How Patient-Focused Systems Can Improve Healthcare Outcomes

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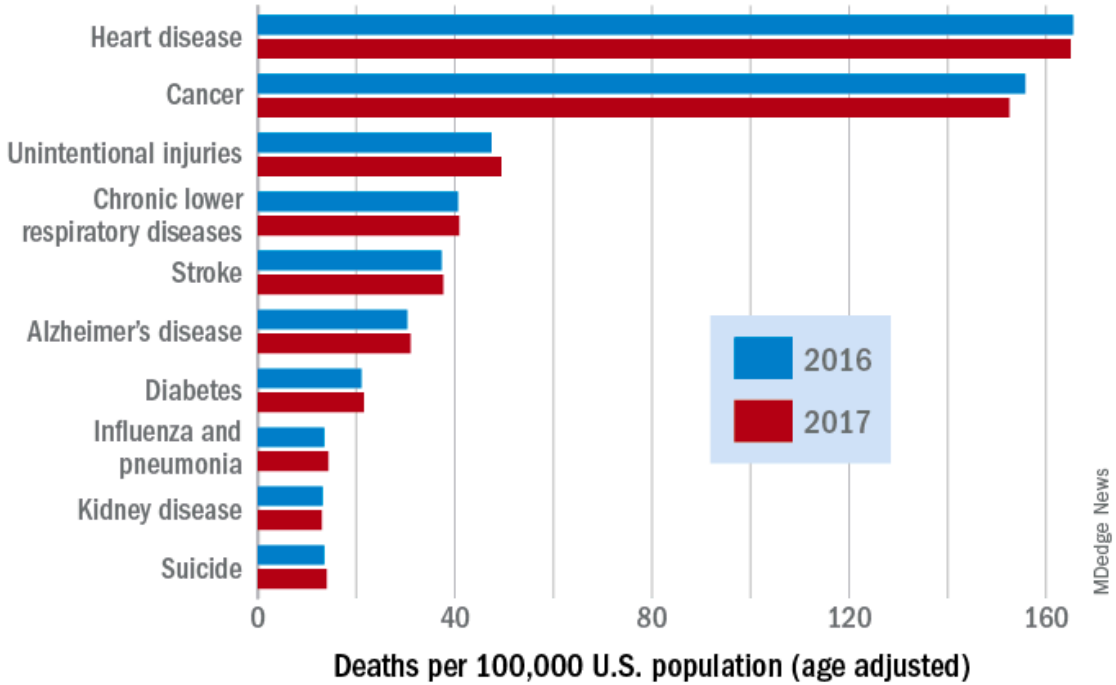
Department of Biomedical Informatics

Harvard Medical School

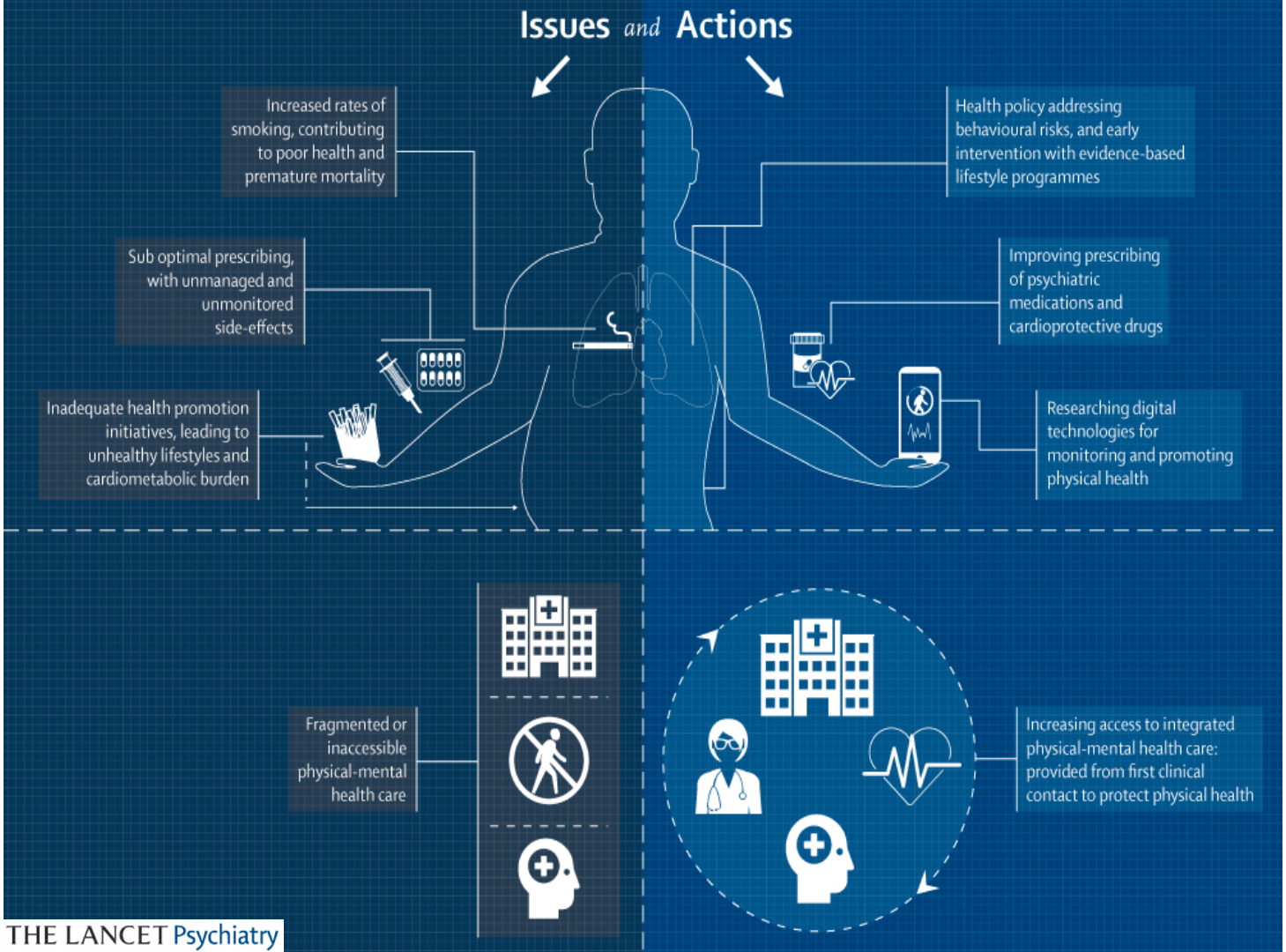
Emotion AI Summit 2019
Boston, MA
October 15, 2019

Ten leading causes of death, 2016 and 2017



Note: Based on data from the National Vital Statistics System.

Source: National Center for Health Statistics



THE LANCET Psychiatry

Additional Systemic Trends Driving Need for Patient-Focused Health Systems

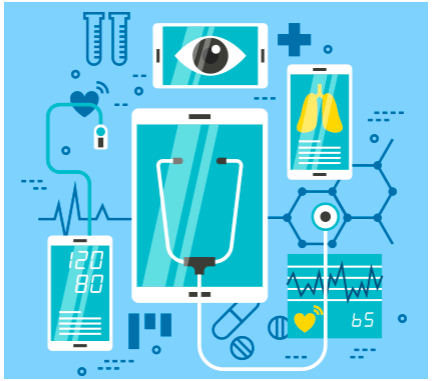
- Escalating health care costs
- Declining number of caregivers
- Increasing need for prevention
- Increasing personal responsibility
- Personalized medicine

Innovative technologies enable

Personal health management
Remote monitoring
Chronic disease management
Medication management
Wellness care
Behavioral change
Urgent care

Customer-focused change drivers

Empowerment
Collaboration
Connectivity
Interoperability
Risk management
Incentives & rewards



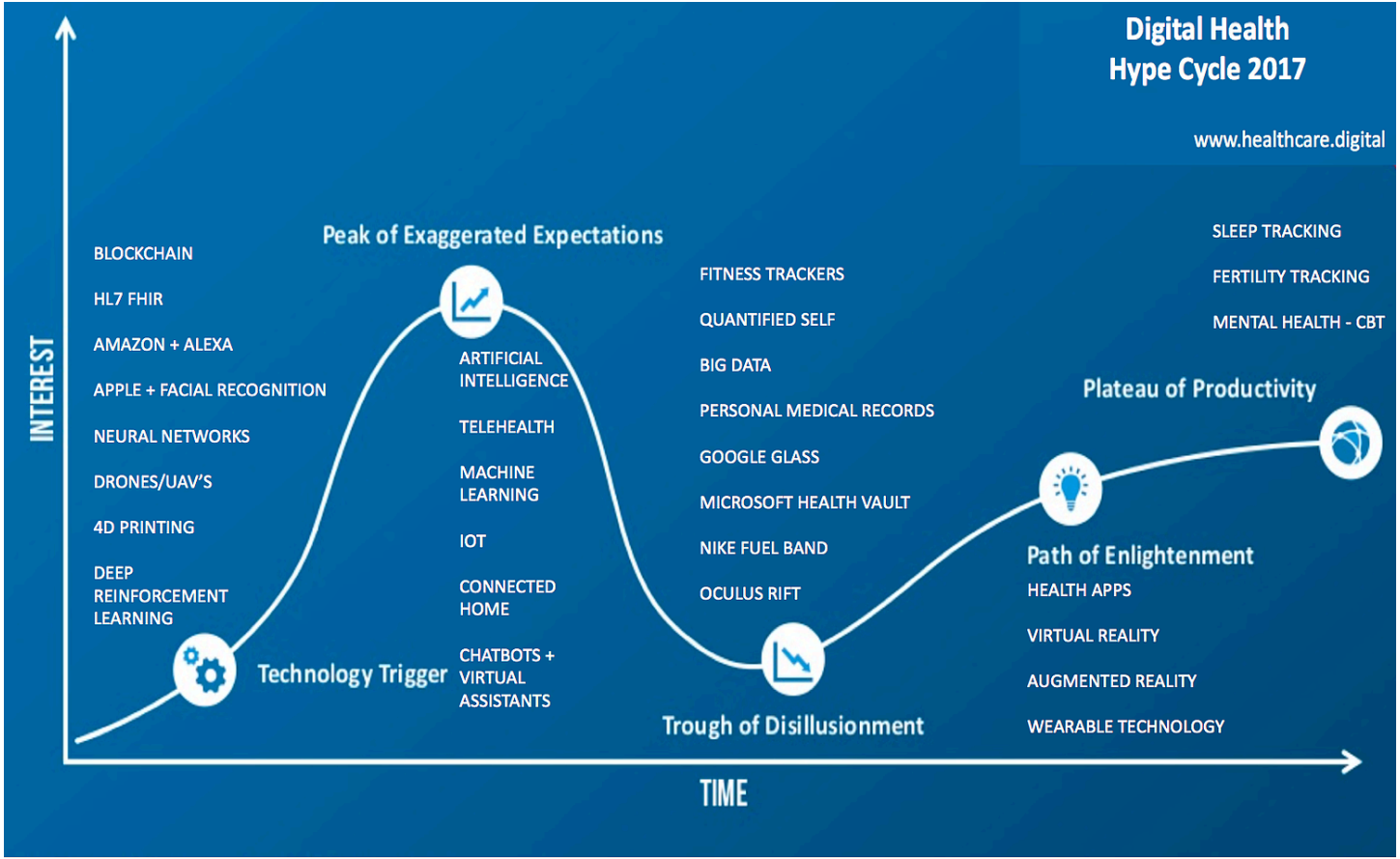
Results

Better outcomes
Broader coverage
Lower cost

Information services enable

Cloud computing
Smart mobility
Social networking
Big data analytics

Adapted from: mHealth Mobile technology poised to enable a new era in health care (Ernst & Young, 2012)

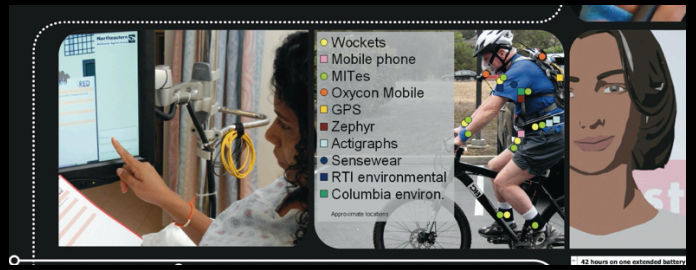

Digital Health
Hype Cycle 2017
www.healthcare.digital
INTEREST
TIME
BLOCKCHAIN
HL7 FHIR
AMAZON + ALEXA
APPLE + FACIAL RECOGNITION
NEURAL NETWORKS
DRONES/UAV'S
4D PRINTING
DEEP REINFORCEMENT LEARNING
Technology Trigger
Peak of Exaggerated Expectations
ARTIFICIAL INTELLIGENCE
TELEHEALTH
MACHINE LEARNING
IOT
CONNECTED HOME
CHATBOTS + VIRTUAL ASSISTANTS
FITNESS TRACKERS
QUANTIFIED SELF
BIG DATA
PERSONAL MEDICAL RECORDS
GOOGLE GLASS
MICROSOFT HEALTH VAULT
NIKE FUEL BAND
OCULUS RIFT
Trough of Disillusionment
SLEEP TRACKING
FERTILITY TRACKING
MENTAL HEALTH - CBT
Plateau of Productivity
Path of Enlightenment
HEALTH APPS
VIRTUAL REALITY
AUGMENTED REALITY
WEARABLE TECHNOLOGY

The “All of Us” Research Program

Eric Dishman, Director

- 2017-2027
- N=>1 Million Participants
- Discover genetic and environmental correlates with disease
- Improve predictions of therapeutic safety and efficacy
- Discover disease biomarkers
- Connect mobile health, digital health, and sensor data with clinical outcomes
- Develop new disease classifications
- Support clinical trials
- Enable machine-learning applications
- Improve understanding of health disparities
- Develop and test new therapeutic agents

Doctoral program in Personal Health Informatics



This program employs a transdisciplinary approach and focuses on innovative technology to improve care from the patient's perspective, which distinguishes it from doctoral degree programs in computer science and medical and health informatics

Graduates are prepared to excel as faculty, industry scientific advisors, and entrepreneurs

Northeastern
College of Computer and Information Science
Bouvé College of Health Sciences

Learn more at:
http://phi.neu.edu

CONSORTIUM ON TECHNOLOGY FOR PROACTIVE CARE


Profs. Holly Jimison & Misha Pavel

Explores the intersection of unobtrusive monitoring and multiscale computational modeling of behaviors and behavioral change

Facilitates research in the area of home monitoring of health behaviors, including helping researchers address the challenges of big data related to large amounts of complex and noisy streaming data from multiple sources used to infer clinically relevant health behaviors

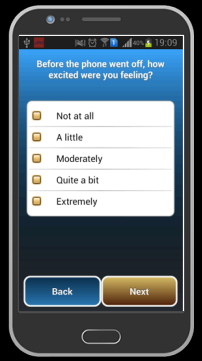
nu Coach


mHealth Research Group

Prof. Stephen Intille

Invents and validates new systems, methodologies, and algorithms that use wearable and ubiquitous sensors, mobile phones, and advanced human-computer interfaces to support health and wellness research and practice

Smartphone



Self-report:
Random EMA
Context-sensitive EMA

Passive sensing

Smartwatch

Self-report:
Random µEMA
Context-sensitive µEMA

Passive sensing

Microtemporal Processes Underlying Health Behavior Adoption and Maintenance

Use real-time mobile technologies to collect intensive longitudinal data examining differences in the micro-temporal processes underlying the adoption and maintenance of:

- physical activity

- low sedentary time

- sufficient sleep duration

Goal is to identify predictors of habits in emerging adults (18-24 yrs)

- N=250

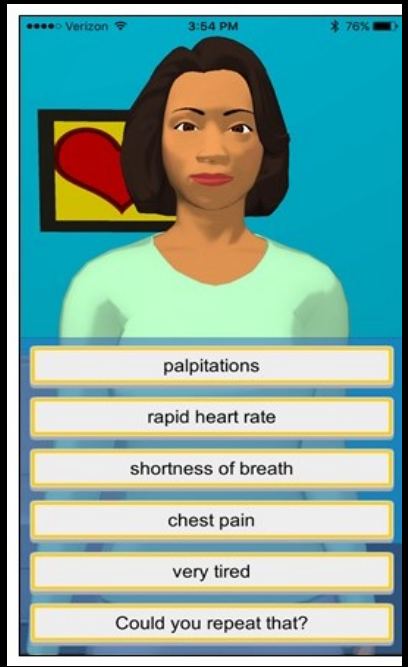
- 1-year prospective longitudinal data collection

ILHBN
INTENSIVE LONGITUDINAL HEALTH BEHAVIOR NETWORK

RELATIONAL AGENTS GROUP

Prof. Timothy Bickmore

Simulating face-to-face counseling, primarily in health education and health behavior change interventions, with a particular focus on the relational aspects of these interactions and how they unfold over time



COMPUTATIONAL BEHAVIORAL SCIENCE LAB

Prof. Matthew Goodwin

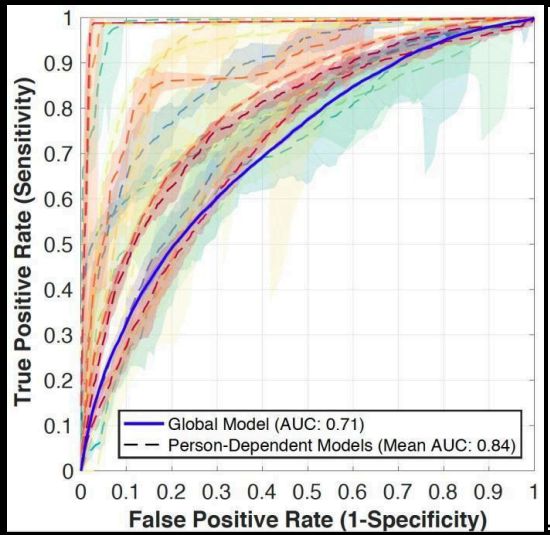
Leverage emerging technologies in computational, cognitive, affective, and behavioral sciences to better evaluate, understand, and support human development

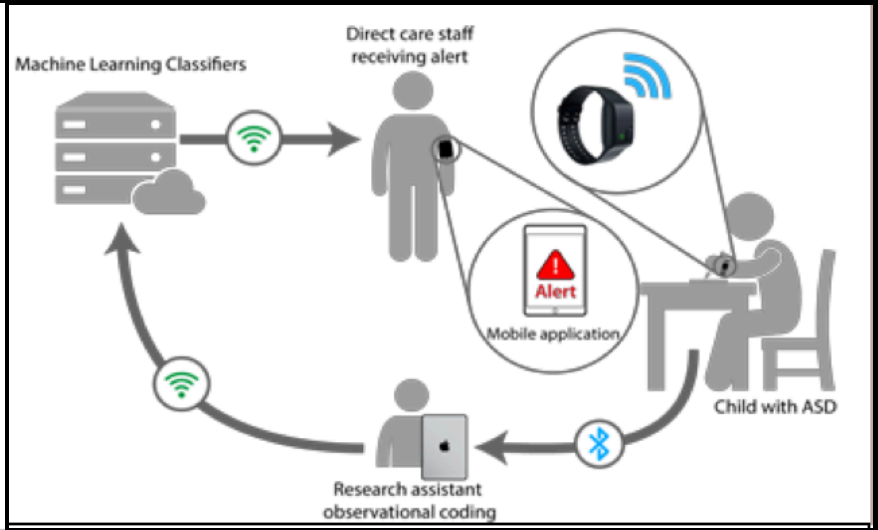
RESEARCH ARTICLE

Autism Research 12: 1286–1296, 2019

Predicting Aggression to Others in Youth With Autism Using a Wearable Biosensor

Matthew S. Goodwin, Carla A. Mazefsky, Stratis Ioannidis, Deniz Erdogmus, and Matthew Siegel





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