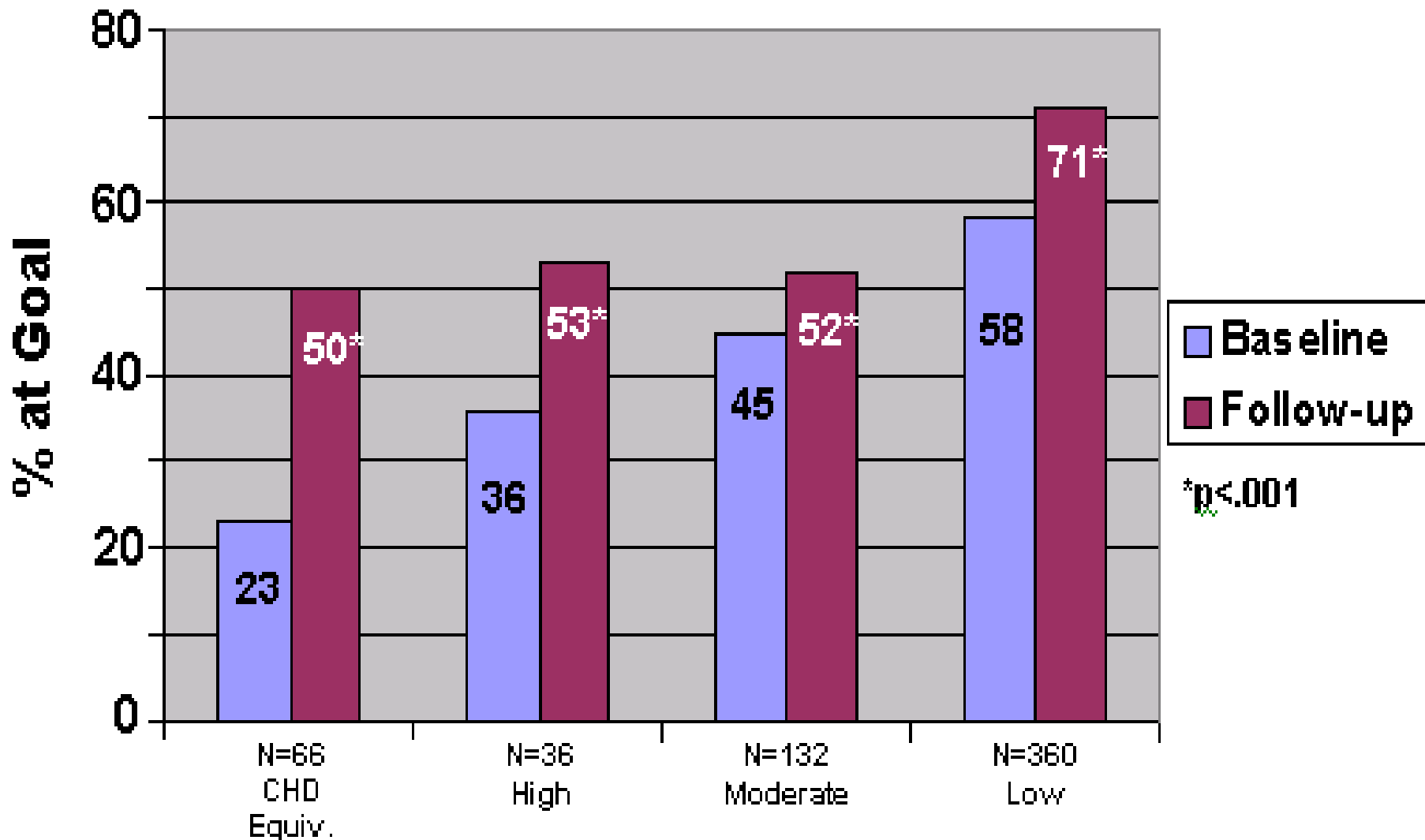
- Established CHD
- Other clinical atherosclerotic dz
- Diabetes
- Cigarette use
- HTN (or Rx for HTN)
- Fm Hx: early CHD
- On Lipid Lowering Drug Therapy
- Fasting



ATP III Pilot Study – Baseline to Follow Up

June 16, 2006

Combined Data: Percent at LDL Goal by Risk Group (N=594)



HeartAge Results

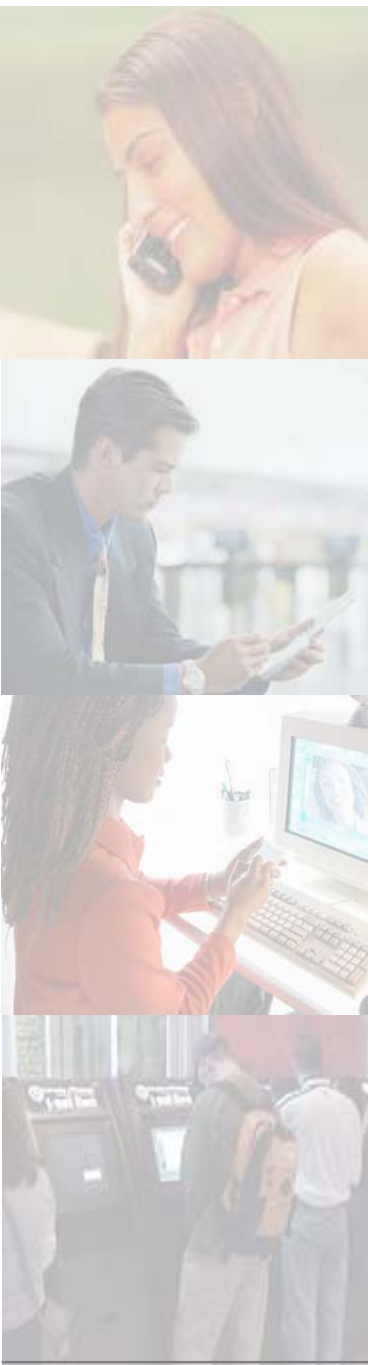
- Increase in self-reported physical activity and fruit and vegetable intake
- Overall statin use increased from 13% to 21%
- Use in high risk group (Framingham score >20%) in high risk group increased from 5% to 34%

Future eHealth Programs

- Expand the range and scale of evidence-based, health behavior change programs
- Use “deeply tailored” and “culturally-informed”, programs geared to specific individual characteristics
- Leverage social media and social networks to enable consumer engagement and retention
- Improve reach and cost efficiency

Conclusions

- eHealth for health behavior change will help transform health care
- Need to continue to support systems-level research and evaluation
- Need to promote success stories
- Consumer engagement through eHealth will improve quality



Thank You

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