

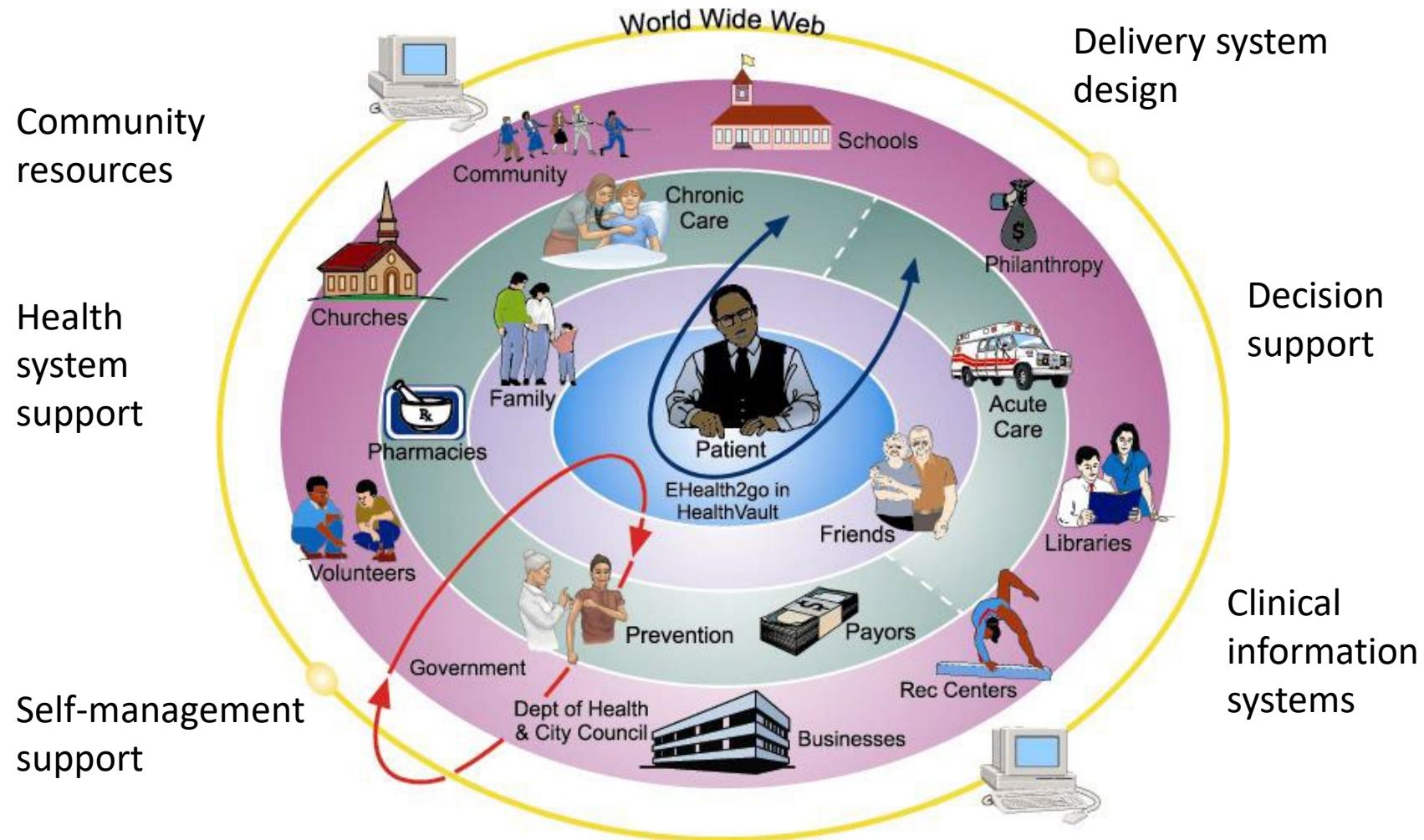
# Managing Health Using Technology

Gail Nunlee-Bland, M.D.

Professor Medicine and Pediatrics

Howard University

# eHealth Enhanced Chronic Care Model







# eHealth for Chronic Illness

- Institute of Medicine, Agency for Healthcare Research and Quality recommend eHealth as a tool to support self-management in chronic illness
- eHealth technology should have a complete feedback loop of 5 stages
  - Transmission of data and information regarding the health status of the consumer
  - Interpretation of data and information using previously established knowledge and use of evidence- based standards
  - Address the specific need of the individual consumer
  - Timely feed back to the consumer addressing their requirements
  - Regular repetition of the feedback loop

# Components of eHealth to Support Chronic Care Model

- Information technology
  - Internet for health information
- Social Networking
- Telehealth
- mHealth (including wearable devices)
- Electronic health records
- Personal health records

# Internet for Self-Management Support

- Connecting providers and consumers to secure portals, health applications, social networks, and large databases

# Patient Engagement Using Technology

- Traditional behavioral methods have shown efficacy, but require significant resources and patient commitment, limiting accessibility to large populations
- Mobile phone technologies have emerged as promising for patient engagement

# Social Networking

- Disease oriented online community
- Virtual community
- May encourage consumer empowerment for improved patient-centered care



# Telehealth

- Effective in the management of acute and chronic disease
- Nurse-led, multi-disciplinary telehealth interventions were effective in improving A1c outcomes
- Telehealth nurse coaching produced higher self-efficacy scores

# mHealth (Wearable Technology)

- Low-cost clinically sensitive data for informed decision making between patient and provider
- Small devices with personalized data
- Possible integration into communication networks, facilitating remote monitoring

# Electronic Health Records

## Benefits

- Clinical
  - Improved quality
  - Reduced medical errors
- Organizational
  - Financial
  - Organizational
- Societal
  - Improved ability to conduct research
  - Improved population health
  - Reduced cost

## Drawbacks

- High upfront acquisition costs
- Ongoing maintenance costs
- Temporary workflow disruption
- Perceived privacy concerns among patients and providers

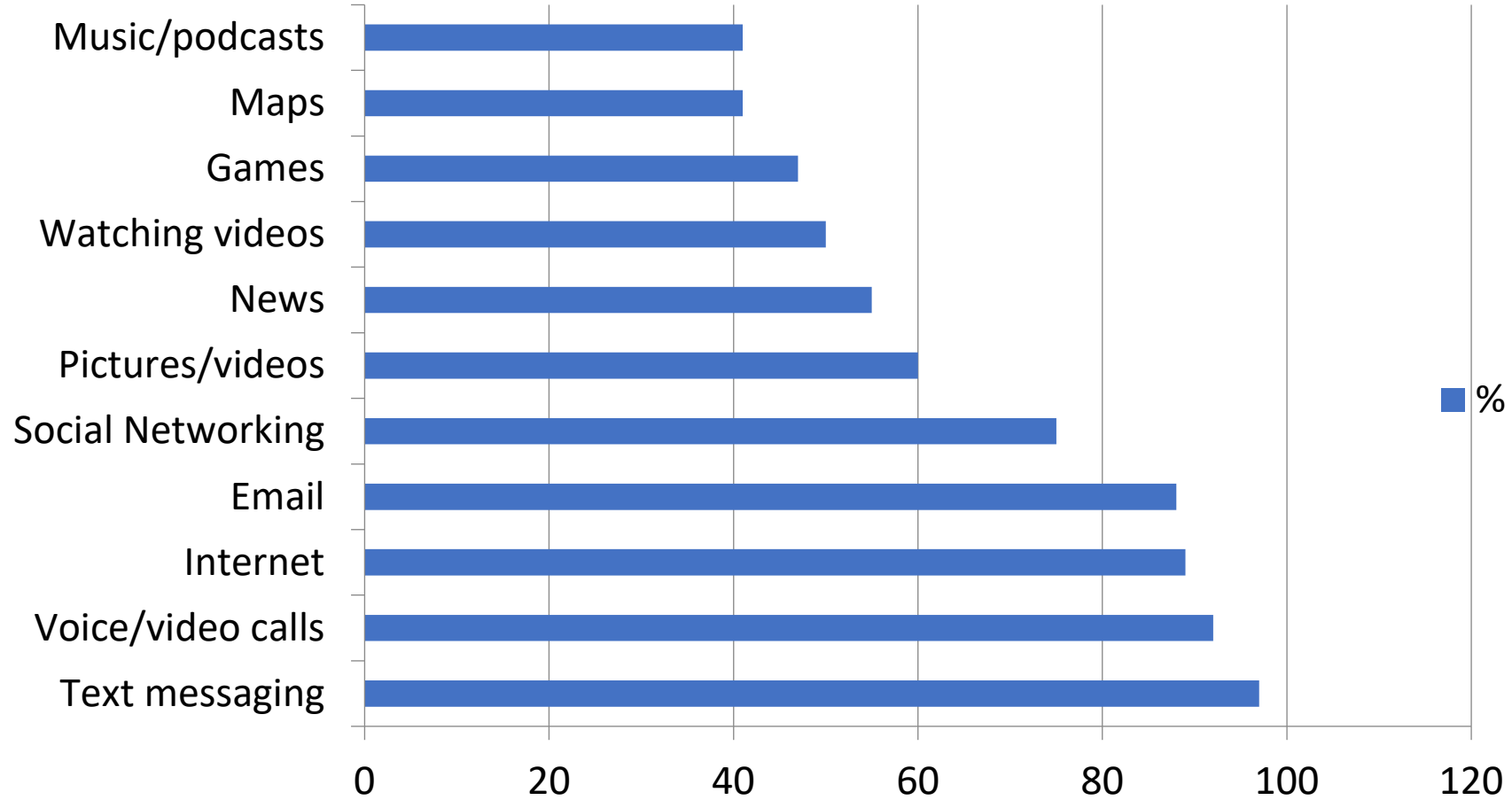
# Personal Health Records

- Patients can use personal health records (PHR)
  - To obtain updated information about their health and health care in a secure and confidential environment
  - Requires online log-in process
- PHR is often tethered to an EHR

# Smartphone Use in America

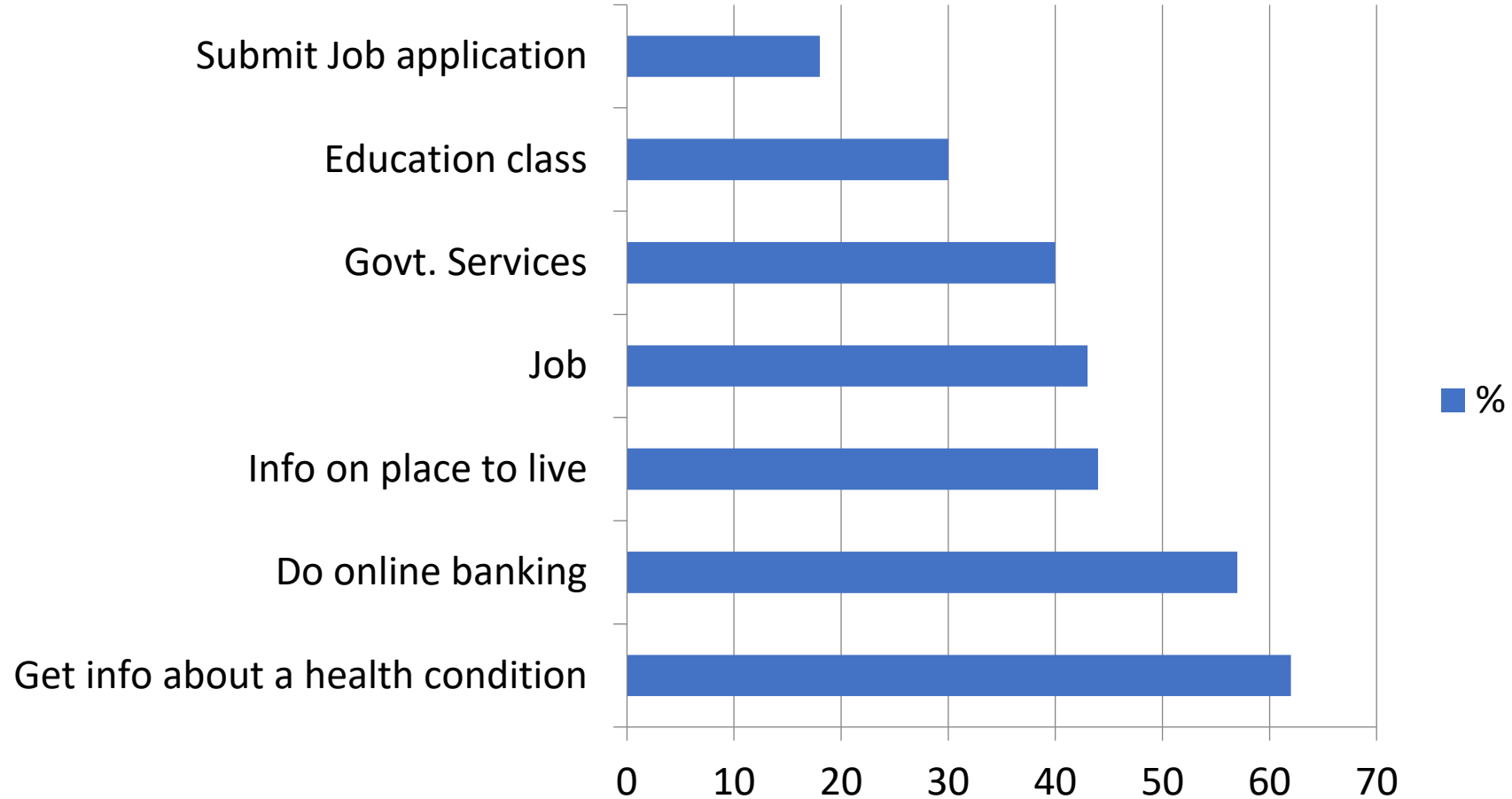
- 97% of U.S. adults own a cellphone of some kind in 2021 with 85% owning a smartphone
- Young adults, minorities and lower-income Americans – depend on their smartphone for internet use
- Smartphones serve as an access point for navigating a wide array of important life events, from health conditions to new jobs

# Smartphone Use





# Smartphone Use



# eHealth Howard University Hospital



# A Patient-Centric, Provider-Assisted Diabetes Telehealth Self-management Intervention for Urban Minorities

Ernest Carter, MD PhD, Gail Nunlee-Bland, M.D. and Clive Callender,  
M.D.





# Diabetes Education Portal

The screenshot shows a web browser window titled "HUH: DTC Diabetes Management Portal - Windows Internet Explorer". The address bar displays "http://dttc.huhosp.org/Patient/Site.aspx". The browser's toolbar includes various search engines (hp, bing, Google), HP-related links (HP Deals, HP Advisor, Snapfish by HP, HP Games, Learn at HP), and a McAfee security icon. The page content features the "Diabetes Management Portal" logo with a ribbon icon, the "HUH HOWARD UNIVERSITY HOSPITAL" logo, and a navigation menu with links: HOME, HEALTH DIARY, VIRTUAL VISIT, E-LEARNING, MESSAGES, DISCUSSION, and FAQ. A central banner for the "HUH DIABETES TREATMENT CENTER Diabetes Management Portal" includes a welcome message and a photo of two healthcare professionals. To the right, a "My Alerts" section states "There are no alerts at this time", and a "Helpful Links" section lists various resources like WebMD, National Diabetes Education Resource Program, and Diabetes Planner.com. Below these, a "My Medical Home Devices" section shows images of a "Weight Scale" and a "Blood Pressure Cuff". The browser's status bar at the bottom indicates "Done", "Internet | Protected Mode: On", and the time "9:15 PM".

HUH: DTC Diabetes Management Portal - Windows Internet Explorer

http://dttc.huhosp.org/Patient/Site.aspx

hp bing HP Deals HP Advisor Snapfish by HP HP Games Learn at HP hp.com

Secure Search McAfee

Google Search More >> Sign In

Convert Select

AVERY Search Ask Weather CNN Maps Avery Templates Options

Favorites AURN News Archive - Ne... re award for outstanding s... Suggested Sites Get More Add-ons

HUH: DTC Diabetes Management Portal

Diabetes Management Portal HUH HOWARD UNIVERSITY HOSPITAL

HOME HEALTH DIARY VIRTUAL VISIT E-LEARNING MESSAGES DISCUSSION FAQ

HUH DIABETES TREATMENT CENTER  
Diabetes Management Portal

Welcome to the DMP. Use this online tool to monitor your readings, interact with care providers and learn more about diabetes.

My Alerts  
There are no alerts at this time

Helpful Links

- » WebMD
- » National Diabetes Education Resource Program
- » Diabetes Planner.com
- » nmadabetesnet.org
- » Body Calculator
- » Weight Loss
- » Type 1 & Type 2 Diabetes - Differences
- » Diabetes Learning Center (American Diabetes Association)
- » Diabetes Care - 10 Ways to Avoid Complications
- » Hyperglycemia
- » Diabetes Myths
- » How You Can Help Your Loved One With Diabetes

My Medical Home Devices

- Weight Scale
- Blood Pressure Cuff

Health Diary  
This provides a central location for you to keep track of your health

Virtual Visit  
Conference with your provider with text, audio and video..

eLearning  
Helpful resources and video from around the web

Messages  
Send and view all your messages

Discussions  
Discussion forums

FAQ  
Commonly asked questions and their answers

Done Internet | Protected Mode: On 100% 9:15 PM

# Video eLearning

The screenshot displays the 'HUH: DTC Diabetes Management Portal' in a web browser. The page features a navigation bar with links for 'My Profile', 'Staff Directory', 'How-to', and 'Logout'. Below this is a menu with 'HOME', 'HEALTH DIARY', 'VIRTUAL VISIT', 'ELEARNING' (highlighted), 'MESSAGES', 'DISCUSSION', and 'FAQ'. The main content area is titled 'eLearning > Video Library' and lists eight videos in a 2x4 grid:

- Introduction** (Diabetes and Balance)
- Healthy Eating** (Healthy Eating)
- Blood Sugar Balance** (Medication for Diabetes)
- Physical Activity** (Physical Activity)
- Risk Reduction** (Risk Reduction)
- Special Situations** (Special Situation)
- Summary** (Summary)
- Understanding the Basics** (Understanding The Basics)

The background of the page is a blurred image of a syringe and white pills.



# Diabetes Workbook

## Diabetes Balance and Health:

### My Personal Road Map Workbook



Funded by MOTTEP

(Minority Organ and Tissue Transplant Education Program)

Supported by the Howard University Hospital Diabetes Treatment Center

Designed and Produced by Susan Chapman Herbert, RN CDE

# Telehealth Study Summary

- Treatment group reported increased knowledge of diabetes and improved adherence
- Behavior change in better self-management
- More likely to reach a healthy BMI
- More likely to reach and A1c of  $< 7$

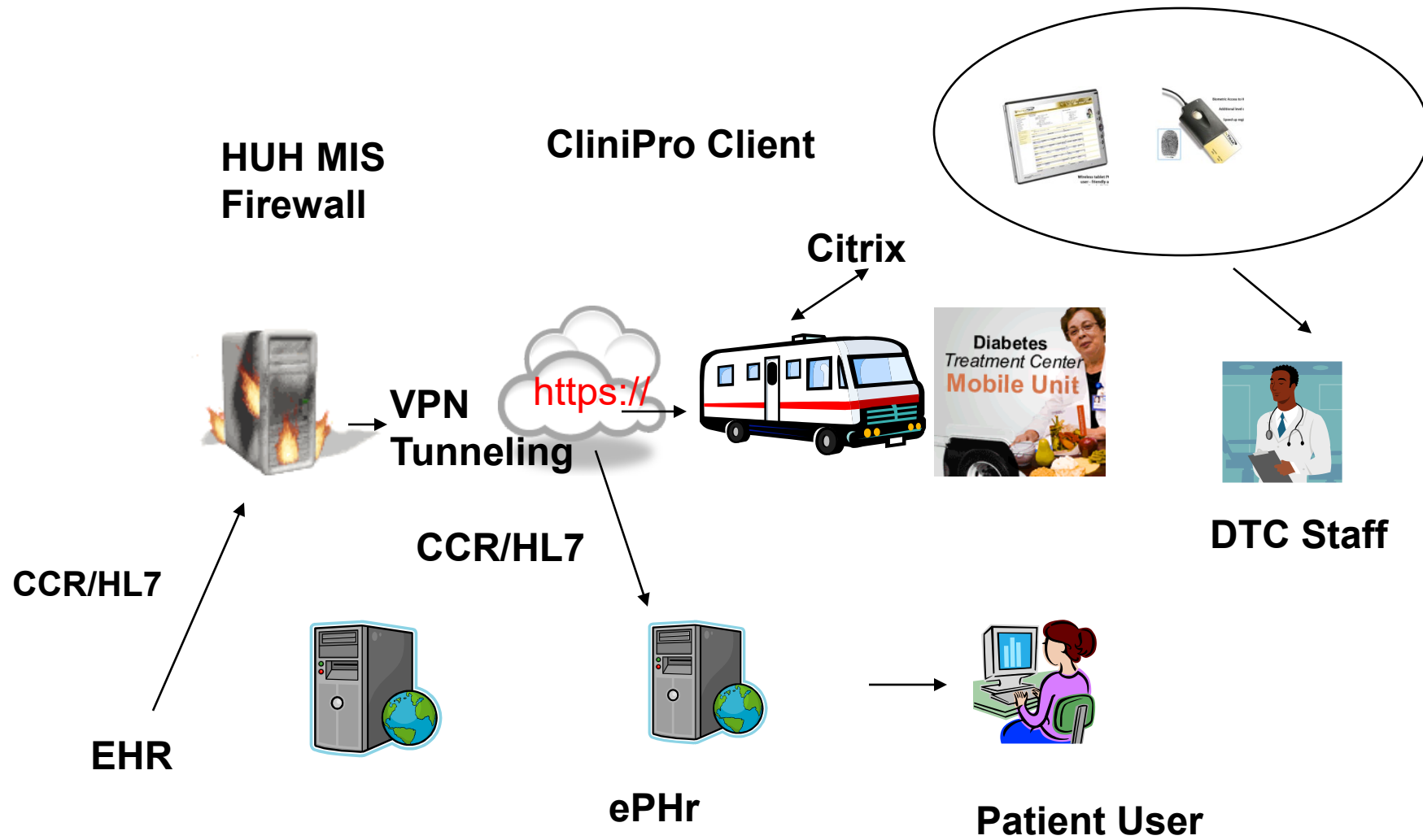
# Implications

- Online intervention increased the accessibility of services and created a patient-provider partnership that endured for 9 months for underserved inner-city African Americans
- Patient empowerment for improved diabetes self-care

# Challenges

- Costs of internet access, laptops and peripherals (glucometers, blood pressure cuffs, and weight scales)
- Patients with less than an 8<sup>th</sup> grade reading level

# Other Technologies





# Branded PHR



HOWARD UNIVERSITY HOSPITAL  
**DIABETES TREATMENT CENTER MOBILE UNIT**

 [Howard University Hospital Diabetes Treatment Center](#)



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This site is a member of the



NoMoreClipboard.com

Family of Websites

**Log On**

Username:

Password:

**Welcome to the Howard University Hospital Diabetes Treatment Center personal health record portal.**

This personal health record portal was developed to help you manage your diabetes and share information with your doctors and caregivers.

- If you already have a personal health record account, sign in on the left.
- If you would like to create a personal health record, [Click Here](#).



HOWARD  
UNIVERSITY  
HOSPITAL

Having trouble logging in? [Click here to look up your username](#). Or [Click here to reset your password](#).

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# Integrated with EHR




HOWARD UNIVERSITY HOSPITAL  
DIABETES TREATMENT CENTER MOBILE UNIT

 [Howard University Hospital Diabetes Treatment Center](#)







Account Summary



Member Summary



Mailbox: 55





E-Clipboard: 3



Log Out

Logged in as: tester   Viewing Member: Doe , Test   Age: 51, Sex: M

 [Click here to import data from Howard University System](#)

 **Howard University Hospital: Diabetes Health Central**

Most Recent Readings:

Blood Pressure

125 / 84 (05-23-2009)

[View Chart](#)

A1C

7 (05-23-2009)

[View Chart](#)

Lipids

LDL - 108 (05-23-2009), HDL - 32 (05-23-2009), Total - 200 (05-23-2009)

[View Chart](#)

BUN/Creatinine

No Data/No Data

[View Chart](#)


Height/Weight/BMI

70.000000 in, 165.001678 lbs, 23.7 (05-23-2009)

[View Chart](#)

[Hide](#) **Howard University Visit Summaries**

Document ID	Service Date	Subject	Document Type	Created By
0 Results				

©©2008 Howard University Hospital  

# Perceived PHR Benefits

- Improved communication between patient and providers
- Portability across insurance plans
- Patient engagement

# PHR Barriers

- Username and password forgotten
- Physician not accepting the data from the PHR

# Managing DC diabetes – phase two



MEDICAL FACULTY ASSOCIATES  
THE GEORGE WASHINGTON UNIVERSITY



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# Community Health Workers & Cell Phone Intervention

- Specific Aim – To compare the effectiveness of A1c reduction using cell phone text reminders, CHWs and the combination of both in a Medicaid population
- Methods
  - 18-70 years
  - A1c >8%
  - Randomly assigned to cell phone, CHW, cell phone plus CHW
  - Medicaid or Medicare
  - Baseline, 3 month, 6 month A1cs obtained

# Medical Minutes

- Patients are provided with Medical Minutes as an incentive to ensure compliance
- Medical Minutes offset voice and data plan costs, but patient has skin in the game
- Patients have options
  - Sprint pre-paid phone
  - Not device or carrier specific





# Immediate feedback and clinical alerts

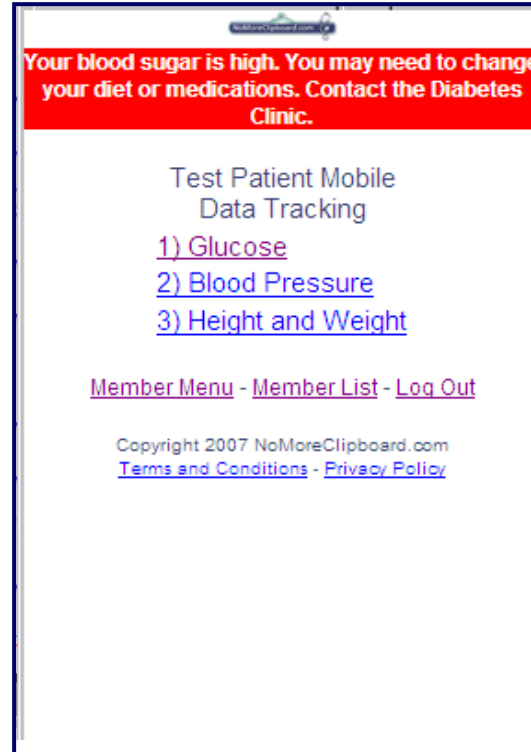


Test Patient Mobile  
Data Tracking

- 1) [Glucose](#)
- 2) [Blood Pressure](#)
- 3) [Height and Weight](#)

[Member Menu](#) - [Member List](#) - [Log Out](#)

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# HEDIS questions

## Howard University questionnaire summary:

Have you had your hemoglobin A1c blood test done in the past 3 months?

Have you been in the hospital in the past 3 months?

Have you gone to an emergency room in the past 3 months?

Have your medications been changed in the past 3 months?

Do you need medication prescriptions refilled?

Do you need blood sugar test supplies?

Have you had your foot exam in the past year?

Have you had your eye examination in the past year?

Have you had your clinic blood and urine tests in the past year?

Have you had your blood pressure checked in the past 6 months?

Have you had your flu shot in this year?

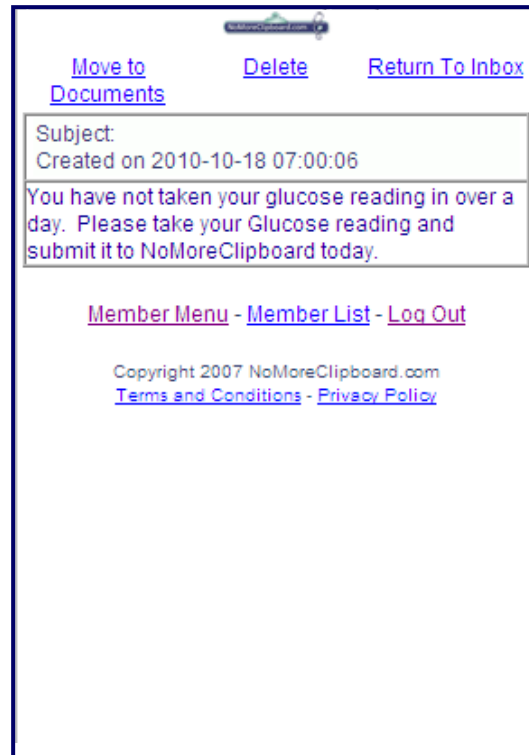
Have you had a pneumococcal vaccine to prevent pneumonia?

Have you been smoking this past year?

Have you met with a diabetes educator or nutritionist?

Are you sad or depressed?

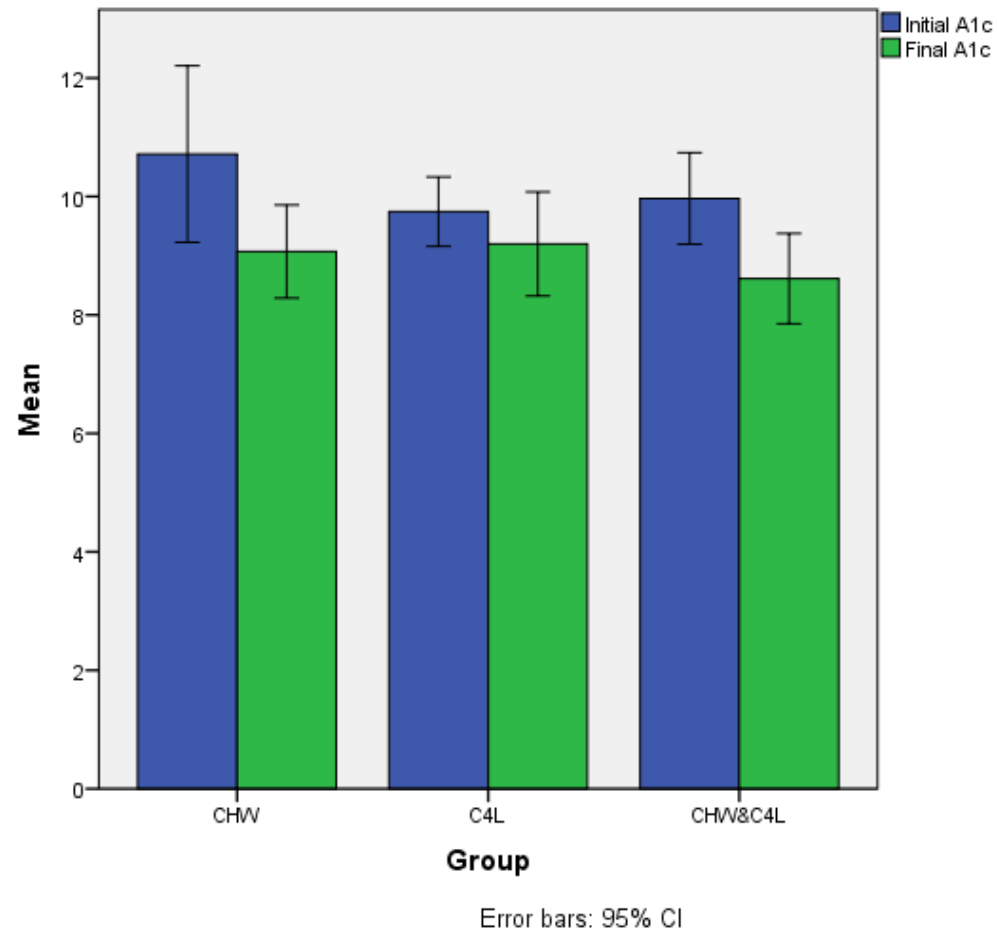
# Compliance reminders



# Observations

- Participation enhances consumer *and* clinician awareness of standards of care
- Improved dialog between patients and providers
- Communication is more frequent, complete and accurate
- Howard University Hospital staff more diligent about adding information and documenting care
- Clear identification of who is participating and who needs intervention
- Patients see the impact

# Community Health Workers & Cell Phone Intervention



N= 20 CHW

N=19 cell phone

N= 24 CHW + cell phone

# Outcomes

- Reduced hemoglobin A1C
- Reduced blood pressure
- Reduced cholesterol
- Fewer ER visits
- Fewer hospital readmissions
- Among an economically disadvantaged population with limited access to care where the differences in diabetes care are most dramatic

# Diabetes Prevention

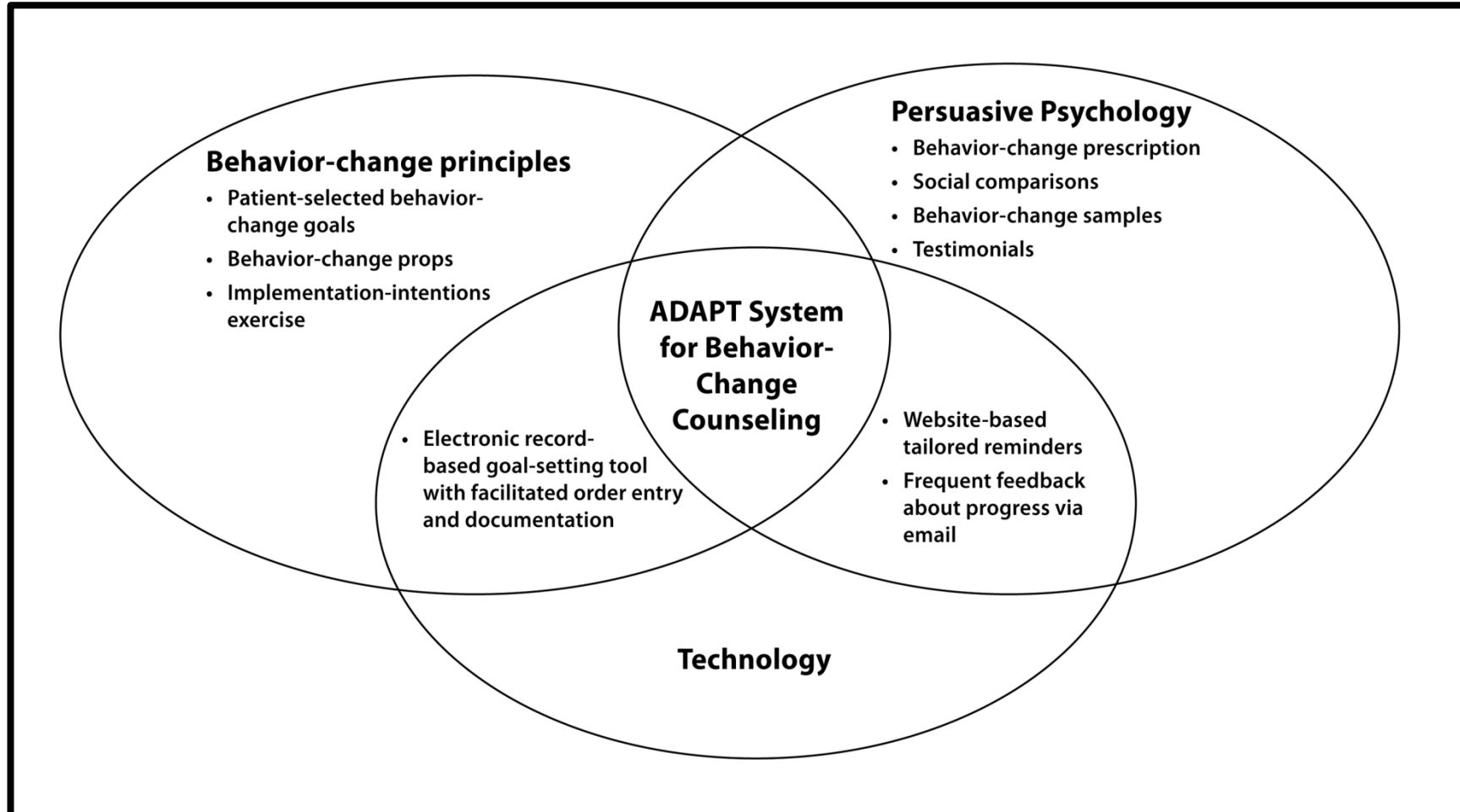
# Lifestyle Intervention

- Weight loss alone reduced an individual's chance by 16% for developing type 2 diabetes
- Exercise along with weight loss reduced type 2 diabetes development by 44%





# Primary Care-Based Counseling for T2DM Prevention: ADAPT



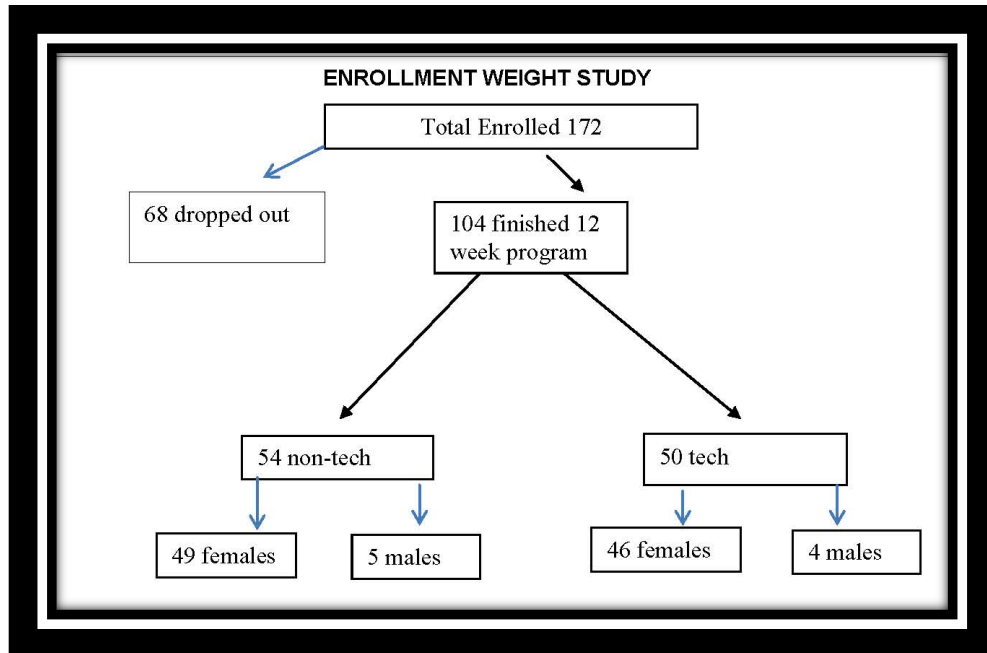
# Specific Aim

- To compare the effectiveness of a lifestyle change intervention delivered either using state-of-the-art communications and networking technologies or using Lifestyle Group Visits

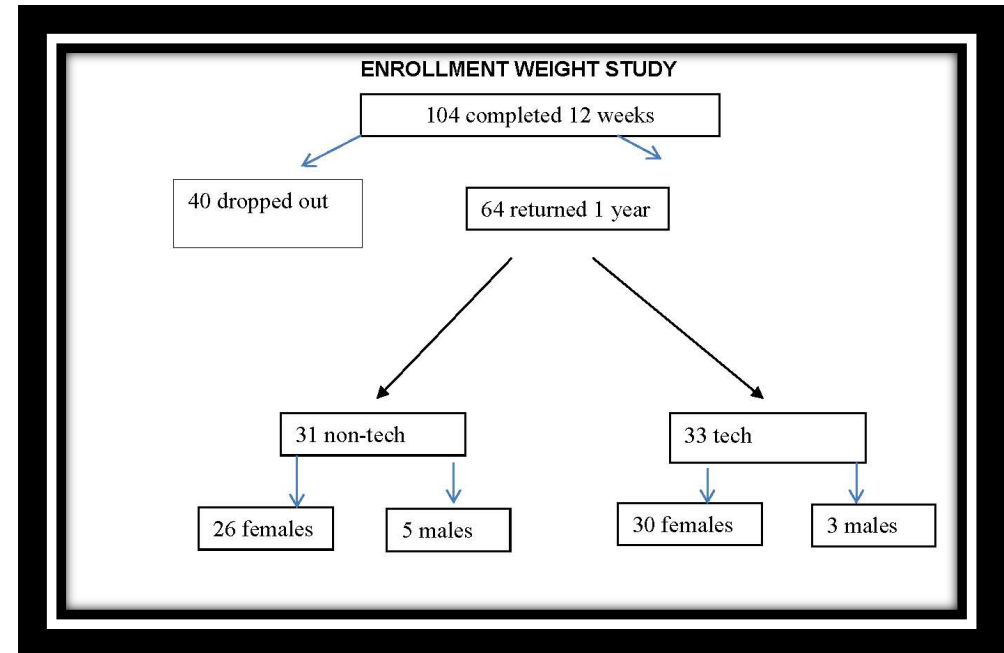
The screenshot shows a web browser window with a green border. At the top, a purple banner contains the text "Please fill out the following form." and a "Highlight Fields" button. The main content area has a blue square icon with two white figures. Below it, the title "Session 12: Ways to Stay Motivated" is displayed. Underneath the title is the section "Progress Review". The first part of the review asks for "Changes you've made to be more active:" and provides three horizontal lines for text entry. The second part asks for "Changes you've made to eat less fat (and fewer calories):" and also provides three horizontal lines. An orange square icon with a white figure is located at the bottom right of the content area. The bottom of the browser window features a green bar with a speaker icon on the left and two buttons labeled "< PREV" and "NEXT >" on the right.

# Results

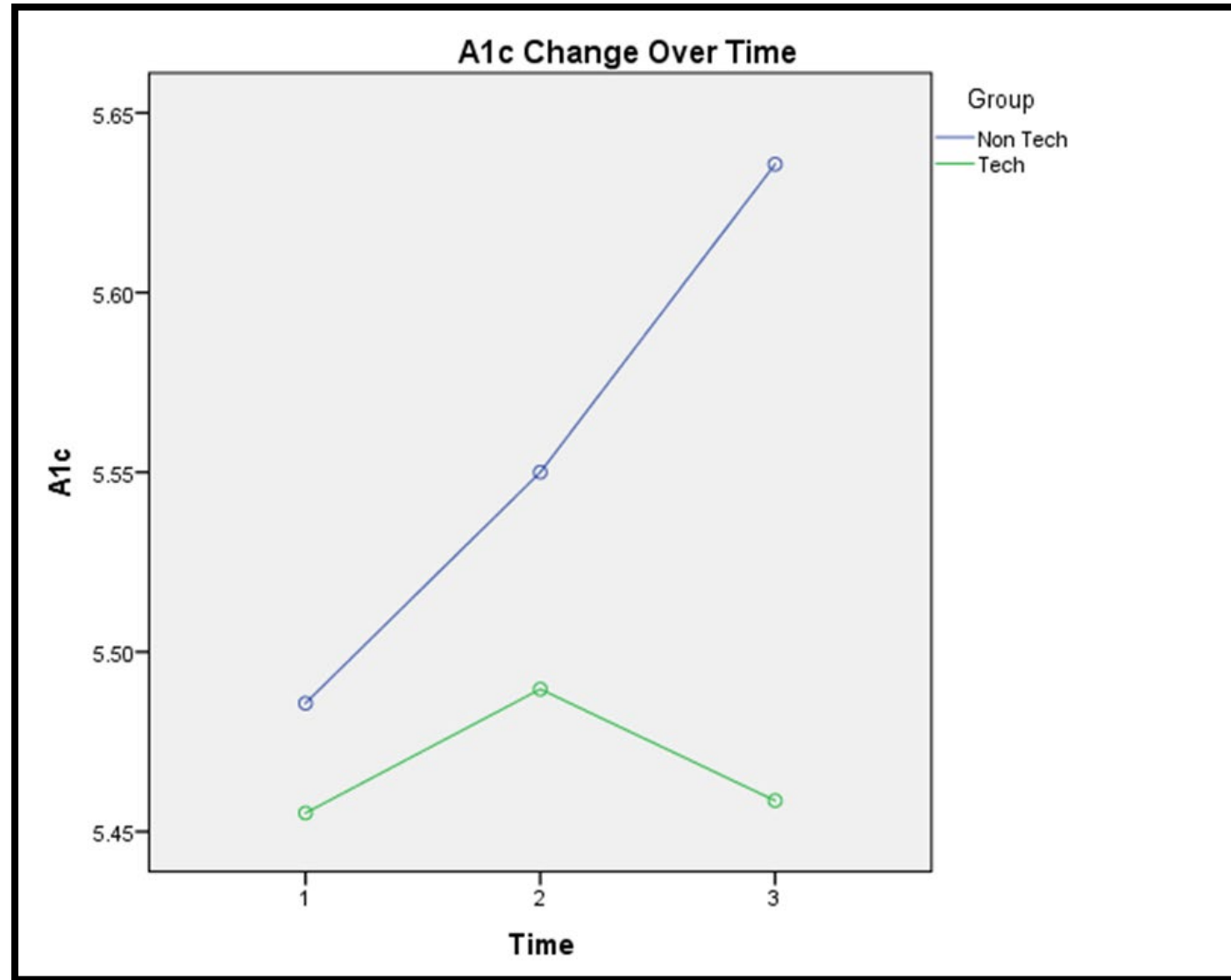
## 12 Weeks



## 1 Year



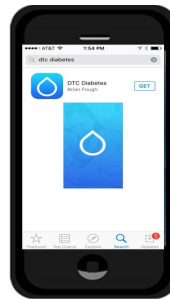
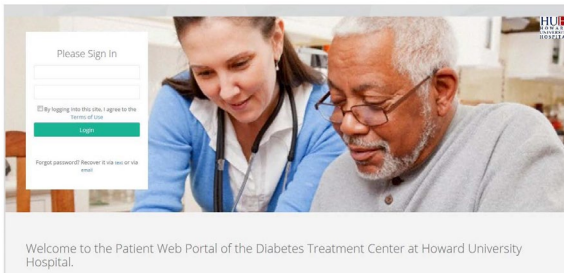




# Conclusion

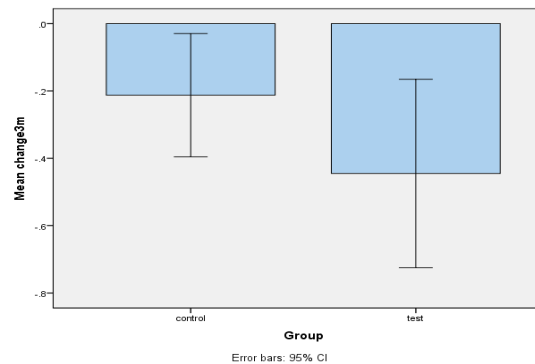
- Both groups benefited from the intervention
- Improved Patient Activation was statistically significant in the Tech group
- Statistically significant reduction in BMI overall for both groups after 3 months
- The data suggests that BMI reduction may be more sustained with the use of technology in this adolescent/young adult population
- No statistically significant reduction in A1c, but the Tech group did not have an increase in A1c

# Patient Web Portal

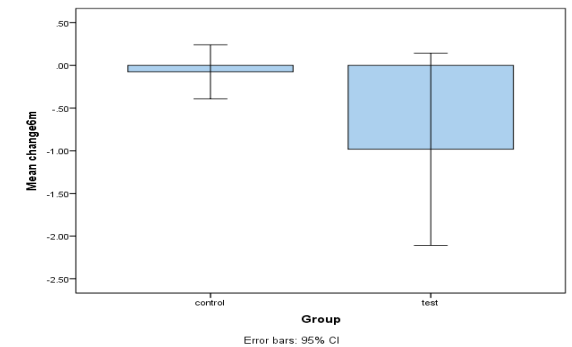


Patient Demographics		
	Test group	Control group
Number (n)	165	202
Age (yrs)	54.3 +/- 14.14	60.27 +/- 12.96
Female (%)	66.1	64.9
Male (%)	33.9	35.1

3-month A1c



6-month A1c



"This project has been funded in whole or in part with Federal funds (1G08LM011545-01) from the National Institute of Health National Library of Medicine. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health."





Gail Nunlee-Bland

[Edit Profile](#)

[Home](#)

[Mailbox](#)

[Appointments](#)

[People](#)

[Calendar](#)

[? FAQ](#)

[Medication Refills](#)

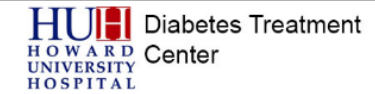
[? FAQ](#)

[Calendar](#)

[Medication Refills](#)

[Learning](#)

## Welcome to the Patient Web Portal



Hello, Gail Nunlee-Bland

[View User Activity](#)

### Use our tools

#### [Mailbox](#)

Secure messaging with the providers and staff of the Diabetes Treatment Center

#### [Calendar](#)

A public calendar for events conducted or supported by the DTC

#### [? FAQ](#)


A collection of frequently asked questions regarding what we do

#### [Medication Refills](#)

You can easily request your medication refills

#### [Learning](#)

Links and videos from around the web that address every aspect of diabetes



Gail Nunlee-Bland

Edit Profile

Home

Mailbox

Appointments

People

Calendar

FAQ

Medication Refills

FAQ

Calendar

Medication Refills

Learning

Learning Resources

Getting Started!

Continuing Education

Healthy Eating

Being Active

Monitoring

Taking Medication

Problem Solving

Reducing Risks

Healthy Coping

Myths & Facts

Library Resources

Diabetes Technology

Diabetes + Balance


All

★ All


Videos

Howard University Hospital Diabetes Treatment Center


Library Resources (18)




5 Facts about Diabetes  
#Culturally Relevant




5 Minute Clinical Consult




Access Medicine




Clinical Key




Cochrane Library




Diabetes as a Disease of Fat Toxicity  
#vegan, vegetarian




How May Plants Protect Against Diabetes?  
#vegan, vegetarian




How to Prevent PreDiabetes from Turning into Diabetes  
#vegetarian, vegan




How to Prevent Prediabetes from Turning into Diabetes



<http://proxyhu.wrlc.org/login?>

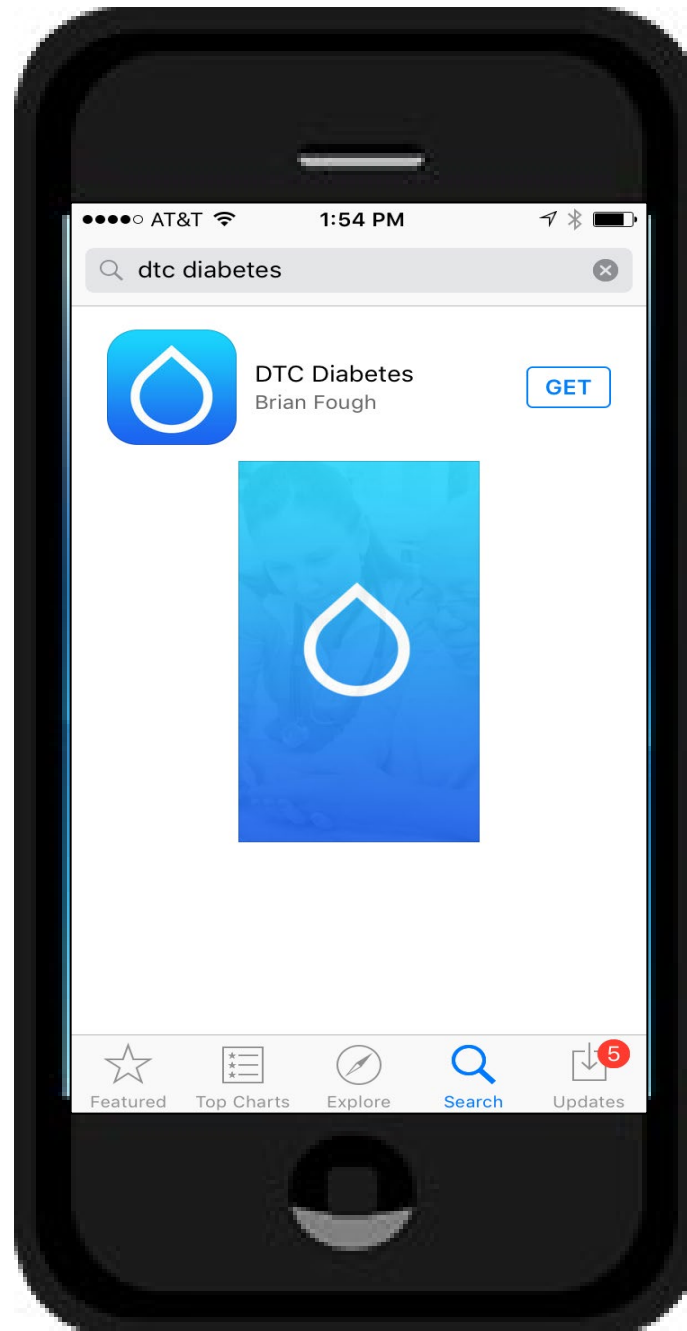


I Have Diabetes



Plant-Based Diets and Diabetes

http://dtc.fough3.net/app/learn.aspx?c=11



# Summary

- Technology can enhance diabetes patient's self-management skills with reduction in A1c in underserved populations
- Technology appears to work best with a literacy level of 8<sup>th</sup> grade or better
- Patients 65 years or older may need additional assistance in the use of technology or a different approach for patient empowerment in better diabetes self-management
- Smartphone and web-based learning technology may be a useful in diabetes prevention in a younger population

# Remote Patient Monitoring

# Cellular Enabled Smart Meter

- Patients are able to share real-time data with the providers through a cell-enabled technology that eliminates the need for manual logbooks or downloads.
- Patients receive daily notifications and reminders.



# Physician Dashboard

Today	Yesterday	Last 7 Days	Last 30 Days	Last 60 Days	Last 90 Days	Custom		
	Morning 12 AM to 10 AM		Afternoon 10 AM to 3 PM		Evening 3 PM to 9 PM		Night 9 PM to 12 AM	
Date	Before Meal	After Meal	Before Meal	After Meal	Before Meal	After Meal	Before Meal	After Meal
Thu 6/27			112 10:03 AM					
Wed 6/26	117 8:31 AM			183 11:36 AM				107 10:11 PM

00:11:22

Stop & Exit

# Patient success story

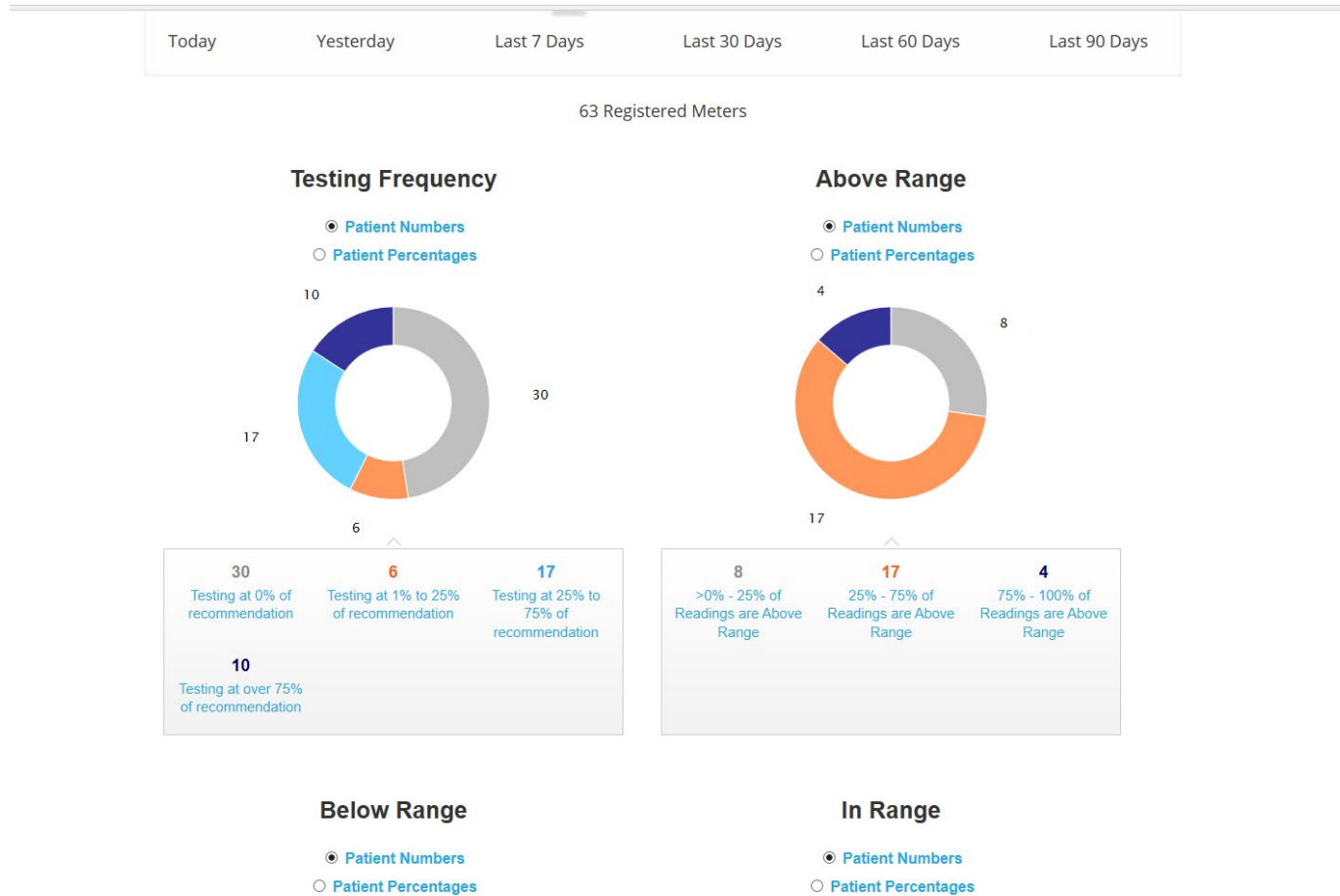
## I.S hemoglobin A1C trend

- Enrolled in the pilot study on 7/30/2018
- Completed pilot study on 10/30/2018
- Back on cellular enabled smart meter in April 2019

	9/22/09	04/06/10	12/09/10	02/13/18	08/08/18	10/24/18	04/17/19	06/27/19
HbA1c (%)	11.5	12.4	9.4	9.3	11.7	5.9	10.5	7.5

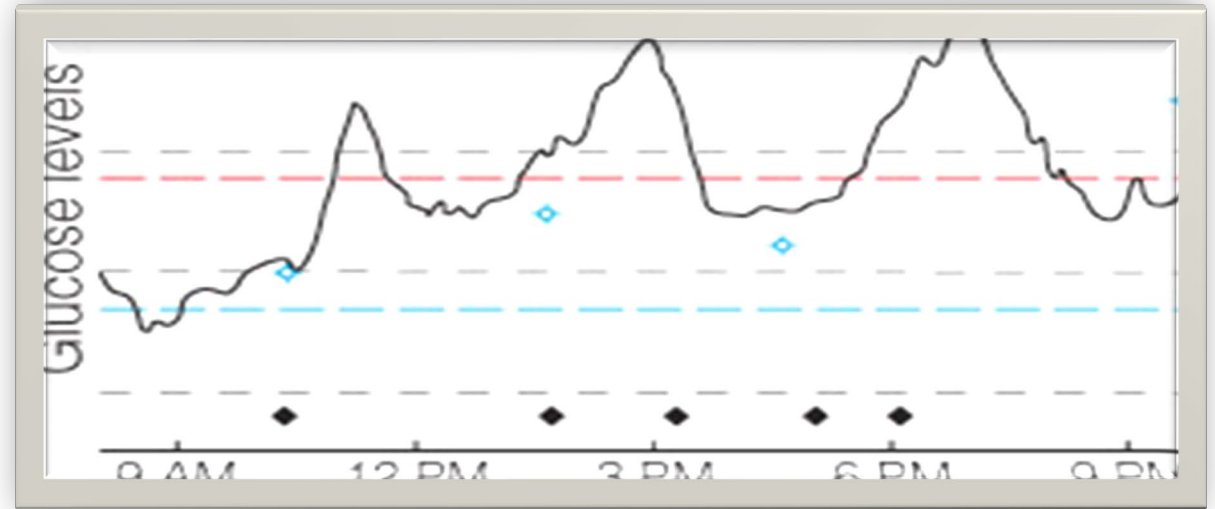
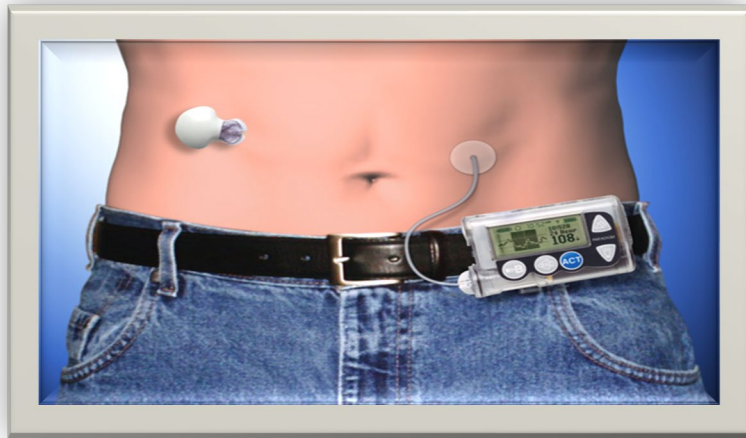
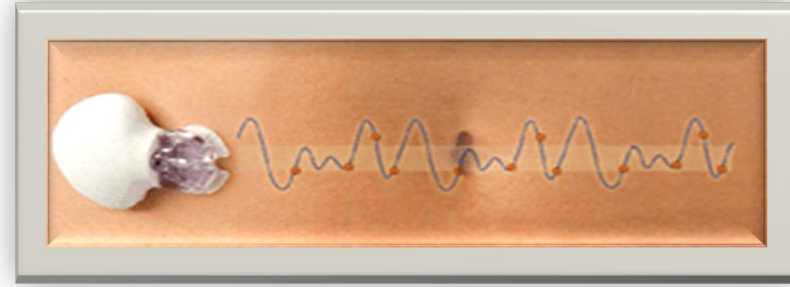


# Population Health

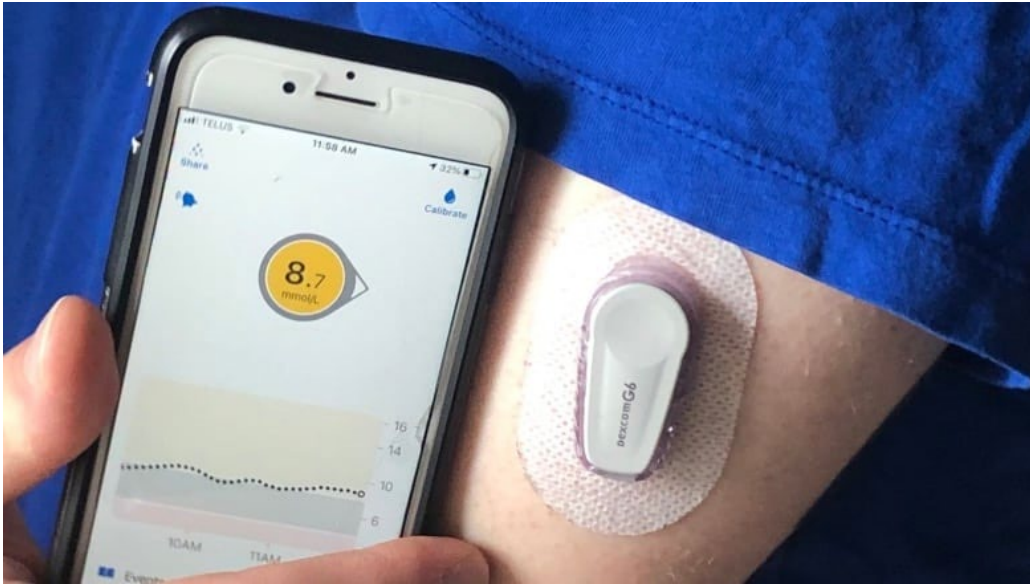


# Wearable Devices

# Insulin Pumps and Continuous Glucose Sensors



# Continuous Glucose Monitors



## Key points included in standard AGP report.

# AGP Report

Name \_\_\_\_\_

MRN \_\_\_\_\_

### GLUCOSE STATISTICS AND TARGETS

**14 days  
% Sensor Time**

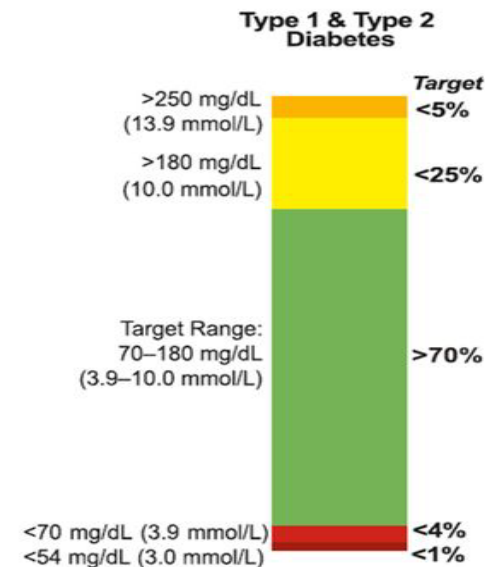
Glucose Ranges	Targets [% of Readings (Time/Day)]
Target Range 70–180 mg/dL .....	Greater than 70% (16h 48min)
Below 70 mg/dL .....	Less than 4% (58min)
Below 54 mg/dL .....	Less than 1% (14min)
Above 180 mg/dL .....	Less than 25% (6h)
Above 250 mg/dL .....	Less than 5% (1h 12min)

Each 5% increase in time in range (70–180 mg/dL) is clinically beneficial.

### Average Glucose Glucose Management Indicator (GMI) Glucose Variability

Defined as percent coefficient of variation (%CV); target  $\leq 36\%$

### TIME IN RANGES



# Acknowledgements

- Ernest Carter, MD, PhD
- Clive Callender, MD, FACS
- Luigi LeBlanc, MPH, CPHIT
- Susan Herbert, RN, CDE
- Richard Katz, MD
- District of Columbia Department of Health
- National Library of Medicine
- National Institute of Minority Health and Health Disparities