Using a Technology Based Diabetes Prevention Program to Improve Patient Activation and Reduce Body Mass Index in African American Adolescents/Young Adults

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Disclosures

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Earlier Weight Gain Increases Total Mortality Risk

National Institutes of Health AARP Cohort Study, 1996-2009
(N=109,947 Never-Smokers)

Men  Women

<table>
<thead>
<tr>
<th>Age at which BMI ≥25 kg/m²</th>
<th>Multivariate hazard ratio*</th>
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<td>Study entry (Age 50-71)</td>
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<td>50</td>
<td>1.12 1.26</td>
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<td>35</td>
<td>1.32 1.68</td>
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<td>18</td>
<td>1.68 2.04</td>
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*Regression analyses adjusted for age, race/ethnicity, education, leisure-time physical activity, and alcohol consumption.

NIH diabetes prevention program

High risk for development of type 2 diabetes mellitus
- FPG ≤ 126 mg/dL
- 2-hour post-OGTT glucose 140–199 mg/dL

Aim: Prevent or delay progression to type 2 diabetes mellitus

Intensive lifestyle changes
- Dietary advice
- Exercise advice (↑ Activity 700 kcal/wk or by 150 min/wk)
- ↓ weight ~ 7% and maintain weight loss through study end

Pharmacologic treatment
- Standard lifestyle advice
- Placebo
- Metformin 850 mg BID

Follow-up every 6 months for 3–6 years

End point: Development of type 2 diabetes mellitus
- FPG ≥ 126 mg/dL or 2-hour OGTT glucose ≥ 200 mg/dL
Diabetes Prevention Program

• Average follow-up 2.8 years
• Incidence of diabetes
  • Placebo 11%
  • Metformin 7.8%
  • Life-style 4.8%
• Conclusions
  • Lifestyle intervention most effective

N Engl J Med 2002;346:393-4003
USING TECHNOLOGY TO PREVENT DIABETES
Primary Care-Based Counseling for T2D Prevention: ADAPT

ADAPT System for Behavior-Change Counseling

Behavior-Change Principles

Persuasive Psychology

Technology

• Website-based tailored reminders
• Frequent feedback about progress via email/text
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
Study Design

• Non-masked randomized interventional parallel assignment trial
• Inclusion criteria
  • African American
  • 18-24 years
  • Impaired fasting blood glucose of 100-125 or HbA1c 5.7-6.4 or
  • + family history of type 2 diabetes mellitus
  • BMI ≥ 25
• Exclusion criteria
  • Pregnancy
  • Unwilling to participate
  • No web-enabled cell phone
  • Diagnosis of diabetes
  • Significant chronic illness
Measurements

• Demographics
• Patient Activation Measure (PAM)-10
• Patient Health Questionnaire (PHQ) 9
• Physical Activity- Godin Leisure Time (GLT)
• Motivation for Weight Loss
• Newest Vital Sign
• International Physical Activity Questionnaire (IPAQ)

• Height
• Weight
• Body Mass Index (BMI)
• Fasting Blood Glucose (FBG)
• HbA1c
• Urine pregnancy test
Study Outcomes

• Primary Outcome
  • Improved Patient Activation Measure

• Secondary Outcome
  • Decrease in BMI
  • Decrease in HbA1c
PAM-10

• PAM – developed by Judy Hibbard at University of Oregon is commercially available
• Assess how activated a patient is in managing his/her health
• Assess what to do with the information to improve outcomes
• 4 levels
  1. No active/important role in their health
  2. Lack confidence and knowledge to take action
  3. Beginning to take action
  4. Maintain behavior over time
Participants randomly assigned to in person group visits or online curriculum
Supplies
Lifestyle Group Visits
Compliance Text Reminders

Please strive for 10,000 steps a day
MY FITNESS PAL AND FITBIT PHONE APPS
HOWARD UNIVERSITY HOSPITAL DIABETES TREATMENT CENTER MOBILE UNIT

Logged in as: gailbland Viewing Member: [Name] Age: 24, Sex: F

Blood Pressure
Most Recent: No Data / No Data

- Take BP questionnaire online
- View questionnaire results

FitBit - Connected!

FitBit Display Name: [Name]
Click here to see your steps.
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</table>
Welcome to the Group LifeStyle Balance Program. This is Howard University Hospital's online educational program for diabetes prevention support. Use this tool to learn more about diabetes prevention, monitor your calorie intake, weight, and physical activity.
Session 12: Ways to Stay Motivated

Progress Review

Changes you've made to be more active:

________________________
________________________

Changes you've made to eat less fat (and fewer calories):

________________________
________________________
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<tr>
<th>Grade Item</th>
<th>Grade</th>
<th>Range</th>
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<td>Be a Fat and Calorie Detective</td>
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<td>Four Keys to Health Eating Out</td>
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<td>The Slippery Slope of Lifestyle Change</td>
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<td>Jump Start Your Physical Activity Plan</td>
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Results

12 Weeks

1 Year
Baseline Characteristics

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<tr>
<th></th>
<th>Non-Tech</th>
<th>Tech</th>
<th>P value</th>
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<tbody>
<tr>
<td>Female gender</td>
<td>78 (88.6%)</td>
<td>77 (91.7%)</td>
<td>0.506</td>
</tr>
<tr>
<td>Age, mean (SD)</td>
<td>19.6 (1.68)</td>
<td>19.6 (1.89)</td>
<td>0.986</td>
</tr>
<tr>
<td>PAM-10 score, mean (SD)</td>
<td>65.2 (14.4)</td>
<td>66.8 (16.56)</td>
<td>0.508</td>
</tr>
<tr>
<td>PHQ9 score, mean (SD)</td>
<td>7.5 (5.77)</td>
<td>6.1 (4.60)</td>
<td>0.096</td>
</tr>
<tr>
<td>GLT Exercise, mean (SD)</td>
<td>39.2 (50.50)</td>
<td>31.4 (22.15)</td>
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<tr>
<td>Motivation for Weight loss</td>
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<td>IPAQ</td>
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<td>0.983</td>
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Baseline Characteristics (cont.)

<table>
<thead>
<tr>
<th></th>
<th>Non-Tech</th>
<th>Tech</th>
<th>P value</th>
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</thead>
<tbody>
<tr>
<td>Newest vital sign</td>
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<td></td>
<td>0.896</td>
</tr>
<tr>
<td>Height (in), mean (SD)</td>
<td>65.8 (3.75)</td>
<td>65.8 (2.78)</td>
<td>0.969</td>
</tr>
<tr>
<td>Weight (lbs.), mean (SD)</td>
<td>209.0 (43.58)</td>
<td>206.5 (40.94)</td>
<td>0.692</td>
</tr>
<tr>
<td>BMI, mean (SD)</td>
<td>34.3 (10.41)</td>
<td>33.4 (5.71)</td>
<td>0.473</td>
</tr>
<tr>
<td>HbA1c, mean (SD)</td>
<td>5.4 (0.32)</td>
<td>5.4 (0.33)</td>
<td>0.393</td>
</tr>
</tbody>
</table>
Follow up Assessments

3 Month Outcomes
• No significant differences

12 Month Outcomes
• Tech group had significantly lower PHQ9 score (p 0.014)
• Tech group were more physically active (p 0.027)
## Linear Regression Analyses  Change in Outcomes Over Time

<table>
<thead>
<tr>
<th></th>
<th>Unadjusted Regression, (95% C.I.)</th>
<th>Adjusted Regression*, (95% C.I.)</th>
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</thead>
<tbody>
<tr>
<td>PAM-10 Score</td>
<td>5.20 (2.94, 7.47)</td>
<td>5.16 (2.91, 7.42)</td>
</tr>
<tr>
<td>BMI</td>
<td>-0.40 (-1.42, 0.61)</td>
<td>-0.39 (-1.41, 0.62)</td>
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<tr>
<td>A1c</td>
<td>0.06 (0.01, 0.10)</td>
<td>-0.04 (-0.11, 0.04)</td>
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</table>

*Adjusted for non tech vs tech group
BMI Change – 3 months

- N=54
- N=50

Group

Error bars: 95% CI
BMI Change – 12 months

Error bars: 95% CI
Weight Trends

- Tech: n=88
- Non tech: n=54

P=0.000
Smartphone Use

- Submit Job application
- Education class
- Govt. Services
- Job
- Info on place to live
- Do online banking
- Get info about a health condition

http://www.pewinternet.org/files/2015/03/PI_2015-04-01_smartphones_03.png
Learning Retention

• After one hour, people retain less than half of the information presented
• After six days, people forget 75% of the information
• Give quizzes on key information to improve retention
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 young adult population
• No statistically significant reduction in HbA1c, but the Tech group did not have an increase in HbA1c
Thanks to My Collaborators

• Zane Networks
• No More Clipboards
• Numedics