DIGITAL HEALTH IS MOVING MAINSTREAM: How Can We Harness the Opportunity?

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Professor of Dermatology, Harvard Medical School
Care delivered outside of a traditional setting that is not dependent on specific time and place restrictions. It integrates technology, often includes Patient Generated Health Data and seeks to include the patient in the process and help them become more engaged.
DIGITAL HEALTH BY THE NUMBERS

More than 6.1 Billion people will have smartphones or tablets with access to mobile health apps by 2020.

Worldwide mHealth market to reach $59 Billion by 2020.

There will be 300 Million pieces of clothing & accessories with embedded health monitoring devices by 2020.

The top 3 therapy fields for connected health solutions are diabetes, obesity and hypertension.
We Must Get it Right!

Demand

Supply

2005  2010  2015  2020  2025
THE DIGITAL HEALTH LANDSCAPE

Telehealth
Remote Monitoring
Digital Therapeutics
Artificial Intelligence
**TELEHEALTH TAXONOMY**

**Real Time “Synchronous”**

- **Virtual Visit**
  - Video visit between MGH MD and patient

**Store and Forward “Asynchronous”**

- **eVisit**
  - Online exchange of medical info between MGH MD & patient

**Consults (Provider to Provider)**

- **Virtual Consult**
  - Video consult from MGH MD to patient’s MD

- **eConsult**
  - Online exchange of medical info between two Providers

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1 Exchange where the provider gives the patient medical advice, or determines if travel to MGH for in-person encounter is advisable
2 Exchange where the MGH consultant “Expert” gives referring provider medical advice
TELEMEDICINE ADOPTION TRENDS

- Wearable use shifting from fitness to managing health
- Urban patients twice as likely to use video telemedicine than rural
- Currently only capturing 0.5% of a 400+ million patient addressable market

Data from 2018 Rock Health Digital Health Consumer Adoption Report
79% of patients found it more convenient to find a time for a follow-up virtual visit vs. an in person one.

68% of patients rated virtual video visits at 9 or 10 on a 10 point scale.

Clinicians reported that virtual video visits are superior to office visits for timely scheduling of appointments (70.5%) and for visit efficiency (52.5%).
ISSUES WITH FRAGMENTED APPROACH

- Patient Confusion & Dissatisfaction
- Reimbursement & Revenue Differences
- Increased Legal Exposure
- Inefficient Use Of System Resources
**INTERSTATE MEDICAL LICENSURE COMPACT**

- Launched in 2014 by the FSMB
- 25 States are current members (District of Columbia & Guam as well)
- As of December 31, 2018, 4,511 medical licenses have been issued to providers to practice telehealth in multiple states
60% OF PATIENTS CARED FOR IN PRIMARY CARE
THE ADDRESSABLE MARKET FOR ONLINE SECOND OPINIONS IS ESTIMATED TO REACH $3.4 BILLION BY 2020
A 2003 study in the British Journal of Medicine documented the significant impact online second opinions have had on improving patient outcomes.

- **90%** of patients over the year studied received a new recommended treatment plan.
- **5%** of patients had a change in diagnosis.
REMOTE MONITORING
ONE YEAR MORTALITY IN CCCP

Mortality

Per 10,000 Person Days

Follow Up Period (Days)

End of CCCP

Data Includes 303 CCCP patients and 252 controls seen at Partners Healthcare in 2012.
PGHDConnect is a cloud-based digital health platform that provides a link to securely share patient generated health data between patients and providers.

Members of the patient’s care team can view the data via MyChart and Epic.
THE NEW PGHDConnect MOBILE APP
Digital health applications

Digital Medicine
Prevention, Diagnostic, Therapeutic

Digital Therapeutics
Is This Different Than Digital Medicine?

Autonomous AI-Enabled Screening, Diagnostic, Therapeutic

CONTEXTUAL PERSPECTIVE
FEATFORWARD

Alerts
Weather
Messaging

Activity Goals

Biometric Tracking

Weight training can cause a temporary increase in blood pressure during exercise. But, weightlifting can also have long-term...
WEEKLY AVG DAILY STEPS (WDS)

Change in WDS by group over time (unadjusted)

Baseline-adjusted slopes for WDS by cohort

<table>
<thead>
<tr>
<th></th>
<th>Control [n]</th>
<th>Intervention [n]</th>
<th>p-value</th>
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</thead>
<tbody>
<tr>
<td>Overall</td>
<td>-57.94 [110]</td>
<td>-29.29 [100]</td>
<td>0.015*</td>
</tr>
<tr>
<td>Obesity</td>
<td>-90.23 [59]</td>
<td>0.95 [52]</td>
<td>&lt;0.001***</td>
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## Baseline-adjusted slopes for BMI by cohort

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<th>p-value</th>
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<tbody>
<tr>
<td><strong>Overall</strong></td>
<td>-0.025 [133]</td>
<td>-0.232 [128]</td>
<td><strong>0.041</strong>*</td>
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<tr>
<td><strong>Obesity</strong></td>
<td>-0.086 [68]</td>
<td>-0.236 [67]</td>
<td>0.362</td>
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<td><strong>Hypertension</strong></td>
<td><strong>0.056 [74]</strong></td>
<td>-0.253 [75]</td>
<td><strong>0.002</strong>*</td>
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(Unadjusted)
ePAL

Sliding pain scale

Learn tab features multi-media educational content w/ daily tip

Users make notes & keep track of questions for their provider

Easy rx re-fill requests

Calendar feature tracks pain trends

Many people don’t realize that effective pain control is an important part of overall cancer treatment. Not only do you...
ePAL CLINICAL RESULTS

Median Pain Severity levels (BPI Severity): Control vs. Intervention

- Enrollment: p=0.56
- Midpoint: p=0.09
- Close out: p=0.035

Control | Intervention
BIGGER THAN WHAT HUMANS OR TECHNOLOGY CAN ACHIEVE ALONE
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AI ALONE: 92%
BIGGER THAN WHAT HUMANS OR TECHNOLOGY CAN ACHIEVE ALONE

AI ALONE: 92%

HUMANS ALONE: 96%
BIGGER THAN WHAT HUMANS OR TECHNOLOGY CAN ACHIEVE ALONE

AI ALONE: 92%
HUMANS ALONE: 96%
AI + HUMANS: 99.5%
Dermatology: Deep neural network classifies skin conditions as well as a dermatologist

The Deep Learning System had high sensitivity and specificity for identifying diabetic retinopathy and related eye diseases using retinal images from multiethnic populations with diabetes.
HOW WILL WE REGULATE AI?
RATIO OF PROVIDERS TO PATIENTS

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<thead>
<tr>
<th>Year</th>
<th>Demand</th>
<th>Supply</th>
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<tbody>
<tr>
<td>2005</td>
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<td>2025</td>
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THE TECHNOLOGY GENIE IS OUT OF THE BOTTLE
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A new regulatory framework that accepts time and place independent care delivery, but maximizes patient safety is required
CONNECT WITH ME

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