Looking Towards the Future
-Imagine the Possibilities-

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Edward W. Marx
The Advisory Board Company
New York City Health + Hospitals

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Conflict of Interest

Edward W. Marx has no real or apparent conflicts of interest to report.
Agenda

• Learning Objectives
• The Intersection of Technology and Nursing
• Ramifications
• At the End of the Day…
• Questions
Learning Objectives

• Discuss emerging technologies relevant to health and care in the future
• Discuss the use of wearable technology and the role of the consumer
• Describe the impact of the integration of smart phones and messaging
• Define the "Internet of Things" and implications for healthcare
Who I am

Serve

Study

Shape

Share
Where I Serve
EMERGING TECHNOLOGIES RELEVANT TO HEALTH AND CARE IN THE FUTURE
“Internet of Things” or IoT refers to the connection of consumer devices and physical products to the Internet via key elements such as Near-Field-Communication payments, embedded sensors and image recognition technology.
Visual Social Media will Rise

When asked what type of posts they enjoy 46% of users said posts with photos, 28% said basic status updates, 19% preferred jokes/cartoons/memes, and 6% prefer links to articles.”
– Social Media Daily, 24th Feb 2013
Social Conversion will Become Integrated and Multi-Channel

Social conversion refers to the number of goals achieved via social media channels such as Facebook, Snapchat, Instagram, LinkedIn, Tumblr, etc.
More User-Friendly Mobile Experiences

“Make it simple, make it helpful, make it help the user, then teach the users, and it might be a success.”
The Rise of Big Data

Big data is a collection of data sets so large and complex that it becomes difficult to process using on-hand database management tools or traditional data processing applications.
More Payments will be Mobile

Near Field Communication, is a short range wireless radio-frequency identification (RFID) technology. RFID makes use of interacting electromagnetic radio fields instead of the typical direct radio transmissions used by technologies such as Bluetooth.
Brand Journalism will be More Common

“...make content that make them want to respond back to you..” – Scott Abel, Econtent Magazine
Virtual Ownership will Dominate

This high usage of smart devices has prompted the creation of digital apps and content for patients and providers.
Outcome Economy & Hardware
Producing Results

New intelligence is bridging the digital enterprise and the physical world. It’s about more than technology; it’s about delivering results.
Intelligent Enterprise & Smarter Systems

A data explosion, accompanied by advances in processing power, health analytics and cognitive technology, is fueling software intelligence. Medical devices and wearables can now recognize, think and respond accordingly.
Workforce Communication & Collaboration

As the digital revolution gains momentum, doctors and healthcare workers are now using machines to be more efficient, provide better care and take on increasingly more complex tasks.
WEARABLE TECHNOLOGY AND THE ROLE OF THE CONSUMER
Definition

Biosensing Wearables

• Activity Trackers
• Smart Patches
• Smart Clothing
• Smart Watches
Biosensing Wearables

- Heart Rate
- Blood Sugar
- Blood Pressure
- Oxygen Saturation
- Heart Activity
- Muscle Activity
- Brain Activity
Exponential Growth!

- 2% of Population Today
- From 5B to 50B in Five Years
Clinical Tool

A Tool that can help

- Cure
- Treat
- Mitigate
- Diagnose
- Prevent

a Disease or Condition
Bridging the Gap
Hurdles to Adoption

Patient

• Motivation
• Affordability
• Convenience
• Rewards

Anticipated Regret
Hurdles to Adoption

Physician

- Accuracy
- Reliability
- Systems
- Time and Effort
- Reimbursement
Hurdles to Adoption

Payor

- Clinical Utility
- Cost of Integration
- Return on Investment
- Non-Existent Guidelines
- Effect on Population Health
Hurdles to Adoption

- Financial
- Physical
- Emotional
Hurdles to Adoption

Example
Wireless Maternal-Fetal Monitoring
Healthcare Environment
Rising Costs

National Healthcare Expenditures ($Trillions)

2007 2008 2009 2010 2011 2012

CMS & California Healthcare Foundation
Healthcare Environment

Example

Google Contact Lens
Regulatory Climate

Accuracy

![Graph showing mean number of steps with regulatory climate accuracy data.](image)

JAMA Accuracy of Smartphone Applications and Wearable Devices for Tracking Physical Activity Data. M.A. Case et al
Regulatory Climate

Safety

- Protecting and promoting health
- Guidance on which applications need approval
Regulatory Climate
Privacy & Security

HHS
## Regulatory Climate

### False Claims

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<td>42.1 (33.4-51.2)</td>
<td>97.0 (82.5-99.8)</td>
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FTC
Regulatory Climate

Certification

The Office of the National Coordinator of Health Information Technology

Health On the Net Foundation
Regulatory Climate

Example

MicroEEG

Path to Success

Engage Stakeholders

Novartis - Alcon
An Ideal Wearable Device...

Path to Success

Accurate
Reliable

Efficient
Effective

Safe
Secure

Costless
Outcome

Easy
Comfort
IMPACT OF THE INTEGRATION OF SMART PHONES AND MESSAGING
Technology 20 Years Ago Now in Phones
Exponential Improvements, Digitization and Recombinant Innovations

Functionality
- Camera/ video camera
- Video conferencing
- Computer
- Game Player
- Virtual assistant
- Book reader
- GPS navigation and maps
- Music player
- Guitar tuner
- Calculator
- Sensors
- And more...
- And, oh yes, a phone

Source: Peter Diamandis, “The Second Machine Age” and Health Care IT Advisor research and analysis
Digital Healthcare Hype Cycle

- **Technology Trigger**
  - Apple and health
  - Personal genomics
  - Blood bioanalytics
  - Brain fitness
  - DIY biohacking
  - Brain controlled bionics
  - Nanorobots
  - Implantable tech
  - Brain chips
  - 3D Bioprinting

- **Peak of Inflated Expectations**
  - Wearable tech
  - Big data
  - Personal health data
  - Medical tricorder
  - Quantified Self
  - Sleep analytics
  - Smartwatch

- **Trough of Disillusionment**
  - Google Glass
  - Health apps
  - Activity trackers

- **Slope of Enlightenment**

- **Plateau of Productivity**

This Digital Health Hype Cycle has in no way been endorsed by Gartner, Inc.
Don’t want to visit the doctor to check out your swollen ankle? You don’t have to. Telemedicine is allowing people to communicate with nurses, doctors and specialists from home or the office and mobile devices are enabling this revolution.

“Telemedicine is ‘the biggest trend in digital health in 2015’”
Skip Fleshman, Partner at Asset Management Ventures
Mobilization of Processes and Documents

Clinicians access information needed to provide information care via Desktop (89%), Laptops (78%), Smartphones (55%) and Tablets (51%)

HIMSS 2014 Mobile Device Study

69% of respondents noted they used apps to access clinical information. However, only 33% reportedly believe they can access most or all of the clinical systems technologies they need via smartphones/tablet computers. Hospitals, care homes and health institutions are leveraging mobile to change and improve the way they work ranging from schedule management, time reporting and communication between care takers to submission of forms, safety, ordering of medicine, accessing patient records and logging of patient data. This is by no means a fast process due to HIPPA compliance and other regulatory requirements but it’s happening.
DIY and Prescription-Only Apps

“86% of clinicians believe that apps will become important for health management over the next 5 years”

PWC Top Health Industry Trends 2015

20% of respondents said FDA approval was very important in their decisions to use a mobile app. WellDoc’s BlueStar is a “Mobile Prescription Therapy” that allows people to input data about their glucose levels, diet, exercise and more. Another app that has recently been approved by the FDA allows radiologists to view images on their smartphone. It is important to determine whether your product is a medical device or app. If your product is a medical device you need to go through the 510 clearances. HealthTap ranked the top apps in 2014 which were mostly food and exercise related.
Apple HealthKit and Google Fit in Hospitals

“So far HealthKit is in the pilot / prototype stage but every pharmaceutical and major health institution that we’ve spoken to want to test HealthKit and equivalent services from other mobile platform providers. Hospitals and medical centres hope that these services will help with monitoring patients with long-term health issues such as diabetes or hypertension. The objective is to provide timely information to allow for intervention before the patient needs to be readmitted to hospital.”

14 of the top 23 hospitals are either already testing HealthKit or are in talks to do so”

Reuters Research, February 2015
Consumer Engagement and Communication

“We’re long past trying to influence consumer behavior - we need to leverage it”

Janet Schijns, VP Global Verticals & Channel Marketing at Verizon Enterprise Solutions

According to the mHealth Summit, ‘Consumer Engagement’ is the new buzzword. Extending the relationship between the provider and the consumer who at times is a patient. We can envision a dialogue to be opened up across digital channels that will enhance this trusted relationship.
"INTERNET OF THINGS" AND IMPLICATIONS FOR HEALTHCARE
Almost ‘anything’
— including ‘living things’—
connected to the internet regardless of location or other physical restrictions.
Today, there are already more things connected to the internet than people.

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<td>26 billion</td>
<td>Gartner</td>
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<tr>
<td>50 billion</td>
<td>Cisco</td>
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<td>75 billion</td>
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<td>200 billion</td>
<td>Intel</td>
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*Number of devices predicted to be connected to the Internet by 2020*

The human brain has 86 billion neurons

*Flaming Lotus Girls Neuron by Ann Larie Valentine on Flickr https://flic.kr/p/75SmyS*
30.3%  
Percentage of IoT devices found in healthcare

69.7%  
Percentage of IoT devices found elsewhere*

* Business/Manufacturing, Retail, Security, Transportation

$2.5 trillion  
The predicted global worth of IoT in healthcare in 2025

Deployment of the Industrial Internet can help to drive down costs from clinical and operations inefficiencies by roughly 25% or about $100 billion per year

Sources: Intel, A guide to the Internet of Things & General Electric Company (2012) Industrial Internet: Pushing the boundaries of minds and machines
IoT Promise & Benefits

Here are 6 extraordinary use cases of the IoT in healthcare today:
Wirelessly Monitor Sleep

People want more comfortable, less invasive procedures. Patients can now have their sleep patterns analyzed with sensors placed in the mattress. The data is then transmitted from the mattress to an online app.
Monitor Patients in their Home

If something seems wrong, caregivers or doctors will be notified immediately.
Remote Consult

You can video chat your doctor…through a robot.

We’ve all heard of Skyping a doctor (even if we haven’t actually done it ourselves).
Emergency Room of Future, Today

Doctors have the ability to track every key action, condition and outcome, including patient survey responses. Armed with this information, hospitals can identify bottlenecks and ways to move people and equipment more efficiently.
Heart-Monitoring Systems

Expectant mothers can have a new source of comfort! To combat high-risk pregnancies, there are now portable, remote fetal and maternal heart rate monitoring systems that provide doctors with a cloud-based portal to enable around-the-clock care.
Health & Fitness

With the boom of Fitbit and other connected fitness devices, you can make sure that you burn off enough calories for the day. You can even create your own leaderboard and compete with friends to see how many steps they’re taking.
PRACTICE IMPLICATIONS
Available Today & Mainstream Tomorrow

- Genetics & Genomics
- 3-D Printing
- Robotics
- Biometrics
- Point of Care
- Personal Digital Assistants
- Communications
- Smart Lift Systems
- Smart Beds
- Smart Rooms
- Bar Codes
- Patient Engagement
- Patient & Staff Identification
Questions

• Blog http://histalk2.com/category/ed-marx/
• Twitter http://twitter.com/marxists
• LinkedIn www.linkedin.com/in/edwardmarx
• FaceBook www.facebook.com/edwardmarx
• Email marxtango@gmail.com