"THE DOCTOR WILL SEE CONNECT TO YOU NOW"

OCTOBER 18, 2013
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Introduction
Throughout history, healthcare has been a very personal interaction between patient and physician.
Our historic legacy is one of direct interaction, a very human connection in the face of limited technology and medical advancements.
Our digital age is changing that physician and patient relationship in a variety of ways:

- Access
- Availability
- Communication
- Distance
- Time / Timeliness
- Relationship
- Reimbursement
- Responsibility

“The digital age has had a deep and likely permanent effect on the patient-physician relationship. I can’t tell you how many times I’ve had physicians beg me to provide them with a way to stop their patients from Googling their symptoms and diagnosing themselves before their first office visit and much to their chagrin, my answer is always the same, “You can’t stop them. Get over it.”” (1)
Introduction

“THE DOCTOR WILL SEE CONNECT TO YOU NOW”

The goals of this presentation will focus on:

✓ Advances in connecting patient and physician / clinician,
✓ Benefits realized by increasing deployment of digital technology, and
✓ Challenges remaining for participants – physicians / clinicians and their patients - in the digital, health environment.
“The Doctor Will See Connect to You Now”

We need to engage in a thoughtful discussion about how the new disruptive digital technologies can help both patients and physicians get what they need. After all, both have the same ultimate goals: good clinical outcomes and a meaningful relationship.” (2)
Digital Possibilities In Health
There are endless digital technologies that can help patient and physician to manage and monitor health. Some of these technologies have been available for decades, but have yet to become ubiquitous for a variety of reasons. Other more recent and emerging technologies continue to evolve to become readily available.

Regardless, these digital technologies and connections are changing the face of health.
Quiz:

What do these two men have in common? How is this related to current digital technologies?

Alfred J. Gross (3)
Inventor
February 22, 1918 – December 21, 2000

Chester Gould (4)
Cartoonist
November 20, 1900 - May 11, 1985
Digital Possibilities in Health

Quiz:

What do these two men have in common? How is this related to current digital technologies?

Alfred J. Gross, an inventor, is a pioneer in mobile, wireless communications. In 1938, he invented the “walkie-talkie” while still in high school, and later developed the first pager system at New York’s Jewish Hospital in 1950. (3)

Chester Gould, a cartoonist, first published his Dick Tracy comic strip in the Detroit Mirror on October 4, 1931. In the 1940’s Mr. Gould wanted to meet Mr. Gross. During that meeting, Mr. Gould asked if he could use the concept of a miniaturized two-way radio, consistent with Mr. Gross’s inventions. (3)
Quiz:

On January 13, 1946, Chester Gould debuted the 2-way, wrist radio. In 1964, Dick Tracy would sport a 2-way, wrist TV to communicate.

The Smartwatch debuts in 2013 with several companies focusing on the “wearable device” market.
A number of technologies and applications had to evolve, mature and converge to provide new possibilities in medicine and health.

*Hardware, the web, operating systems and applications:* (6)

The smartphone may be the tipping point for both clinicians and consumers.
The common thread exemplified in the quiz is that many technologies have been evolving for decades. A number of other events were required to deliver the type of solutions that might prove to be advances. (7)
The Millenium has ushered in vast numbers of technologies not only developed within the U.S. but from collaborations globally. (8)
What is the pattern that is revealed by the convergence of these elements over time? (9)

The Millenium has ushered in vast numbers of technologies not only developed within the U.S. but through collaborations globally.
Texting for Clinicians and Patients

- Dr. Fred Church, developer of a new app, *eConsult My Doctor*
- Communication management tool that allows for HIPAA compliant texting or e-mail options
- Deploys best practice standards for data at rest and in transit using **AES 256-bit encryption**; secure login; data is encrypted
- Includes an EMR and PHR
- Export content via PDF or attach the PDF of the e-consultation interaction to their respective EHR
- Market delivery date: Nov. 30, 2013.
- Cost: app will be *free* and the basic subscription level will also be *free*

**More information:**
http://e-ConsultMyDoctor.com
First neonatal telemedicine program launched in Texas
September 19, 2013 (11)
Children’s Medical Center Dallas will provide physicians at other hospital neonatal intensive care units (NICUs) with 24-hour access to board-certified UT Southwestern neonatologists

Miami Children's Hospital Prepares For Telemedicine Growth
September 9, 2013 (12)
Launched in 2012; three telemedicine models -- mobile, semistatic and extremely static – available; services national and international; iPad use for telehealth

Mayo, Arizona College To Study Telehealth Concussion Assessments
September 4, 2013 (13)
Assess athletes' concussion symptoms in real time; Northern Arizona University (Flagstaff, AZ)
OUR FUTURESCAPE...
As we anticipate the future and how clinicians and patients / consumers will interact, this section of the presentation will focus on:

- Challenges to advancing digital interaction between clinician and patient / consumer
- Emergent technologies that hold promise for expanding the digital connection between clinician and patient / consumer
Our FutureScape…

What might the future hold as digital technologies as well as the amount of patient data expand?

While the future looks amazing in terms of digital advancement – all devices and technologies - , some challenges remain:

- **Policies** *(Federal and State)*
- **Regulatory Initiatives**
- **Data Security and Privacy** *(potential hacking)*
- **Authorization of Data Access** *(need to know or required access)*
- **Legal Implications**
- **Clinician Workflow and Processes**

- **Health Information Technology – Access and Storage** *(collating all information into one system or storing it for ready access by clinicians)*
- **Relevance and Relationship of Data for Real-Time, Medical Decision-Making**
- **Standards / Interoperability**
Today and for the foreseeable future, the items in **Columns A and B are not always synchronized for maximum impact**. In addition, clinical practice continues to evolve based on evidence and the required information requirements will also change.

<table>
<thead>
<tr>
<th><strong>COLUMN A</strong></th>
<th><strong>COLUMN B</strong></th>
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<tbody>
<tr>
<td>Policies <em>(Federal and State)</em></td>
<td>Health Information Technology – Access and Storage</td>
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<td>Regulatory Initiatives</td>
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<tr>
<td>Clinician Workflow and Processes</td>
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What are the challenges that remain specifically for physician practices, clinics and health systems at this point in time?

Provider -Specific Considerations

- Synchronization of Clinical Workflows with new or emerging technologies to remain productive given pressures to care for a growing number of patients
- Access, investment and integration into Clinical operations
- Availability of Commercialized, innovative technologies and corresponding software
- Levels of on-going, Provider investment as technologies are made available market and sustain/evolve

- Standards and Interoperability of medical devices / sensors
- Commercialization of innovative technologies and corresponding software
- Levels of on-going investment as technologies are delivered to the market and sustain/evolve
- Technical support and maintenance for Clinical users
- Privacy and Security remains a concern for Patient information
Addressing the Challenges

✓ Anticipate
✓ Identify Sources of Patient Data (i.e. internal and external to organization)
✓ Plan
✓ Act
✓ Then, Plan Again

Potential Sources of Patient Data for Clinicians

- Medical Sensors (internal and/or external)
- Medical Devices (internal and/or external)
- Ambulatory Practices (Primary Care and Specialists)
- Health Systems or Hospitals (i.e. one or several locations)
- Long-Term Care Sites, Rehabilitation Facilities, etc.
- Independent / Assisted Living facilities
- Health Information Exchanges (HIEs)
- Patient-Centered Medical Home
- Accountable Care Organization
- Personal Health Record (PHR) (consumer controlled or shared with providers)
- Third-Party Monitoring Centers (e.g. post-discharge, Chronic Disease Management, etc.)
- Consumer-based Apps (i.e. smartphone, PC or tablet-based)
Our FutureScape…

Why the Challenges Are Complex…

Cancer, Patient Groups Spend Millions To Build Genetic Databases (14)
September 17, 2013

- collect DNA and other information from patients with diseases that are difficult to treat
- data can be analyzed to detect genetic mutations / make available to experts and pharmaceutical companies.
- databases could help connect patients with clinical trials

Other databases being created:
- Leukemia & Lymphoma Society, which plans to launch an $8.2 million project to capture and analyze DNA data gathered from 900 patients with acute myeloid leukemia;
- Multiple Myeloma Research Foundation, which next week will reveal data from an ongoing $40 million project to map the genetic and clinical characteristics of the blood cancer; and
- Michael J. Fox Foundation, which plans to launch a Parkinson's disease study that would complement an ongoing $50 million study to identify biological markers of the disease (Winslow, Wall Street Journal, 9/16).

There are a significant number of concurrent initiatives and investments to identify more relevant patient information. The challenge now:
(1) Where does the data reside?
(2) Can the data be accessed by both clinician and patient?
(3) Does the health data become part of the Electronic Health Record?

Skin-like soft sensors designed for 'smart' surgical gloves (15)
August 10, 2013

- researchers have created skin-like soft sensors for fingertips that they hope to develop into "smart" gloves for surgeons
- could be an asset in procedures such as local ablations and ultrasound scans
Challenges: Medical Devices and Cybersecurity

Privacy and security of patient information, whether from medical devices or other digital solutions between clinician and patient/consumer, require continuous vigilance and safeguards.

FDA, facing cybersecurity threats, tightens medical-device standards (16)
June 13, 2013

“Over the last year, we’ve seen an uptick that has increased our concern,” said William Maisel, deputy director of science and chief scientist at the FDA’s Center for Devices and Radiological Health. “The type and breadth of incidents has increased.” He said officials used to hear about problems only once or twice a year, but “now we’re hearing about them weekly or monthly.” ……

Part Seven:
“Medical device manufacturers have some of the smartest engineers on the planet,” Fu said. “But cybersecurity is uncharted territory for this industry.”

FDA wants tighter cybersecurity for medical devices (17)
June 13, 2013

“The FDA's action comes after years of warnings, investigations and outrage over medical device security.

The issue first came to wide attention in 2011 when engineer Jay Radcliffe figured out how to hack his Medtronic ($MDT) insulin pump with easily obtained electronics, revealing that it could be wirelessly forced to deliver a fatal dose.”
Emergent Technologies: At the Intersection of Fantasy and Fact

- September, 2013
  Samsung releases the Galaxy Gear Smartwatch

- 2013 and Beyond
  Microbots / Nanotechnology continue to evolve

- 2013 and Beyond
  Interactive e-Skin for Monitoring (18) / Implantable Biosensors (19)
The pairing of hardware and software, existing or emergent, are creating new solutions for clinicians. (20)

- PanOptic Ophthalmoscope (Welch Allyn) plus an iPhone app = iExaminer (available at the Apple App Store)
- Purpose: capture, store, send and retrieve images from the imaging device using an iPhone 4 or 4S
- Advantage of eExaminer: view fundus and retinal nerve in an undilated pupil five times larger than that of a traditional ophthalmoscope and increases magnification by 26%
- The iExaminer is currently pending 510(k) clearance from the FDA.
Our FutureScape…

Emergent Technologies: “Medical Telesensor”

Part of the future for connecting clinicians and patients with an active flow of information requires miniaturization, the evolution of materials, corresponding technology and application are required to develop new or emerging solutions.

Example: (21)
Oak Ridge National Laboratory is working on how to “develop an array of chips to collectively monitor bodily functions”
- send physiological data by wireless transmission to an intelligent monitor
- While supported by the Defense Sciences Office of the Advanced Research Projects Agency, there will be civilian applications for any of these projects
How does this work?
Microchip generates electricity when it makes contact with the stomach's digestive fluids and sends a signal to a patch on patient's skin. Disposable patch then can transmit information to a health care provider's mobile phone application, including data on:

- Time the pill is taken
- Heart rate
- Body position and
- Temperature

Emergent Technologies: Digital Pill Technology (22)

- Proteus Digital Health: ingestible pills with an embedded microchip to transmit patient data to health care providers
- FDA: amending the Federal Food, Drug and Cosmetic Act to categorize digital pill technology as a class 2 medical device
- FDA approval: July 2012
Our FutureScape…

Emergent Technologies: Wireless Patient Monitoring

**Pilot Study** (23)
**What?** SensiumVitals®
**Who?** St. John’s Health Center (Santa Monica, CA)
**When concluded?** March 2013
**Outcome? (2)** (a) Shows significant clinical / economic benefits (b) Increases Patient Surveillance compared to current practices (c) Detects deterioration in patient condition

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**Facts:** (24)
- Unique, patented, ultra-low powered wireless healthcare technology to monitor patient vital signs every two minutes: heart-rate, respiration rate and temperature, / Single patient use / Five-day battery life
- Developed by Professor Toumazou, Regius Professor of Engineering / founding director of the Institute of Biomedical Engineering (Imperial College, London, England)
- First ultra-low power, wearable, wireless patient monitoring product to receive FDA (510k) clearance
- Wireless communication of vital signs via a bridge to nurse station or any web-enabled device
Vendor, Preventice, Inc., has licensed the algorithms and clinical practices from the Mayo Clinic in November 2010, and the Mayo Clinic holds an equity position in this vendor. (26)

Emergent Technologies: Wireless Remote Monitoring (25)

What?  BodyGuardian ™ Remote Monitoring System

For Whom?  Remote monitoring for individuals with non-lethal cardiac arrhythmias in the ambulatory setting

Facts:
- FDA-cleared system
- Cloud-based platform that remote monitoring for individuals with non-lethal cardiac arrhythmias
- Continuously records, stores and periodically transmits the following physiological data to a remote server for up to 30 days
- Transmit data via wireless and smartphone technology / Physicians and clinicians can view data and reports with an iPad or the web or receive alerts based on biometric changes
  - ECG
  - Heart rate (including HR variability and HR reliability)
  - Respiration rate
  - Activity
Our FutureScape…

Emergent Technologies: Investment

Part 1: External Investment

According to California accelerator, Rock Health: (27)

1. “Venture capital funding of digital health grew by nearly half in 2012 to more than $1.4 billion,
2. By comparison, venture-capital investment in biotechnology and medical devices declined. An estimated 134 digital health companies each raised more than $2 million in 2012.
3. Electronic health records startup investment was dwarfed by health consumer engagement products and tools and tracking for personal health.”

The most active hubs for digital health investment have been the San Francisco Bay Area and Boston. Dallas and Chicago represent the next tier, followed by Seattle, Nashville and South Florida. (27)
Emergent Technologies: Investment

Part 2: Internal Investment

For-profit and not-for-profit Health Systems are investing in innovation and emerging technologies at a growing rate. Examples include: (28)

- **Ascension Health** (St. Louis, MO) set aside a **$225 million venture capital fund** earmarked for projects involving health IT, devices and diagnostic screenings.

- **Hospital Corporation of America** (Nashville, TN) aims to grant **$10 million annually to startups** in the healthcare field through its subsidiary Health Insight Capital.

- Investment firm, **Heritage Group** (Nashville, TN), **has raised** **$157 million** from investments from surrounding hospital systems including **Community Health Systems, LifePoint Hospitals and Vanguard Health Systems**

The map on the following slide identifies a select number of U.S. health systems that are funding their own centers of innovation that are contributing to the accelerating number of technologies in support of digital patient care as well as other advancements to enhance care delivery.
There are numerous innovation centers nationally that continue to explore how best to improve health through existing and emergent technologies.

**Centers of Innovation (Select Examples Only)**

- Transformation Lab – Intermountain Healthcare (Murray, UT)
- The Innovation Institute - St. Joseph Health (Orange, CA)
- Glassomics (San Diego, CA)
- Scripps Translational Science Institute – Scripps Health (La Jolla, CA)
- Sprint Accelerator (Kansas City, KS)
- Mayo Clinic Center for Innovation (Rochester, MN)
- UPMC Technology Development Ctr. (Pittsburgh, PA)
- Partners Healthcare Center for Connected Care (Boston, MA)
- Health Wildcatters (Dallas, TX)
- CCF Innovations (Cleveland, OH)
- xG Health Solutions Geisinger Health System & Oak Investment Partners (Danville, PA)

More Centers of Innovation:
- Foundation for Healthcare Innovation (affiliate of the Health Data Consortium)
- Garfield Health Care Innovation Center (Kaiser Permanente)
- The Innovation Center (Centers for Medicare and Medicaid)
- Universities (various across the U.S. and globally)
Study by Kalorama: (30)
"Remote and Wireless Patient Monitoring Markets"

Drivers of this technology: (30)
- costs in healthcare,
- avoid overcrowding, and
- support elderly patients.

Barriers to the adoption of the technology: (30)
- privacy concerns with wireless systems,
- compatibility between systems, and
- financial pressures that come with limited budgets.
Study by InMedica, part of research firm HIS, in 2012: Global Use of Wireless Remote Monitoring Devices

75%-80% of health expense funds persons with chronic conditions

Various paths will lead to even further digital connections between clinicians and patients / consumers!

"By linking the Center's [Center for Connected Health, a division of Partners HealthCare] remote monitoring database to the Partners’ medical record system, we are taking an important step towards continuous chronic disease management. This is a significant part of how we are working to change care delivery, putting the patient at the center of their care while maintaining a close watch on their condition when they are not in the hospital or doctor’s office. With a vision to the future, Partners has been committed to connected health for over a decade. As a result, we have created one of the most robust remote monitoring platforms of any large health care system, and are well-positioned to incorporate patient-initiated data into health care decision-making."

James Noga
Vice President and Chief Information Officer
Partners HealthCare
Our FutureScape…

And More Innovation to Come…

**GARFIELD INNOVATION CENTER**

**Measuring Success:**
- efficient resolution of workflow
- equipment or technology integration challenges
- increased staff, physician, and member satisfaction
- reduction in patient and workplace injuries
- increased quality measures
- cost reduction for new facilities or cost avoidance
- ability to replicate successes across the program

(33)

**Founded:** 2006
**Goal:** Be a resource for Kaiser Permanente regions to explore new, innovative ways of delivering health care
**Team:** Multi-disciplinary approach with engineers, architects, technologists, physicians, nurses, and members
**Setting:** 37,000 square feet of space / safe, risk-free environment (33)
And More Innovation to Come…

Goal:
Provide an environment to find solutions related to health data / National competition held annually to identify new apps and products in support of health data

Who Participates:
Companies, start-ups, academic institutions, government agencies and individuals (34)

"Health Datapalooza is an incredible gathering of tech innovators, clinicians, patient advocates, entrepreneurs, health care leaders, policymakers, and researchers. It's helping to fuel the creation of a rising tide of new tools and services that are making a real difference in people's lives.“ (35)

Todd Park
U.S. Chief Technology Officer
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Page 4: Graphics from www.bing.com
Page 5: Graphics from www.bing.com
Page 8: (2) Rowe, Jeff. “In the age of health IT, doctors and patients need to learn how to communicate”, Healthcare IT News, November 1, 2011. http://www.healthcareitnews.com/blog/age-health-it-doctors-and-patients-need-learn-how-communicate

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Page 10: Cartoon found on www.bing.com
Page 14: (6) Graphic developed by The Kiran Consortium Group LLC, 2013.
Page 15: (7) Graphic developed by The Kiran Consortium Group LLC, 2013.
Page 16: (8) Graphic developed by The Kiran Consortium Group LLC, 2013.
Page 17: (9) Graphic developed by The Kiran Consortium Group LLC, 2013.
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Digital Possibilities in Health (continued)


Our FutureScape


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Our FutureScape (continued)


Page 34: (25) Product information found on vendor web site: http://www.preventice.com/products/bodyguardian


Page 38: (29) Graphic developed by The Kiran Consortium Group LLC, 2013. Information derived from a number of industry articles:
Our FutureScape (continued)

Page 36: Additional articles that pertain to the map:

Other information regarding Centers of Innovation:
- Foundation for Healthcare Innovation (affiliate of the Health Data Consortium) http://www.healthcareinnovation.us/hdc/
- Garfield Health Care Innovation Center (Kaiser Permanente) http://xnet.kp.org/innovationcenter/about/
- The Innovation Center (Centers for Medicare and Medicaid Services) http://innovation.cms.gov/initiatives/#views=models
- Universities – Across the U.S. and globally are investing in innovation specific to healthcare (e.g. University of Michigan, etc.)


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