mHealth and Health Systems - Challenges, Pitfalls & Promises

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Conflict of Interest Disclosures

- Scripps Translational Science Institute has received grant support from the Qualcomm Foundation.
- I am a medical advisor for DynoSense, Airstrip, Agile Edge Technology, FocusMotion, and Chief Medical Advisor and Board member for Nanomobile Healthcare.
mHealth

“mHealth (or mobile health) is the use of mobile or wireless devices to improve health outcomes, healthcare services and health research.”

–NIH Consensus group
Science Trans Med April 15, 2015
Predicted Growth in Wearable Sensor Devices

The Economist March 12, 2016
“...high quality adequately powered trials of optimised interventions are required to evaluate effects on objective outcomes.”

“The paucity of evidence calls for much needed future research...”

“High quality trials measuring clinical outcomes are needed.”
“You’ve got to start with the customer experience and work back toward the technology - not the other way around.”

Steve Jobs
1955-2011
Targeting the Quantified Self
Is Self-Quantification Desirable?

“You Get Reminded You’re a Sick Person”: Personal Data Tracking and Patients With Multiple Chronic Conditions

Jessica S Ancker¹, MPH, PhD; Holly O Witteman²,³,⁴, PhD; Baria Hafeez¹, MS; Thierry Provencher⁵; Mary Van de Graaf¹, MPH; Esther Wei⁶, NP

“…patients with multiple chronic illnesses
• Consider it work to track their own data
• Find that the data can be emotionally charged
• They perceive that providers do not welcome it.”

Ancker JA. J Med Internet Res 2015;17(8)
Efficacy of self monitoring of blood glucose in patients with newly diagnosed type 2 diabetes (ESMON study):

The Impact of Blood Glucose Self-Monitoring on Metabolic Control and Quality of Life in Type 2 Diabetic Patients

An urgent need for better educational strategies

Observational study of the frequency of SMBG in 2855 individuals with T2D and its association with metabolic control and quality of life.

Conclusions: “In patients not treated with insulin, self-monitoring is associated with higher HbA1c levels and psychological burden.”

O’Kane MJ. BMJ. 2008 May 24;336:1174-7
Franciosi M. Diabetes Care 2001; 24:1870–77
The Hidden Cost of Personal Quantification

100 students, given pedometer and told they were studying the comfort of wearing it:

- Taped shut (control)
- Asked to check steps several times in day. (Measurement)
- Told they could look at steps, but not required for study (Optional Measurement)

<table>
<thead>
<tr>
<th>Measurement --&gt;</th>
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<td>• Made walking feel more like work ( (p=0.005) )</td>
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<tr>
<td>• Decreased happiness &amp; satisfaction ( (p=0.026) )</td>
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Etkin J. Journal of Consumer Research 2016; Pre-pub 3/5/16
Compliance with Apps and Wearables

- 3 healthy and 3 chronically ill participants.
- 4 devices, 1 app for 11 health indicators.
- Over 4 weeks, average weekly compliance of 76% for healthy.
- Only 16% for chronically ill.

Shaw RJ. JAMIA 2016;0:1–5. doi:10.1093/jamia/ocv186,
Compliance with Apps and Wearables

- 48,104 downloaded the app
- 16,585 consented
- 9,520 agreed to share data broadly
- 898 contributed data on at least 5 separate days over the first 6 months
mHealth technologies alone are unlikely to engage individuals in their care.

However, taking advantage of their unique capabilities we can development new systems of care that can completely transform health management & wellness promotion.
Digital Medicine

The convergence of smartphone-enabled mobile computational and connectivity capabilities, other wireless sensors, genomics, information systems, cloud computing and machine learning into *entirely new systems of health management.*
1. One of every 3 adults in America has high BP.¹

2. Nearly 40 million office visits every year in the US have a primary diagnosis of hypertension making it the single most common reason for an office visit.²

3. Less than half of all individuals in the US have their blood pressure under control, and only 20% worldwide.¹


mHealth for High Blood Pressure

CareTaker

Withings Body Cardio

DynoSense

Bold Diagnostics

Scanadu

HealMet
Digital Medicine for High BP

+ sleep
+ diet
+ activity
+ stress
+ medications
+…
Healthcare Team

- Physician
- Nurse
- Pharmacist
- Dietician
- Physical therapist
- IT...

Personalized Predictive Analytics
Automated Clinical Decision Support
Learning Healthcare System
“How many businesses do you know that want to cut their revenue in half? That’s why the healthcare system won’t change the healthcare system.”

Rick Scott
Florida Governor
Founder of Columbia Hosp Corp, then CEO of Columbia/HCA, the largest private for-profit health care company in the U.S.
The $2.8 trillion US healthcare industry is being upended by companies attuned to the needs and desires of empowered consumers.

“Healthcare’s new entrants: Who will be the industry’s Amazon.com?”

pwc. Health Research Institute April 2014. Healthcare’s new entrants: Who will be the industry’s Amazon.com?
“It is really hard to design products by focus group. A lot of times, people don’t know what they want until you show it to them.”

Steve Jobs
1955-2011
mHealth and Health Systems - Challenges, Pitfalls & Promises

• mHealth technologies have tremendous potential to transform how health is managed.

• Implementing mHealth technologies has proven to be especially challenging in existing health care systems.

• Comprehensive digital medicine systems of care are required to provide the truly disruptive solutions needed that completely transform how we manage health and healthcare research.