What’s App?
Challenges and Opportunities in Diabetes Mobile Technologies

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Disclosure Information

I have no conflicts of interest to disclose.

Everybody’s doing it

Overview

► mHealth defined
► Why mHealth?
► Opportunities
► Challenges
► Wrap-Up

mHealth defined

“The use of mobile and wireless devices to improve health outcomes, healthcare services, and health research.”

► NIH Consensus Group (2012)
Overview

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- Why mHealth?
- Opportunities
- Challenges
- Wrap-Up

Why mHealth?

- Haven’t we come so far in diabetes???
  - Increased number and efficacy of diabetes medications.
  - Improved medication delivery systems.
  - Evolving technology for glucose monitoring.

Why mHealth?

- Why mHealth?
  - Haven’t we come so far in diabetes???
    - Yes.
    - Only 18.8% met all targets for HbA1c, lipids, and BP.
      - 47.5% with HbA1c > 7%
      - 15.6% with HbA1c > 9%
    - but!
      - Many PWD do not achieve optimal clinical control.

Why mHealth?

- Diabetes Self-Management Education (DSME):
  - It works...
    - Improves adherence, clinical, QOL, and financial outcomes.
    - DSME reduced HbA1c by an average of 0.74% in a meta-analysis of 118 RCTs.
  - . . . IF PWD can access it.
    - Utilization is 5-7%.

Why mHealth?

- What do we ask of PWD?

An illustration...

- Many PWD do not achieve optimal clinical control.

Why mHealth?

- Might mHealth be a way to extend the reach of DSME?
  - Why or why not?
Food for thought!

Project Dulce:
- RN-led team of MAs and RDs: clinical management
- Promotoras: DSME
- Good, but significant barriers to attendance, and attrition was high.

Food for thought!

Study Objective:
Examine the effect of Dulce Digital on HbA1c.

Can mobile text messaging be used to overcome barriers and deliver DSME to individuals with poorly controlled diabetes?

Study Objective:
Examine the effect of Dulce Digital on HbA1c.

Dulce Digital showed significantly greater improvements over time compared to the control group ($p < .05$)

Dulce Digital
N=126 Hispanics w/ HbA1c ≥ 7.5% received Dulce Digital or UC.
- Dulce Digital (n=63) received 3 types of text messages:
  - Educational/motivational
  - Medication reminders
  - BGM prompts
- 2-3 messages/day, with frequency tapering over 6 mos.
- Outcome assessments at baseline, 3 and 6 months.

Why mHealth?

Diabetes Self-Management Support (DSMS):
- Support for implementing and sustaining behaviors needed to self-manage on an ongoing basis.
- Behavioral, educational, psychosocial, clinical.
- Especially important in the context of new challenges and/or advances in treatment.
- Evidence for the role of CHWs, peers, lay persons.
Why mHealth?

MINI-DISCUSsION #2

How do you provide DSMS to your patients?

How might mHealth play a role?

So . . .

If there is potential for mHealth to provide, or to augment DSME/S . . .

. . . Where do we start?

No shortage of options!

- 325,000 mHealth apps
- + 78,000 in 1 year
- Winner’s Circle:
  - Android is #1
  - Diabetes is #1

Million dollar question

What is the best diabetes app?

It’s complicated.

Million dollar answer

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Opportunities: Functionality

- What can these apps do?
  - Track
    - Blood sugar
    - Medication
    - Dietary intake
    - Physical activity
  - Emotional well-being
  - Graph
  - Report + share
  - Educate
  - Connect
  - Support children & families
Opportunities: Low Cost

- Pricing:
  - Majority are free
  - Other payment plans:
    - $9.99 one-time fee
    - $3.99/month
    - $60/year
  - This is fairly low cost relative to...
- Other healthcare expenses (PWD)
- Traditional DME/S Interventions (healthcare)

Opportunities: Clinical Benefit

- 2016 – 2018 systematic reviews & meta-analyses:
  - HbA1c was the most common primary outcome.
  - ∆ = -0.15 to -1.9%.
  - Complications prevention focus
  - Structured display of data

MINI-DISCUSSION #3

What benefits have you seen through your patients’ use of apps?

MINI-DISCUSSION #4

What challenges have you seen with diabetes app use?

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Considerations

- The sheer number!
  - How does a PWD choose?
  - How does a HCP keep up?
  - How does the research keep up?
  - It doesn’t . . .
Considerations: Evidence-based?

- "Rapid proliferation of app development is significantly outpacing research on app use and related outcomes…"
- Most apps in the marketplace have not been rigorously tested.
- "Newness" of apps
- Study limitations
  - Small n
  - Short intervention and/or follow-up periods
- Bottom line: More rigorous testing is needed.


Considerations: Accuracy

An illustration: Insulin dose calculation

- 46 calculators were identified that performed simple mathematical calculations using carb intake and BG:
  - 30% documented the formula
  - 59% allowed calculation when 1 or more missing values
  - 48% used ambiguous terminology
  - 37% did not update in response to a changing user input
- 67% carried a risk of dose recommendations that violated basic clinical assumptions.

Considerations: Appropriateness

- Are the recommendations appropriate?
- Is the feedback appropriate?

Encourage your PWD to be informed and discriminating app consumers.

Considerations: Is it for everyone?

MINI-DISCUSSION #5

Might some PWD benefit from app use more (or less) than others?

Considerations: Is it for everyone?

- Subgroup analyses show greater benefit among:
  - T2D vs. T1D
    - HbA1c Δ = - 0.8% vs. - 0.3%
  - "Younger" (Mean age ≤ 55 years) versus "older" samples
    - HbA1c Δ = - 1.0% vs. - 0.4%
  - Shorter (<8.5 years) duration of disease
    - HbA1c Δ = - 0.8% vs. - 0.2%

Hou et al. Diabetes Care, 2016; Kitsiou et al. PLOS ONE, 2017; Wu et al. JMIR mHealth and uHealth, 2017; Wu et al. Obes Rev, 2018
Considerations: Is it for everyone?

- A text message intervention with the option to engage friends/family (FF).
  - 29% did not have FF to invite
  - 15% had FF who declined to participate
  - In the end, 35% engaged FF
  - Just because apps can network with FF ≠ all patients (or FFs) will engage.
- Pew Research Center statistics on cell phone ownership:
  - Any cellphone: Men 96%, Women 94%
  - Smartphone: Men 78%, Women 75%
  - Cellphone, but not smartphone: White 18%, Black 23%, Hispanic 23%
  - < HS graduate: Men 92%, Women 94%
  - HS graduate: Men 64%, Women 72%
  - Some college: Men 54%, Women 77%
  - College graduate: Men 39%, Women 77%
  - < $30,000: Men 64%, Women 74%
  - $30,000 - $49,999: Men 74%, Women 83%
  - $50,000 - $74,999: Men 77%, Women 83%
  - ≥ $75,000: Men 93%, Women 93%
  - Urban: Men 77%, Women 79%
  - Suburban: Men 79%, Women 83%
  - Rural: Men 67%, Women 67%

Considerations: Engagement

- Medicaid & Medicare patients w/ T2D used app for 4 months.
- All were asked to monitor BG; non-BG features were optional:
  - Exercise: 100% used, 23% high frequency use
  - Med adherence: 77% used, 55% high frequency use
  - Weight: 73% used, 41% high frequency use
  - Blood pressure: 41% used, 33% high frequency use
  - “Modest” engagement with non-BG app features over 4 months.

MINI-DISCUSSION #6

- Why?

Considerations: Engagement

- “The gap between recording information and changing behavior is substantial…little evidence suggests that (devices) are bridging that gap.”
  - Data must be presented back to the user in a manner that motivates and sustains action.
  - Few apps incorporate behavior change theory.
- Recommendations:
  - Goal-setting and problem-solving
  - Personalized feedback
  - Tailored reminder features.
More food for thought!

Cyberinfrastructure

Dulce Digital Me!

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Opportunities
- Considerations

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Wrap-Up

Apps are not magic wands . . . but can be useful tools.
- Not all PWD are created equal.
- Not all apps are created equal.
- Do your research!

Thank you