Phone Call Reminders and Mobile Health Apps: Do They Help Our Diabetic Patients?

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Purpose

Assessing if phone call reminders and mobile health applications help patients control their diabetes.

Methods

Study Period: 7/1/2018 - 3/9/2019

Inclusion Criteria: Type 2 DM, Phone Access, English Speaking, HbA1c values at V1 and V2; follow up visit at 3-4 months after V1.

1. Telephone call reminders: weekly on Wednesdays or Thursdays (Phone Group = TEL).
2. Patient received instruction sheet at V1 but no telephone calls. (Paper Group = PA).
3. Instruction Sheet:
   - a. Reduce carbohydrate intake (If you consume carbohydrates 3x daily, reduce to 2x daily.)
   - b. Conserve 3 servings of raw vegetables daily
   - c. Exercise 25 minutes daily (pace)
   - d. Drink 2 cups of water before meals
   - e. Control: no instruction sheet given. No instructions except “follow ADA diet and exercise regularly”.

TEL/PA Patients with HbA1c values at V1 and V2.

Paper and Phone Group combined = TELPA.

Exclusion Criteria: Lost to follow up for second visit

Mobile Application Analysis

1. Using Google Play Store Search (keyword: “weight loss”), we evaluated the most popular health and mobile apps in October 2018 and March 2019.
2. 50% of medications are abandoned at the pharmacy.3
3. Mobile health applications are growing in popularity. Currently, there are more than 300,000 mobile health apps available for download.4
4. An estimated 7.8% of diabetics use a digital mobile health application.

Results

Table 1: Medical History

<table>
<thead>
<tr>
<th>Age (Range)</th>
<th>Sex (M:F)</th>
<th>HbA1c at V1</th>
<th>HbA1c at V2</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEL (Phoncall)</td>
<td>65-76 (8)</td>
<td>8.54±2.77</td>
<td>6.5±1.66</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>PA (Paper)</td>
<td>65-76 (8)</td>
<td>8.54±2.77</td>
<td>7.24±1.66</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TELPA (Phone + Paper)</td>
<td>65-76 (8)</td>
<td>8.54±2.77</td>
<td>7.24±1.66</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Table 2: Lifestyle Mobile Apps: 2018 vs 2019

<table>
<thead>
<tr>
<th>App Name</th>
<th>2018 Downloads</th>
<th>2019 Downloads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calorie Counter - MyFat Pal</td>
<td>5,000,000+</td>
<td>10,000,000+</td>
</tr>
<tr>
<td>Lose Weight in 30 Days - Flat Stomach</td>
<td>5,000,000+</td>
<td>10,000,000+</td>
</tr>
<tr>
<td>My Diet Coach - Weight Loss Motivation &amp; Tracker</td>
<td>10,000,000+</td>
<td>5,000,000+</td>
</tr>
<tr>
<td>MIND YOUR WEIGHT - Lose Weight &amp; Track</td>
<td>5,000,000+</td>
<td>10,000,000+</td>
</tr>
<tr>
<td>Pedometer, Step Counter &amp; Weight Loss Tracker App</td>
<td>5,000,000+</td>
<td>10,000,000+</td>
</tr>
<tr>
<td>BMI Calculator - Methods at Home</td>
<td>5,000,000+</td>
<td>10,000,000+</td>
</tr>
<tr>
<td>Weight Loss Tracker</td>
<td>10,000,000+</td>
<td>10,000,000+</td>
</tr>
<tr>
<td>Monitor Your Weight</td>
<td>5,000,000+</td>
<td>10,000,000+</td>
</tr>
<tr>
<td>Fat Burning, Weight Loss Method</td>
<td>5,000,000+</td>
<td>10,000,000+</td>
</tr>
<tr>
<td>Diet Watch</td>
<td>5,000,000+</td>
<td>10,000,000+</td>
</tr>
</tbody>
</table>

Discussion

1. Diabetes management is a multifactorial process involving diet, exercise, self-monitoring, medication adherence, and healthy coping mechanisms.
2. Our study evaluated a simple intervention: weekly phone call and/or an instruction sheet.
3. Mobile health apps are limited in patient engagement.

Conclusion

1. A simple telephone reminder may be useful for HbA1c management despite the influence of the Internet.
2. Mobile phone apps lack built-in feedback and daily reminders as a free feature.
3. Physicians should continue to work with all stakeholders in the mobile health arena in order to better serve our diabetic patients.

References

5 Results Continued

Figure 1a: Avg HbA1c: TEL vs PA

Figure 1b: Avg HbA1c: C vs TELPA

Figure 2a: Change in HbA1c: V1, V2

Figure 2b: Change in HbA1c: V1, V2

Figure 3: Change in HbA1c: Increase vs Decrease

Contact Email: lukevin091@gmail.com (Kevin Lu), gloria_wumd@sbcglobal.net (Gloria Wu)
Background
1. Diabetic patients with poor compliance have a 1.6-fold greater risk of mortality.  
2. 50% of medications are abandoned at the pharmacy.  
3. Mobile health applications are growing in popularity. Currently, there are more than 300,000 mobile health applications available for download.  
4. An estimated 7.8% of diabetics use a diabetes mobile health application.

Methods
Inclusion Criteria: Type 2 DM, Phone Access, English Speaking, Hba1c values at V1 and V2; follow-up visit at 3-4 months after V1.
1. Telephone call reminders: weekly on Wednesdays or Thursdays (Phone Group TEL)
2. Patient received instruction sheet at V1 but no telephone calls. (Paper Group PA)
3. Instruction Sheet: a. Reduce carbohydrate intake (If you consume carbohydrates 3x daily, reduce to 2x daily.)  
b. Exercise 25 minutes daily (goal)  
c. Drink 2 cups of water before meals  
d. Have 3 savings of new vegetables daily  
e. Exercise 25 minutes daily (goal)  
f. Drink 2 cups of water before meals  
120 DM patients with Hba1c values at V1 and V2.  
5. Paper and Phone Group combined = TELPA
Exclusion Criteria: Fail to follow-up for second visit
Mobile Application Analysis
1. Using Google Play Store Search (keyword: "weight loss"), we evaluated the most popular health and weight loss mobile apps in October 2018 and March 2019.  
2. Google PlayStore has install increments of 100,000+; 500,000+ and 1,000,000+; 5,000,000+.  
Inclusion criteria: Free, apps listed under the "Health and Fitness" category under Google Play Store Search.  
Exclusion criteria: "Premium" version which required money.

Results

Table 1: Medical History

<table>
<thead>
<tr>
<th>TEL</th>
<th>PA</th>
<th>TELPA</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tel (Phone call)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13/6.0</td>
<td>x̄ = 6.32±0.7</td>
<td>x̄ = 5.84±0.7</td>
<td>x̄ = 5.84±0.7</td>
</tr>
<tr>
<td>Range</td>
<td>5.3 - 9.0</td>
<td>5.3 - 9.0</td>
<td>5.3 - 9.0</td>
</tr>
<tr>
<td>9/4.0</td>
<td>x̄ = 7.14±1.6</td>
<td>x̄ = 6.55±0.3</td>
<td>x̄ = 6.55±0.3</td>
</tr>
<tr>
<td>Range</td>
<td>6.0 - 9.6</td>
<td>5.8 - 7.6</td>
<td>5.8 - 7.6</td>
</tr>
<tr>
<td>5/1.1</td>
<td>x̄ = 7.31±4.1</td>
<td>x̄ = 7.24±0.8</td>
<td>x̄ = 7.24±0.8</td>
</tr>
<tr>
<td>Range</td>
<td>6.0 - 11.9</td>
<td>6.2 - 11.9</td>
<td>6.2 - 11.9</td>
</tr>
<tr>
<td>4/1.1</td>
<td>x̄ = 5.84±0.38</td>
<td>x̄ = 5.84±0.38</td>
<td>x̄ = 5.84±0.38</td>
</tr>
<tr>
<td>Range</td>
<td>5.5 - 6.2</td>
<td>5.5 - 6.2</td>
<td>5.5 - 6.2</td>
</tr>
</tbody>
</table>

Figure 1a: Avg Hba1c : TEL vs PA

Figure 1b: Avg Hba1c : C vs TELPA

Discussion
1. Diabetes management is a multifactorial process involving diet, exercise, self-monitoring, medication adherence, and healthy coping mechanisms.  
2. A study evaluated a simple intervention: weekly phone call and an instruction sheet.  
3. Mobile health apps are limited in patient engagement.

Conclusion
1. A simple telephone reminder may be useful for Hba1c management despite the influence of the Internet.  
2. Mobile phone apps lack built-in feedback and daily reminders as a free feature.  
3. Physicians should continue to work with stakeholders in mobile health and Internet health arenas to better serve our diabetic patients.

References
1. Diabetic patients with poor compliance have a 1.6-fold greater risk of mortality.  
2. 50% of medications are abandoned at the pharmacy.  
3. Mobile health applications are growing in popularity. Currently, there are more than 300,000 mobile health applications available for download.  
4. An estimated 7.8% of diabetics use a diabetes mobile health application.

Table 2. Lifestyle Mobile Apps: 2018 vs 2019

<table>
<thead>
<tr>
<th>Mobile App Ranking</th>
<th>TELPA</th>
<th>PA</th>
<th>TEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Telco Caller</td>
<td>10/10</td>
<td>10/10</td>
<td>10/10</td>
</tr>
<tr>
<td>2. Lose Weight in 30 Days</td>
<td>5/10</td>
<td>5/10</td>
<td>5/10</td>
</tr>
<tr>
<td>3. Lose BellyFat in 30 days</td>
<td>5/10</td>
<td>5/10</td>
<td>5/10</td>
</tr>
<tr>
<td>4. Lose It</td>
<td>5/10</td>
<td>5/10</td>
<td>5/10</td>
</tr>
<tr>
<td>5. Pedometer, Step Counter, BMI Calculator, Weight Loss Tracker App</td>
<td>1/10</td>
<td>1/10</td>
<td>1/10</td>
</tr>
<tr>
<td>6. My Calorie - Calorie Tracker</td>
<td>1/10</td>
<td>1/10</td>
<td>1/10</td>
</tr>
<tr>
<td>7. Diabetes Reflex Test</td>
<td>1/10</td>
<td>1/10</td>
<td>1/10</td>
</tr>
<tr>
<td>8. Diabetes Management</td>
<td>1/10</td>
<td>1/10</td>
<td>1/10</td>
</tr>
</tbody>
</table>
Purpose
Assessing if phone call reminders and mobile health apps help patients control their diabetes.

Methods
Inclusion Criteria: Type 2 DM, Phone Access, English Speaking, Recent HbA1c within 2 weeks of V1, V2; return for follow up visit at 3-4 months after V1.
1. Instruction Sheet
   a. Reduce carbohydrate intake (if you consume carbohydrates 3x daily, reduce to 2x daily.)
   b. Consume 3 servings of raw vegetables daily
c. Exercise 25 minutes daily (goal)
d. Drink 2 cups of water before meals
e. Telephone call reminders weekly on Wednesdays or Thursdays (Phone Group = TEL)
2. Telephone call reminders: weekly on Wednesdays or Thursdays (Phone Group = TEL)
3. Control group of diabetic pts were monitored without weekly phone calls but were given the same 4 suggestions during V1, V2. At V2, we asked them about weight gain or weight loss.
4. Of the 10 most popular Android mobile lifestyle modification applications, all applications have a weight loss goal.
5. Paired t-test.

Table 1: Medical History

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>BMI</th>
<th>Duration of DM</th>
<th>HbA1c at V1</th>
<th>HbA1c at V2</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEL Group</td>
<td>&lt;40</td>
<td>20.4±2.3</td>
<td>19.5-37.7</td>
<td>18.0-11.0</td>
<td>x = 2.0±1.2</td>
</tr>
<tr>
<td>PA Group</td>
<td>&lt;40</td>
<td>20.4±3.5</td>
<td>20.1-31.9</td>
<td>12.0-25.0</td>
<td>x = 2.4±1.4</td>
</tr>
<tr>
<td>C Group</td>
<td>&lt;40</td>
<td>20.0±2.5</td>
<td>17.4-37.9</td>
<td>11.8±0.5</td>
<td>x = 2.0±1.1</td>
</tr>
<tr>
<td>TELPA Group</td>
<td>&lt;40</td>
<td>20.3±3.3</td>
<td>19.5-33.7</td>
<td>14.4±1.0</td>
<td>x = 2.0±1.3</td>
</tr>
</tbody>
</table>

Discussion
After 5 months of weekly phone reminders, the TEL group reduced their HbA1c from 8.58% to 7.11% (16.43% overall decrease) vs the PA group reduced from 8.39% to 7.24% (13.71% overall decrease).

Conclusion
Reinforcing lifestyle modifications via phone and counsel helps diabetic patients control their HbA1c.

Statistical Analyses
Analysis were performed using R 3.5
**Background**

1. Diabetes patients with poor compliance have a 1.6-fold greater risk of mortality.
2. 50% of medications are abandoned by patients.
3. The American Association of Diabetes Educators (AADE) has defined the AADE7 Self-Care Behaviors as a framework for patient-centered diabetes self-management education (DSME) and care. The seven self-care behaviors are: healthy eating, being active, monitoring, taking medications, problem solving, healthy coping, and reducing risks.
4. Mobile health applications are growing in popularity. Currently, there are more than 300,000 mobile health applications available for download.

**Methods**

**Study Period:** 7/1/2018 - 3/8/2019

**Inclusion Criteria:**
- Type 2 DM
- Phone Access
- English Speaking
- Recent HbA1c within 2 weeks of V1, V2;
- Type 2 Diabetes, Phone Access, English Speaking, Recent HbA1c within 2 weeks of V1, V2;
- Failed to follow-up for second visit

**Exclusion Criteria:**
- Missed V2 appt.
- Pts were offered a weekly phone call reminder from a staff member with 4 suggestions: 1) drink 2 cups of water before meals, 2) reduce carbohydrate intake by 1 serving/day, 3) eat 3 servings of raw vegetables daily, 4) exercise 20-25 minutes/day. HbA1c was collected in visit 2 (V2).

**Control group of diabetic pts were monitored without weekly phone calls but were given the same 4 suggestions during V1, V2. At V2, we asked them about weight gain or their diabetes.

**Purpose**

Assessing if phone call reminders and mobile health applications help patients control their diabetes.

**Results**

**Table 1: Medical History**

<table>
<thead>
<tr>
<th>Group</th>
<th>Sex (M:F)</th>
<th>Age (yrs)</th>
<th>HbA1c (avg)</th>
<th>HbA1c (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEL Group</td>
<td>n=10</td>
<td></td>
<td>8.64 (2.78)</td>
<td>5.8 - 13.1</td>
</tr>
<tr>
<td>PA Group</td>
<td>n=10</td>
<td></td>
<td>8.39 (1.50)</td>
<td>6 - 11.9</td>
</tr>
<tr>
<td>Control</td>
<td>n=10</td>
<td></td>
<td>8.62 (1.72)</td>
<td>8.5 - 6.0</td>
</tr>
<tr>
<td>TELPA Group</td>
<td>n=20</td>
<td></td>
<td>8.69 (2.36)</td>
<td>5.8 - 13.1</td>
</tr>
</tbody>
</table>

**Table 2: Top Android Health & Lifestyle Modification Application Free Features (October 2018 vs March 2019)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MyFitnessPal</td>
<td>50,000,000</td>
<td>Y</td>
<td>5,000,000</td>
<td>Y</td>
</tr>
<tr>
<td>30 Day Fitness Challenge</td>
<td>10,000,000</td>
<td>Y</td>
<td>50,000,000</td>
<td>Y</td>
</tr>
<tr>
<td>Lose BellyFat in 30 days</td>
<td>10,000,000</td>
<td>Y</td>
<td>50,000,000</td>
<td>Y</td>
</tr>
<tr>
<td>Calorie Counter</td>
<td>10,000,000</td>
<td>Y</td>
<td>50,000,000</td>
<td>Y</td>
</tr>
<tr>
<td>Weight Loss Tracker App</td>
<td>5,000,000</td>
<td>Y</td>
<td>10,000,000</td>
<td>Y</td>
</tr>
<tr>
<td>Fat Burning Challenge</td>
<td>5,000,000</td>
<td>Y</td>
<td>10,000,000</td>
<td>Y</td>
</tr>
<tr>
<td>Flat Stomach</td>
<td>5,000,000</td>
<td>Y</td>
<td>10,000,000</td>
<td>Y</td>
</tr>
<tr>
<td>Weight Loss Tracker, WW</td>
<td>5,000,000</td>
<td>Y</td>
<td>10,000,000</td>
<td>Y</td>
</tr>
<tr>
<td>Moving Your Way</td>
<td>5,000,000</td>
<td>Y</td>
<td>10,000,000</td>
<td>Y</td>
</tr>
<tr>
<td>HealthLine, Weight Loss Indicator</td>
<td>5,000,000</td>
<td>Y</td>
<td>10,000,000</td>
<td>Y</td>
</tr>
<tr>
<td>Fitbit</td>
<td>5,000,000</td>
<td>Y</td>
<td>10,000,000</td>
<td>Y</td>
</tr>
<tr>
<td>MyDay Coach</td>
<td>5,000,000</td>
<td>Y</td>
<td>10,000,000</td>
<td>Y</td>
</tr>
<tr>
<td>MyDay Coach, Weight Loss Indicator</td>
<td>5,000,000</td>
<td>Y</td>
<td>10,000,000</td>
<td>Y</td>
</tr>
<tr>
<td>MyDay Coach, Weight Loss Tracker</td>
<td>5,000,000</td>
<td>Y</td>
<td>10,000,000</td>
<td>Y</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**References**


**Discussion**

- After 5 months of weekly phone reminders, the phone group reduced their HbA1c from 8.58% to 7.17% (16.43% overall decrease) vs the control group reduced from 8.39% to 7.24% (13.17% overall decrease).
- The historical control group increased their HbA1c from 6.62% to 6.96% (5.59% overall increase) vs the intervention group reduced their HbA1c from 8.69% to 7.21% (15.08% overall decrease).
- Of the 10 most popular Android mobile lifestyle modification applications, all applications have a weight loss goal.

**Conclusion**

- Reinforcing lifestyle modifications via phone and counsel helps diabetic patients control their HbA1c.
- Popular health applications are improving, but still lack rewarding reminders and positive feedback to encourage behavior change.
Methods

**Background**

Exclusion criteria: Any features found in “premium” version or require money to be unlocked.

Drink 2 cups of water before meals

Exercise 25 minutes daily (goal)

**Instruction Sheet**

Using Google Play Store Search (keyword: “weight loss”), we evaluate the most downloaded health and lifestyle applications of all-time as of March 2019.

2. Google Play Store has download increments of 100, 500, and 1000.

3. Inclusion criteria: Free (“free filter”)

4. Exclusion criteria: Any feature found in “premium” version or require money to be unlocked.

5. All applications were found in the “Health and Fitness” category.

**Results**

2. The American Association of Diabetes Educators (AADE) has defined the AADE7 Self-Care Behavior as a framework for patient-centered diabetes self-management education (DSME) and care. The seven self-care behaviors are: healthy eating, being active, monitoring, taking medications, problem solving, healthy coping, reducing risks.

Mobile health applications available for download.

**Results (Continued)**

Mobile Application Analysis

1. Using Google Play Store Search (keyword: “weight loss”), we evaluate the most downloaded health and lifestyle applications of all-time as of March 2019.

2. Google Play Store has download increments of 100, 500, and 1000.

3. Inclusion criteria: Free (“free filter”)

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**Results**

2. The American Association of Diabetes Educators (AADE) has defined the AADE7 Self-Care Behavior as a framework for patient-centered diabetes self-management education (DSME) and care. The seven self-care behaviors are: healthy eating, being active, monitoring, taking medications, problem solving, healthy coping, reducing risks.
### Methods (Continued)

#### Mobile Application Analysis

1. Using Google Play Store Search (keyword: "weight loss"), we evaluated the most downloaded weight and healthy living apps of all time as of March 2019.
2. Google Play Store has downloaded increments of 100, 500, and 1,000.
3. Inclusion criteria: Free (no filter)
4. Exclusion criteria: Any features found in "premium" version or require money to be unlocked.

#### Results

Table 1: Medical History

<table>
<thead>
<tr>
<th>Group</th>
<th>n (%)</th>
<th>Age Range</th>
<th>HbA1c ((%))</th>
<th>Weight Loss Goals</th>
<th>Push Notifications</th>
<th>Rewards or Congratulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEL Group</td>
<td>11</td>
<td>25-33.7</td>
<td>8.4 ± 3.73</td>
<td>1) Lose Weight in 30 Days (Veev)</td>
<td>2) Reminder for meals, 2) push notification for reminders</td>
<td>4) rewards or congratulations</td>
</tr>
<tr>
<td>TELPA Group</td>
<td>20</td>
<td>25-33.7</td>
<td>8.4 ± 3.73</td>
<td>1) Lose Weight in 30 Days (Veev)</td>
<td>2) Reminder for meals, 2) push notification for reminders</td>
<td>4) rewards or congratulations</td>
</tr>
</tbody>
</table>

Figure 1a: Avg HbA1c: Phone vs Paper

Figure 1b: Avg HbA1c: Control vs Phone/Paper

### Discussion

- After 5 months of weekly phone reminders, the phone group reduced their HbA1c from 8.52% to 7.26% (14.79% overall decrease) vs the control group reduced from 8.35% to 7.24% (14.31% overall decrease).
- The historical control group increased their HbA1c from 6.66% to 6.96% (4.31% overall increase) vs the intervention group reduced their HbA1c from 8.52% to 7.26% (14.79% overall decrease).
- Of the 11 most popular weight loss Android mobile applications, 7/11 applications incorporated an exercise plan, but only 2/11 featured nutritional guidance and psychological support.

### Conclusion

- Reinforcing lifestyle modifications via phone and counseling helps diabetic patients control their HbA1c.
- Currently, popular weight loss mobile applications lack important features for sustained weight loss for diabetes including nutritional guidance and psychological support.

### References


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### Abstract

The incidence of Type 2 Diabetes is growing rapidly. Mobile health apps (mHA) promise behavior modification to achieve a health goal. We postulate that reminders may promote lifestyle changes in Type 2 DM patients. Mobile health apps (mHA) promise behavior modification to achieve a health goal. We postulate that reminders may promote lifestyle changes in Type 2 DM patients. Mobile health apps (mHA) promise behavior modification to achieve a health goal. We postulate that reminders may promote lifestyle changes in Type 2 DM patients.
Methods (Continued)

Mobile Application Analysis

1. Using Google Play Store Search (keyword: “weight loss”), we evaluate the most downloaded weight loss applications of all-time as of March 2019.
2. Google Play Store has download increments of 100, 500, and 1000.
3. Google Play Store lists those apps with a minimum of 1000 downloads.

Inclusion criteria: Free (“free filter”) Google Play Store lists those apps with a minimum of 1000 downloads.

Exclusion Criteria:的生命
1. Patients came back for a follow-up visit (V2) 3 months after V1.
2. All diabetic patients had a HbA1c test within 3 months prior to their first visit.
3. All patients in the Phone Call Reminders group had a HbA1c lab test performed within 2 weeks of their first visit.
4. Patients in the Phone Call Reminders group were not available for telephone calls.

Results

Table 1. Android Weight Loss Application Free Features

<table>
<thead>
<tr>
<th>Mobile Application</th>
<th>Downloaded from Google Play Store</th>
<th>Meal Tracker</th>
<th>Exercise Plan</th>
<th>Calorie Counter</th>
<th>Weekly Reminders</th>
<th>Push Notifications</th>
<th>Encouragement</th>
<th>Feedback</th>
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<tbody>
<tr>
<td>Calories Counter</td>
<td>MyFitnessPal</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<td>Y</td>
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<tr>
<td>Lose Weight in 30 Days (Simple)</td>
<td>MyFitnessPal</td>
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<tr>
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<td>MyFitnessPal</td>
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<td>My Diet Coach – Weight Loss</td>
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<td>Y</td>
<td>Y</td>
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<tr>
<td>Daily Planner Challenge for Home</td>
<td>MyFitnessPal</td>
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<td>Lose Weight Tracker, BMI</td>
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<tr>
<td>Lose Weight Tracker</td>
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<tr>
<td>Daily Planner</td>
<td>MyFitnessPal</td>
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<td>Y</td>
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<tr>
<td>7/11</td>
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<td>Y</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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</table>

Results Continued

Table 1. Android Weight Loss Application Free Features

Methods

Phone Reminder Study

1. All diabetic patients are given a list of lifestyle recommendations inspired by DSN/ES before their first visit (V1):
   a. Reduce carbohydrate intake if you consume carbohydrates 3x daily, reduce to 2x daily.
   b. Consume 3 servings of new vegetables daily
   c. Exercise 25 minutes daily (goal)
   d. Drink 2 cups of water before meals.
2. All diabetic patients had a HbA1c test within 3 months prior to their first visit.
3. Diabetic patients were randomly selected and those who approved were called weekly to remind them of the list of lifestyle recommendations.
4. Patients came back for a follow-up visit (V2) 3 months after V1.
5. Patients had their HbA1c tested after V1 and within 2 weeks of V2.

Inclusion Criteria: Type 2 Diabetic, have access to phone, English speaking, must have HbA1c test result for visit 1 and visit 2, informed consent

Exclusion Criteria: Lost to follow-up within 3 months of study period.
Phone Call Reminders and Mobile Health Apps: Do They Help Our Diabetic Patients?

Kevin Lu BS1, Gloria Wu MD2, Brian Leung BS3, Shannon Luu BS4, Laura Billard BS5

1University of California, San Diego, 2University of California, San Francisco, School of Medicine, 3Tulsys Technology, 4Santa Clara University, 5University of California, Santa Barbara

MON-150
March 25, 2019

Abstract

Purpose

Assessing if phone call reminders of lifestyle modifications improve diabetes control

Methods (Continued)

Mobile Application Analysis

1. Using Google Play Store Search (keyword: “weight loss”), we evaluate the most downloaded weight loss applications of all-time as of March 2019.
2. Google Play Store has downloaded increments of 100, 500, and 1000.
   a. Google Play Store lists those apps with a minimum of 1000 downloads.
   b. Google Play Store lists those apps with a minimum of 100,000 downloads.
   c. Google Play Store lists those apps with a minimum of 1000,000 downloads.

Exclusion Criteria

Free (“free” filter)

Results

Total number of pts: 20 (11 Males, 9 Females)

Inclusion criteria:

1. All applications were found in the “Health and Fitness” category.
2. The seven self-care behaviors are:
   a. Healthy Eating
   b. Being Active
   c. Monitoring
   d. Taking Medications
   e. Problem Solving
   f. Healthy Coping
   g. Reducing Stress

Methods

Phone Reminder Study

1. All diabetic patients are given a list of lifestyle recommendations inspired by DSNM5 before their first visit (V1):
   a. Reduce carbohydrate intake if you consume carbohydrates 3x daily, reduce to 2x daily)
   b. Consume 3 servings of raw vegetables daily
   c. Exercise 20-25 minutes/day
   d. Drink 2 cups of water before meals
   e. Monitor blood sugar levels

Results

Conclusion

Phone calls remind patients of lifestyle modifications help diabetic patients control their HbA1c.

Current use of mobile health applications has limited importance for sustained improvements in diabetes-related quality of life.

Acknowledgements

This research was supported by the University of California, Los Angeles, and the Mayo Clinic Administrative Office.

References

Phone Call Reminders and Mobile Health Apps: Do They Help Our Diabetic Patients?

Kevin Lu BS*, Gloria Wu MD*, Brian Leung BS*, Shannon Luu BS*, Laura Billard BS*
1*University of California, San Diego, 2*University of California, San Francisco, School of Medicine, 3Tuttle University, 4Santa Clara University, 5University of California, Santa Barbara

Abstract

Purpose: To evaluate if phone call reminders and mobile health apps lack systematic reminders or rewards for goal achievement. Despite the popularity of mobile health apps, a simple phone call may still make a positive feedback.

Methods

Mobile Application Analysis

1. Using Google Playstore Search (keyword: “weight loss”), we evaluate the most downloaded weight loss applications of all-time as of March 2019.
2. Google Playstore has download increments of 100, 500, and 1000.
3. Inclusion criteria: Free (“free filter”) using Google Playstore Search (keyword: “weight loss”), we evaluate the most downloaded weight loss applications of all-time as of March 2019.

Background

● According to the CDC, 30 million Americans are diabetic. 84 million US adults are considered prediabetes or “at risk” for diabetes. (1)
● American Association of Diabetes Educators (AADE) has defined the AADE7 Self-Care Behaviors as a framework for patient centered diabetes self-management and care. (2) Healthy Eating, Being Active, Taking Medications, Monitoring, Reducing Risks, Healthy Coping, Adherence to treatment and self-management. (3)
● The American Diabetes Association (ADA) recommends patients to be monitored to improve adherence to treatment and self-management. (3)
● In addition, weight loss is important in managing diabetes in overweight/obese individuals. Mobile health apps have been a popular trend. Currently, there are more than 300,000 mobile health apps available for download.

Methods

Phone Reminder Study

1. All diabetic patients are given a list of weight loss recommendations from DSWES before their first visit (v1):
   a. Reduce carbohydrates intake (If you consume carbohydrates 3x daily, reduce to 2x daily.)
   b. Consume 3 servings of raw vegetables daily
   c. Exercise 20-25 minutes daily (pilates)
   d. Drink 2 cups of water before meals
   2. All diabetic patients had an HbA1c test within 3 months prior to their first visit.
   3. Diabetic patients were randomly selected and those who approved were called weekly to remind them of the list of weight loss recommendations.
   4. Patients had their HbA1c tested 100 days after visit 1 and within 2 months of visit 2 (v2).

Results: Phone Group (PG) avg age=63.8 yrs, sd=9.52. Control Group (C) avg age=61.7yrs, sd=7.32 yrs.

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Total number of pts: 20 (11 Males, 9 Females)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone Group (6M:4F)</td>
<td>10 pts</td>
</tr>
<tr>
<td>Control Group (8M:5F)</td>
<td>10 pts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phone Call Intervention</th>
<th>HbA1c change (8.71% change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone Group</td>
<td>0.72</td>
</tr>
<tr>
<td>Control Group</td>
<td>0.72</td>
</tr>
</tbody>
</table>

| Total number of pts: 20 (11 Males, 9 Females) |
| Phone Group (6M:4F)                  | 10 pts                          |
| Control Group (8M:5F)                | 10 pts                          |

Conclusions:

1. After 6 weeks of phone intervention, the phone group reduced their HbA1c from 8.64% to 7.28% (15.74% overall decrease) vs the control group reduced from 8.27% to 7.58% (8.71% overall decrease).
2. Of the 11 most popular weight loss mobile applications, 7/11 applications incorporated an exercise plan, but only 2/11 featured nutrition journals.
3. Only 1/11 applications have water intake encouragement and vegetable intake encouragement.

Table 1: Most Popular Weight Loss Applications by Download

<table>
<thead>
<tr>
<th>Mobile Health Application</th>
<th>Number of Downloads (Android)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calorie Counter - My Fitness Pal</td>
<td>5,000,000+</td>
</tr>
<tr>
<td>Lose Weight in 30 Days (Simple Design)</td>
<td>5,000,000+</td>
</tr>
<tr>
<td>Lose Belly Fat in 20 Days - Flat Stomach</td>
<td>5,000,000+</td>
</tr>
<tr>
<td>Age Range 51 - 73 yrs; avg=61.7yrs</td>
<td>5,000,000+</td>
</tr>
<tr>
<td>My Diet Coach - Weight Loss &amp; Tracker</td>
<td>5,000,000+</td>
</tr>
<tr>
<td>Pedometer - Step Counter &amp; Weight Loss Tracker App</td>
<td>5,000,000+</td>
</tr>
<tr>
<td>30 Day Fitness Challenge - Beginner to Home</td>
<td>5,000,000+</td>
</tr>
<tr>
<td>Dafiti - Weight Loss Workouts</td>
<td>5,000,000+</td>
</tr>
<tr>
<td>Slim FX - Women Workouts</td>
<td>5,000,000+</td>
</tr>
</tbody>
</table>

Table 2. Android Weight Loss Application Free Features

<table>
<thead>
<tr>
<th>Mobile Applications Ranked by Downloads</th>
<th>Calories Counter - My FitnessPal</th>
<th>Lose Weight in 30 Days (Simple Design)</th>
<th>Lose Belly Fat in 20 Days - Flat Stomach</th>
<th>Lose IT - Calorie Counter</th>
<th>My Diet Coach - Weight Loss &amp; Tracker</th>
<th>Pedometer - Step Counter &amp; Weight Loss Tracker App</th>
<th>30 Day Fitness Challenge - Beginner to Home</th>
<th>Dafiti - Weight Loss Workouts</th>
<th>Slim FX - Women Workouts</th>
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<tbody>
<tr>
<td>Calories Counter</td>
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<td>Y</td>
<td>Y</td>
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<td>Y</td>
<td>Y</td>
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<td>Y</td>
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<td>Lose Weight in 30 Days</td>
<td>Y</td>
<td>Y</td>
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<td>Lose Belly Fat in 20 Days</td>
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<tr>
<td>Age Range 51 - 73 yrs</td>
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<tr>
<td>My Diet Coach</td>
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<tr>
<td>Pedometer</td>
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<tr>
<td>30 Day Fitness Challenge</td>
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<td>Y</td>
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<tr>
<td>Dafiti</td>
<td>Y</td>
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<td>Y</td>
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<tr>
<td>Slim FX</td>
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Table 3. Android Weight Loss Application Paid Features

<table>
<thead>
<tr>
<th>Mobile Applications Ranked by Downloads</th>
<th>Calories Counter - My FitnessPal</th>
<th>Lose Weight in 30 Days (Simple Design)</th>
<th>Lose Belly Fat in 20 Days - Flat Stomach</th>
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<th>My Diet Coach - Weight Loss &amp; Tracker</th>
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<th>Slim FX - Women Workouts</th>
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</thead>
<tbody>
<tr>
<td>Calories Counter</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Lose Weight in 30 Days</td>
<td>Y</td>
<td>Y</td>
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<td>Y</td>
<td>Y</td>
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<tr>
<td>Lose Belly Fat in 20 Days</td>
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<td>Y</td>
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<td>Y</td>
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<td>My Diet Coach</td>
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<td>30 Day Fitness Challenge</td>
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<td>Slim FX</td>
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<td>Y</td>
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<td>Y</td>
</tr>
</tbody>
</table>

Conclusions

1. After 6 weeks of phone intervention, the phone group reduced their HbA1c from 8.64% to 7.28% (15.74% overall decrease) vs the control group reduced from 8.27% to 7.58% (8.71% overall decrease).
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