Digital health

To improve human health, healthcare services & wellness for individuals

<table>
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<tr>
<th>Wellness &amp; Prevention</th>
<th>Symptom Onset and Seeking Care</th>
<th>Diagnosis</th>
<th>Condition Monitoring</th>
<th>Treatment</th>
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<tbody>
<tr>
<td>Exercise &amp; Fitness</td>
<td>Patient Experience Tools</td>
<td>Condition Education &amp; Management</td>
<td>Prescription Filling &amp; Compliance</td>
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<td>Diet &amp; Nutrition</td>
<td>General Healthcare Information</td>
<td>Self-Monitoring</td>
<td>Prescription Discounts</td>
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<tr>
<td>Lifestyle &amp; Stress</td>
<td>Symptom Checking</td>
<td>Remote Patient Monitoring</td>
<td>Prescription Filling</td>
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<td>Stress Management</td>
<td>Finding a Clinician</td>
<td>App-Enabled Rehabilitation Programme</td>
<td>Medication Management &amp; Adherence</td>
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<td>Sleep/Insomnia</td>
<td>Managing Clinical and Financial Information</td>
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<td>Smoking Cessation</td>
<td>Social Media</td>
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<td>Alcohol Moderation</td>
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Physician may recommend app-supported disease management programmes, connected sensors for remote monitoring, or apps for any use case across the patient journey.
The Hype

- Reduces healthcare costs
- Mitigates healthcare staff shortages
- Overcomes rising demand
- Enhances accessibility/equity
- Increases personalisation of care
- Promotes patient empowerment
The ambition
Greenhalgh 2010
Person
centred care
Empowered
patient
Key Challenge

Human factors

connecting, sharing, communicating
Digital communication process

- Real Time Data Received
- Monitoring
- Analytics and Visualizations

Digital Health Tools:
- Continuous Glucose Monitoring
- Actigraphy
- Electrocardiogram (ECG)
- Electronic Patient Reported Outcomes (ePRO)
- Blood Pressure Monitor
- Consumer Apps

Healthcare organisation:
- Someone receives it
- Someone analyses & interprets it
- Someone acts on it

Patient

Collaboration Platform:
- Telemedicine
- Social
Patients
Automated Insulin Delivery: How artificial pancreas “closed loop” systems can aid you in living with diabetes (introducing “the APS book” by @DanaMLewis)
The digital divide: online access

Source: Ofcom. Adults’ media use & attitudes - Report 2018
Digital divide: socio-economic status

Source: Ofcom. Adults’ media use & attitudes – Report 2018
Symptom Monitoring With Patient-Reported Outcomes During Routine Cancer Treatment: A Randomized Controlled Trial

Ethan Basch, Allison M. Deal, Mark G. Kris, Howard I. Scher, Clifford A. Hudis, Paul Sabbatini, Lauren Rogak, Antonia V. Bennett, Amylon C. DeRespinis, Thomas M. Atkinson, Jeannie E. Chou, Dorothy Duklo, Laura Sir, Allison Barz, Paul Novotny, Michael Frauzino, Jeff A. Sloan, and Deborah Schrag

Computer Experienced

Usual care
STAR

Usual Care
STAR

Computer Inexperienced

Usual care
STAR

Usual Care
STAR

Graduate College High School

White Black Asian

Graduate College High School

White Black Asian

Graduate College High School
Survival

% alive at 12 months

* P<0.05

<table>
<thead>
<tr>
<th></th>
<th>Usual care</th>
<th>STAR</th>
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<tbody>
<tr>
<td>All</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experienced</td>
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<tr>
<td>Inexperienced</td>
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</table>

Computer-Experienced

Patients Visiting ER (%)

Usual care

STAR

Computer-Inexperienced

Patients Visiting ER (%)

Usual care

STAR

$p = .16$

$p = .02$
Facilitators

Study staff
- Trained participants
- Ensured assessments completed
- Differential mode of completion
- Tablets & computer kiosks
- Symptom reports for clinicians
Barriers and facilitators

Key Barriers
- Hospitalization
- Physical symptoms, e.g., poor vision
- Technical malfunctions
- Short battery life
- Slow system
- Lost/damaged devices
- Change to service plans
- Forgetfulness of the user
- Limited/inconvenient placement
- Poor phone network coverage
- Financial costs
- Impact on privacy or security
- Poor data reliability
- Lack of intrinsic motivation
- Influence of clinicians

Key Facilitators
- Clear, simple, and informative
- Larger screen on device
- Passive data collection
- Notifications
- Familiarity and knowledge
- Fits with routine
- Access to internet connection
- Tailored or personalized
- Available training or support
- Feedback
- Incentive or social comparison
- Influence of clinicians

People will only use a personal health journal around serious or long term conditions if it’s something they can engage with their clinicians on Lennon et al 2018
Professionals
Care delivery model 2019
San Andreas Fault

Reactive care model

Proactive care model
Mobile phone-based
Utilises an electronic Patient-Reported Outcomes system

Clinicians
“Who will hold the handset?”

Patients
“It was reassuring to know that my symptoms were being recorded and stored somewhere. I triggered two alerts and received phone calls back with helpful/reassuring advice”
Clinician views on digital health

I know myself how emails encroach on your time, my gut reaction is how is the doctor going to cope with this workload?

Would I be comfortable with it? Yes, if you show me data that demonstrate device use reduces adverse event rates. Right now it’s theoretical—it sounds great on paper, but whether it can actually deliver is unknown.

We’ve had a new IT system coming in, that’s created an absolute nightmare for everybody, because we’re not necessarily skilled in IT processes so generalized IT training would be good...then tailoring it to the things that we’re doing...

Lennon et al 2018, Levine et al 2015, Greenhalgh et al 2010
Two systems, that I would find a big disadvantage. You notice this now with many apps, all need extra actions, so that would be the biggest drawback. Simblett et al 2018
Clinical efficacy and effectiveness

Candidates for Adoption
- Alcohol & Substance Abuse
- Sleep / Insomnia
- Cancer
- Smoking Cessation
- Parkinson’s Disease
- PTSD
- Hypertension
- Cardiac Rehab
- Stress Management
- Alcohol Moderation
- Kidney Disease
- Pulmonary Rehab

Candidates for Inclusion in Clinical Guidelines
- Diabetes
- Depression
- Anxiety

Candidates for Evaluation in an RCT
- AF Screening
- Medication Refills
- MI
- Hematology
- Dental

General Lack of Studies
- GI Conditions
- Self-Diagnosis & Symptom Checking
- Finding an HCP
- Managing Clinical and Financial Records
- Medication Discounts
- Pregnancy

Potential Disappointments – More Study Required
- Exercise
- Pain Management
- Dermatological Conditions
- Schizophrenia / Bipolar
- Multiple Sclerosis
- Autism

Relative Quantity and Quality of Available Clinical Evidence
- Limited
- One Observational Study
- Multiple Observational Studies
- One RCT Study
- Multiple RCT Studies
- One Meta-analysis
- NOTABLE

Sources: IQVIA AppScript Clinical Evidence Database, Aug 2017
Data quality

Why Doctors Still Misunderstand Heart Disease in Women
Reconsidering the “typical” heart-attack symptoms

VIDHI DOSHI  OCT 26, 2015

AI-Driven Dermatology Could Leave Dark-Skinned Patients Behind
Machine learning has the potential to save thousands of people from skin cancer each year—while putting others at greater risk.

ANGELA LASHBROOK  AUG 16, 2018

MORE STORIES

Being Black in America Can Be Hazardous to Your Health
OLGA KHAZAN

Facial-Recognition Software Might Have a Racial Bias Problem
CLARE GARVIE AND JONATHAN FRANKLE
The future is digital
Thank you

Dr Jo Armes

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@healthscisurrey
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Digital health apps usage

58% downloaded health app

More likely to be:
Younger
Have higher income
Be more educated

Reasons for not downloading apps:
Lack of interest
Cost
Data privacy concerns

Reason for discontinued app usage:
High data entry burden
Loss of interest
Hidden costs

Krebs & Duncan 2015
I was up at 3am, in the hospital, next to my wife...

...surfing the web on the crappy wireless internet...

...trying to find information about a critical medical treatment...

...and I couldn’t get access to the papers!

#@$%!!