Michael Hasselberg, PhD, RN, PMHNP-BC
Robert Wood Johnson Foundation Clinical Scholar Fellow
Associate Professor of Psychiatry and Clinical Nursing
Associate Director, UR Health Lab
Technology is Disrupting Every Industry

Top 5 publicly traded companies (by market cap)

- EXON: 406Bn
- PetroChina: 260Bn
- Walmart: 220Bn
- China Mobile: 201Bn
- P&G: 185Bn
- Apple (Tech Company): 505Bn
- EXON: 442Bn
- Amazon: 825Bn
- Microsoft: 312Bn
- Alphabet: 775Bn
- Google: 310Bn
- Microsoft (Tech Company): 758Bn
- Facebook: 562Bn

2008 2013 2018
<table>
<thead>
<tr>
<th>Apple Health Mobile App</th>
<th>Apple Watch</th>
<th>Apple Health Records</th>
<th>ResearchKit &amp; CareKit</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Medical supplies &amp; equipment</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>• Employee health with J.P. Morgan and Berkshire Hathaway</td>
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<td></td>
<td></td>
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<tr>
<td>• Voice technologies (Alexa)</td>
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<table>
<thead>
<tr>
<th>Amazon</th>
<th>• Over 190 healthcare patents filed</th>
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<tbody>
<tr>
<td></td>
<td>• Google Glass</td>
</tr>
<tr>
<td></td>
<td>• Body sensors and monitors</td>
</tr>
<tr>
<td></td>
<td>• HIPAA cloud platform</td>
</tr>
<tr>
<td></td>
<td>• $375 million investment in Oscar Health</td>
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</table>

<table>
<thead>
<tr>
<th>Alphabet</th>
<th>• Healthcare NExT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Azure for health data</td>
</tr>
<tr>
<td></td>
<td>• Microsoft Genomics</td>
</tr>
<tr>
<td></td>
<td>• AI Network Project</td>
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<tr>
<td></td>
<td>• Empower MD with UPMC</td>
</tr>
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<td></td>
<td>• Project InnerEye</td>
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<table>
<thead>
<tr>
<th>Microsoft</th>
<th>• Data share with top hospitals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• AI for suicide predictions and drug addiction</td>
</tr>
<tr>
<td></td>
<td>• Healthcare marketing</td>
</tr>
</tbody>
</table>

Hasselberg, 2019
“The Amazon Effect”

Convenience

Experience

Value
Innovators Focus on the Ends of an Value Chain: Creators & Consumers
Health Lab

Clinicians & Caregivers

Patients

- CHAMMP
- GIDS
- Simon School
- URMFG
- Orthopaedics
- Pediatrics
- Cardiology
- Urology
- Wilmot Cancer
- Psychiatry
- Radiology
- Hajim School
- Eastman School
- Preventive Medicine
- CTR Human Exp Therapeutics

Medicine of the Highest Order
### Innovation in Behavioral Health

#### Patient Facing Technology
- **Apps and Web Services**
  - Self Management: self-help, fitness, affirmative prompts, relaxation, stop smoking, personal exploration
- **Text Messaging and Apps**
  - Practice Extenders: remote monitoring, reminders, follow-up assessments, reduce phone tag
- **Digital Therapeutics**
  - Practice Extenders: variety of approaches including online therapies (like CBT) and coaching modules
- **Decision Supports**
  - Embedded In EHR: treatment pathways, clinical formulation, prescribing and treatment algorithms

#### Capacity to Treat Mild to Moderate Behavioral Conditions
- **e-Consult**
- **Project ECHO**
- **Remote Tele-Hub**
- **Telepsychiatry**
  - Consultation Platform: primary care to specialist, all cases with consultation input, education
  - Telementoring and Education: didactics and case presentations, "hub and spokes", collaborative learning
  - Collaborative Care: curbsides, outreach and treatment, registry review, Child Access Projects
  - Direct Evaluation: evaluation by specialist, documentation, asynchronous model, teletherapy

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Raney, Bergman, Torous, & Hasselberg, 2017
Moving Towards Direct-to-Consumer

Cellphones, Computers Are the Most Commonly Owned Devices

% of U.S. adults who own each of the following devices

<table>
<thead>
<tr>
<th>Device</th>
<th>2013</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellphone, including smartphones</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td>Desktop/laptop computer</td>
<td>73</td>
<td>68</td>
</tr>
<tr>
<td>Smartphone</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td>Tablet computer</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>MP3 player</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Game console</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>E-book reader</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Portable gaming device</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

Growing share of low-income Americans are smartphone-only internet users

% of U.S. adults who have a smartphone but no broadband at home, by annual household income


Source: Survey conducted Sept. 29-Nov. 6, 2016. Trend data from previous Pew Research Center surveys.

PEW RESEARCH CENTER
Behavioral Health Mobile Apps

Over 10,000 available to download today

- Track symptoms
- Offer access to education
- Deliver adjunctive therapy treatments
- Provide mindfulness and meditation exercises
Rapid Growth in Self Wellness Apps

<table>
<thead>
<tr>
<th>United States</th>
<th>Worldwide</th>
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<tbody>
<tr>
<td>1</td>
<td>Calm</td>
</tr>
<tr>
<td>2</td>
<td>Headspace</td>
</tr>
<tr>
<td>3</td>
<td>10% Happier</td>
</tr>
<tr>
<td>4</td>
<td>Simple Habit</td>
</tr>
<tr>
<td>5</td>
<td>Breathe</td>
</tr>
<tr>
<td>6</td>
<td>YogaGlo</td>
</tr>
<tr>
<td>7</td>
<td>Yoga Studio: Mind &amp; Body</td>
</tr>
<tr>
<td>8</td>
<td>Abide - Christian Meditation</td>
</tr>
<tr>
<td>9</td>
<td>Pacifica</td>
</tr>
<tr>
<td>10</td>
<td>Stop, Breathe &amp; Think</td>
</tr>
</tbody>
</table>

Note: Does not include revenue from third-party Android stores in China or other regions.

SensorTower - Data That Drives App Growth

sensortower.com
Need for Care Delivery Apps

Cognitive Behavioral Therapy (CBT)

- Focuses on the relationships among cognitions (thoughts), emotions (feelings), and behaviors
- Module-based and time-time limited psychotherapeutic approach
- Efficacious across numerous health conditions (i.e. depression, anxiety, substance use disorder, insomnia, pain, etc.)
“Best of Breed”

• Mild to moderate depression / anxiety
• 8 weekly sessions of 50 minutes in length
• Video-vignettes and interactive menus
• Evidence-based
“Best of Breed”

- Substance use disorders
- 7 module self guided web-based program
- Video-vignettes and interactive menus
- Evidence-based

Yale University

CBT4CBT™

Medicine of the Highest Order
“Best of Breed”

- Insomnia
- Provides educational information
- Self reported sleep diary
- Teaches sleep hygiene strategies
- Evidence-based

VA | U.S. Department of Veterans Affairs

Medicine of the Highest Order
“Best of Breed”

- Distressing thoughts and feelings
- AI-powered chatbot
- Communication through text messages
- Daily check-ins
- Evidence-based
Current Behavioral Health Mobile App Limitations

- Poor Usability
- Lack of Trust
- Disconnect From Therapist
- Lack of User-centered Design
UR Development of CBT Mobile App

Lead - UR Medicine Health Lab
• Expertise in technology innovation to improve delivery of care

Co-lead - Department of Psychiatry
• Expertise in cognitive behavior therapy, and implementation science

Eastman School of Music
• Expertise in visual and audio therapeutic functions

Art, Science, & Engineering
• Expertise in computer science and smartphone sensors
cCBTvr

- Uses evidence-based CBT treatment protocols for anxiety and stress
- Consists of 8 modules arranged in a sequence
  - Progressively build upon the previous lesson
Electronic Health Record Integration

- Secure data transmission
- Allows the user’s health care providers to monitor progress within the mobile app
Virtual Reality Psychotherapy

• Virtual reality (VR) experience with psychotherapist designed to give the illusion that the user is “there” in the therapy office
Symptom Tracking with Real-Time Data Visualization

• Use of National Institute of Health computer adaptive testing tools to track anxiety symptoms

• User data drives the application program interface (API) creating a personalized experience
Interactive Therapeutic Activities

- Case-enhanced learning examples to illustrate CBT principles
- Interactive animated and VR tasks to practice CBT skills
Individualized Immersive Experience

• Personalized VR
  Mindfulness and Meditation

• User chooses:
  o Therapist
  o Length of session
  o Music
  o VR Location
Next Steps

• Feasibility / efficacy testing in UR clinical service lines
• Institutional Review Board protocol in submission
• Partnerships with external organizations