A Sea of Changing Waters – HealthCare Technology – The Perfect Storm

Speaker: David Smith SocialCare

The pace of change has never been greater and no industry is as ripe as Healthcare to take advantage of it. Many of the major systems in use today in healthcare can trace their roots back to the mainframe and client server technologies. In addition, most of the systems are closed systems and will not work with others. Technology, Regulatory, Demographics, Social Media, and Industry change are creating a perfect storm where change and transformation will create a new future and will transform the HealthCare Industry.

The Perfect Storm of events has happened to cause the healthcare industry to be ripe for innovation and disruption. This Perfect Storm is a combination of Government legislation mandating that all healthcare providers "digitize" and convert all paper health records to Electronic Health Records (EHR), forcing them to use a product from the current Health IT marketplace which is extremely outdated, cumbersome, and expensive. Also, with the passage of the Affordable Care Act (Obamacare), over 30 million uninsured Americans will qualify for health insurance coverage. That's an influx of over 30 million new patients entering an already broken healthcare system that we have in this country.

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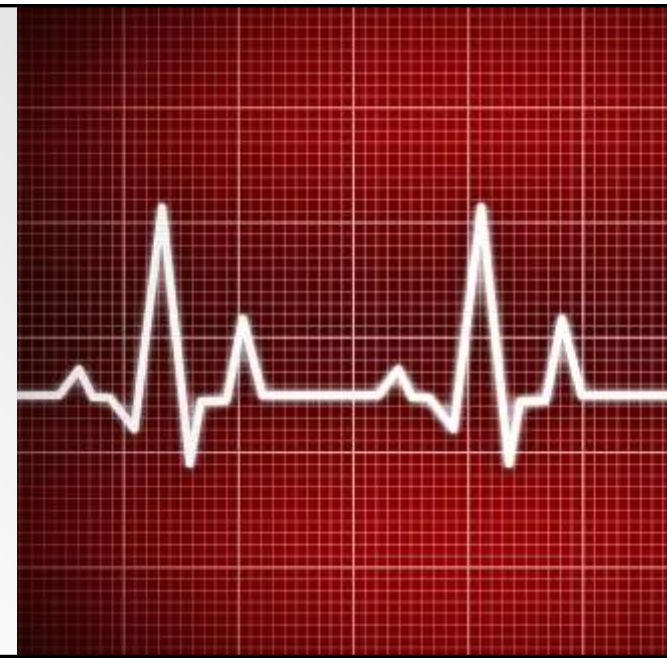
David Smith
SocialCare



Innovation is at a crossroad in the United States. The Perfect Storm of events has happened to cause the healthcare industry to be ripe for innovation and disruption. This Perfect Storm is a combination of Government legislation mandating that all healthcare providers "digitize" and convert all paper health records to Electronic Health Records (EHR), forcing them to use a product from the current Health IT marketplace which is extremely outdated, cumbersome, and expensive. Also, with the passage of the Affordable Care Act (Obamacare), over 30 million uninsured Americans will qualify for health insurance coverage. That's an influx of over 30 million new patients entering an already broken healthcare system that we have in this country.

The Perfect Storm

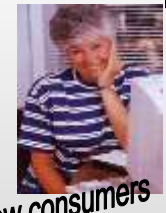
Internet

Disgruntled physicians

New HCFA quality standards
New purchaser demands

Regulatory

New technologies



New consumers

New tasks, new workers

"Healthcare is up next for transformation. Healthcare is the largest segment of our economy. Few people are satisfied with the current American healthcare system. It gets more expensive while innovations that actually improve the patient experience are rare. While there may be innovative new treatments and surgeries, basic functions for healthcare practices like storing and sharing electronic health records between physicians are still a pain." – TechCrunch

"The past decade belonged to the rise of social networking. Now, with the passage of the Affordable Care Act, this is the decade for healthcare entrepreneurs." – VentureBeat

Current State of Healthcare System

- Healthcare "System" is antiquated and not equipped to transform
- Government isn't coming up with solutions
- Universities are focused on intellectual property vs collaboration
- Bringing solutions to market requires large players
- BUT Innovative solutions require nimble organizations
- AND Large players are not nimble
- GROWING Need for Rapid Innovation and Time to Market
- DISRUPTIVE Information Age an Opportunity to Reinvent the system

Drivers of Change in Health Care

- Increasing public accountability
- Privacy and Security
- Rise of sophisticated consumers
- 24/7 society
- Science and technology –particularly molecular biology and IT
- Ethical issues to the fore

Drivers of Change in Health Care

- Changing boundaries between health and health care
- Environment
- Regulatory
- Population
- Prosperity
- Longevity

The Problem

- Between the health care we have today and the care we could have in the future lies not just a gap, but a large chasm
- A system full of underuse, inappropriate use, and overuse of care services and systems
- Unable to deliver today's science and technology; will be even worse with innovations in the pipeline
- But even today's innovations will not work in a broken system

The Problem

- A fragmented system characterized by unnecessary duplication, long waits, and delays
- Poor information systems; disorganized knowledge
- "Brownian motion" rather than organizational redesign
- A system designed for episodic care when most disease is chronic
- Health care providers operate in silos

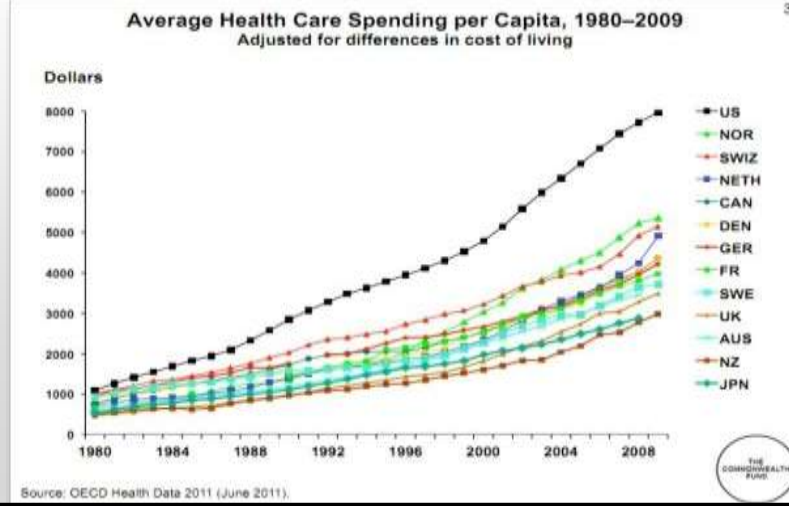
A snapshot of some of the problems…

- Quality of care
  - U.S. residents receive about 50% of care that is recommended[1]. Is this good? Acceptable?
- Individual expenditures
  - By 2025, average family premium will EQUAL median income[2]
  - This means 50% of Americans will spend EVERY dollar they make on a health insurance policy.
- National expenditures
  - 16% of GNP is health care[2]
  - 25% of economic growth between 2000-2005[2]

[1]McGlynn EA, Asch SM, Adams J et al. The Quality of Health Care Delivered to Adults in the United States. NEngl J Med. 2003;348:2635-2645.

[2]Sager A, Socolar D. Data brief No. 8: Health costs absorb one-quarter of economic growth, 2000-2005. Boston, MA: Boston University School of Public Health, 2005

Average Health Care Spending



UNITED STATES HEALTH SYSTEM COVERAGE

- Richest country in the world
- Many Americans do not get the care they need
  - Ranked last of 23 developed nations in providing universal care (Commonwealth Fund)
  - 45 million (15% of population) have no health insurance
  - Millions are "underinsured"
- Not curing people with curable diseases?
- Risk of financial ruin due to medical bills
  - Medical bankruptcy is a unique American problem
  - 60% of bankruptcies are a result of medical bills
  - Approximately 700,000 Americans/year

Overall Scope

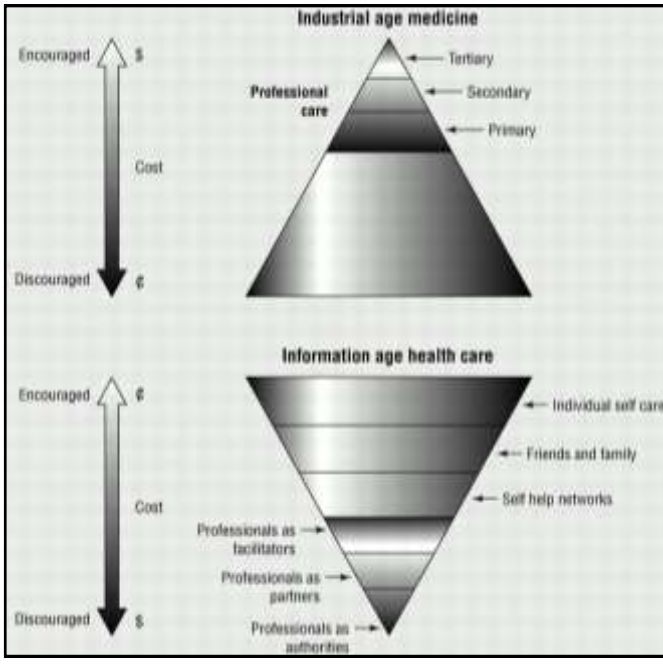
- Patients receive the proper diagnosis and treatment only about 55% of the time*
- Overall, disparities in health care quality and access are not getting smaller **
- **Total health care expenditures in 2006 totaled $2.1 trillion (16% of GDP) and are projected to reach $4.1 trillion (19.6% of GDP) by 2016*****

* McGlynn E, Asch S, et al. The Quality of Health Care Delivered to Adults in the United States N Engl J Med 2003;348:2635-45.
** AHRQ 2007 National Healthcare Disparities Report
*** National Health Expenditure Accounts

SAVING OUR FUTURE REQUIRES TOUGH CHOICES TODAY…

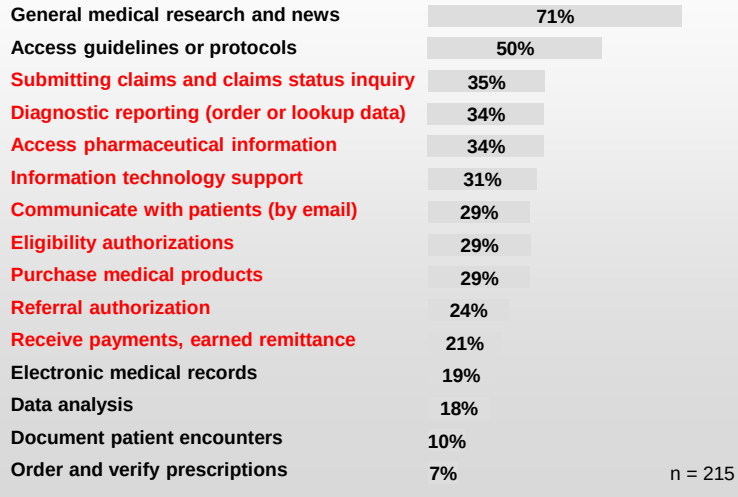
The Honorable David M. Walker, Comptroller General of the USA

- "Our single largest domestic policy challenge is healthcare"
- The truth is, our nation's healthcare system is in critical condition. It's plagued by growing gaps in coverage, soaring costs, and below average outcomes for an industrialized nation on basic measures like error rates, infant mortality and life expectancy.

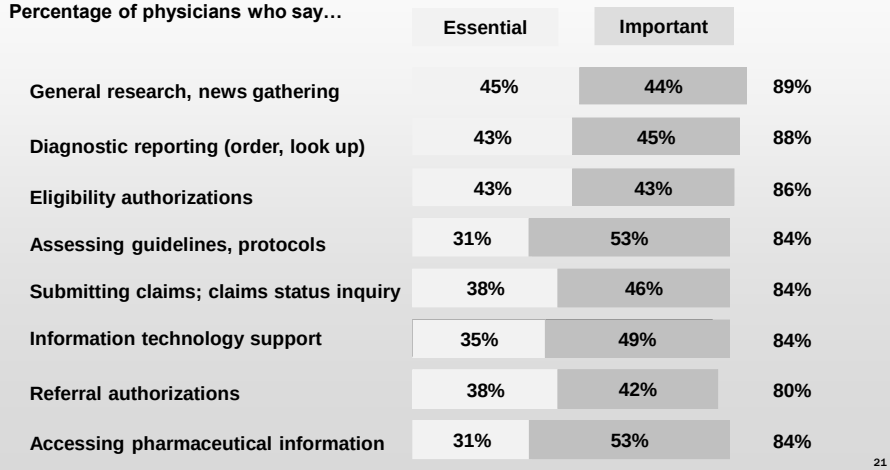


A Transformation is Occurring in Healthcare

30% use at least one Internet-enabled application for core business and clinical functions



Over 80% agreed Internet applications were essential or important



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Physicians identified six barriers to broad-scale adoption of internet services

Percentage of physicians who say…	Major Barrier	Minor Barrier
Lack of compatibility between systems	58%	35%
Lack of resources to convert paper records	51%	39%
Inability to find real world systems	50%	36%
Lack of capital for investment	49%	40%
Physician reluctance to change	45%	45%
Concerns about confidentiality on the Internet	44%	44%

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Challenges ahead: Clinical devices, biotechnology and pharmaceuticals *converge with IT*

Organ Assistance and Substitution

- In the next two to five years, the novel organ assistance and substitution devices most likely to be developed and reach the market include
  - bioartificial liver assist devices that utilize live hepatocytes
  - an artificial lung known as an intravenous membrane oxygenator (IMO) that will perform short-term rescue in patients with acute respiratory distress (Hattler Respiratory Catheter)
  - an artificial retina that will restore limited sight in blind patients with retinal diseases
  - implantable, closed-loop artificial pancreas systems

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Table II-1:
Targeted Clinical Conditions: OAS Technologies

Category	Diseases/Conditions
Artificial Retina	Retinitis Pigmentosa (RP) Age-related Macular Degeneration (AMR)
Bioartificial Liver	Acute and Chronic Liver Failure - Hepatitis - Alcoholic Liver Disease - Toxins
Bioartificial Kidney	Acute and Chronic Renal Failure - Diabetes - High Blood Pressure - Glomerulonephritis
Total Artificial Heart/ Ventricular Assist Device	Acute and Chronic Heart Failure - Congestive Heart Failure (CHF) - Coronary Heart Disease (CHD)
Artificial Lung	Acute and Chronic Pulmonary Failure - Chronic Obstructive Pulmonary Disease (COPD); primary causes are chronic bronchitis and emphysema - Cystic Fibrosis - Primary Pulmonary Hypertension
Artificial Pancreas	Diabetes Mellitus - Type I - Type II - Gestational Diabetes
Artificial Bowel Sphincter	Severe Fecal Incontinence

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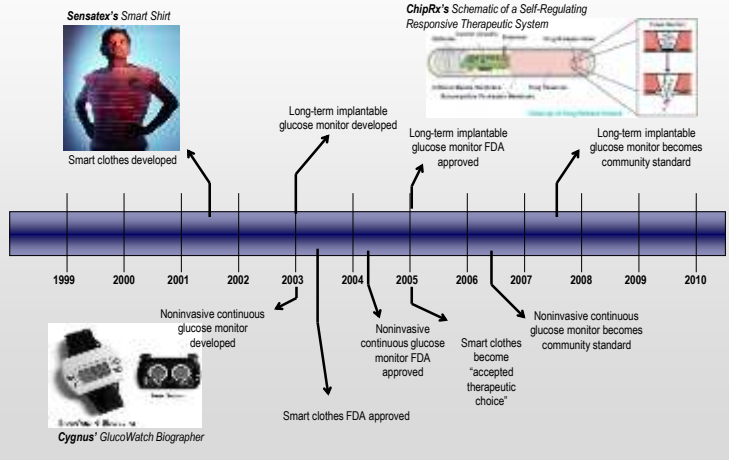
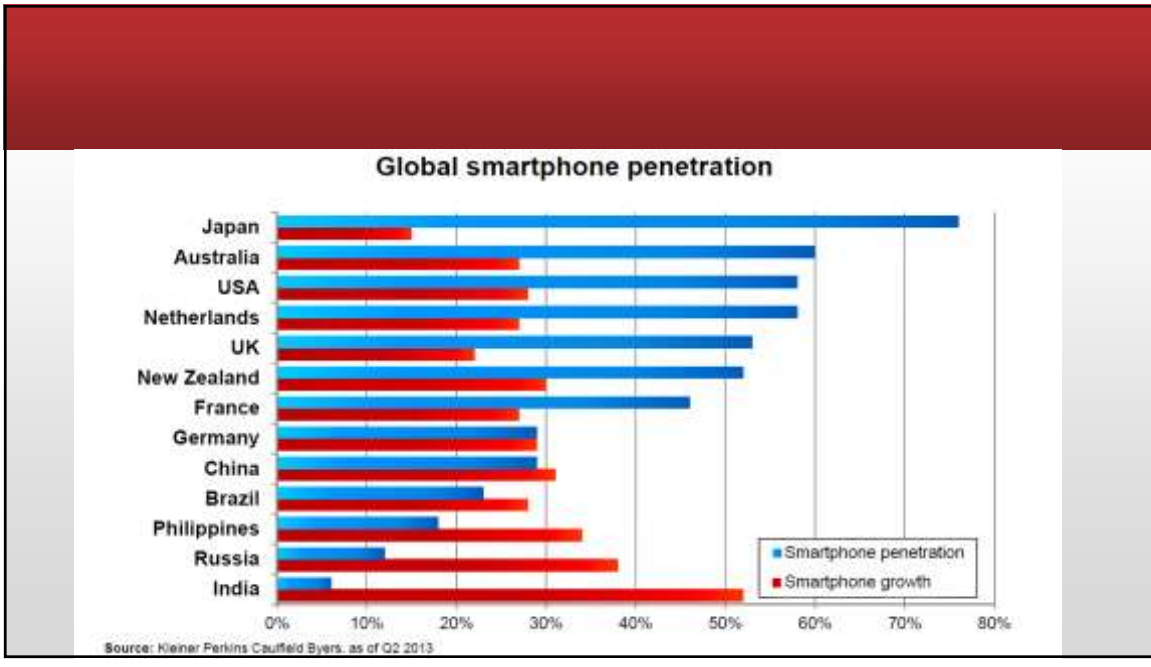
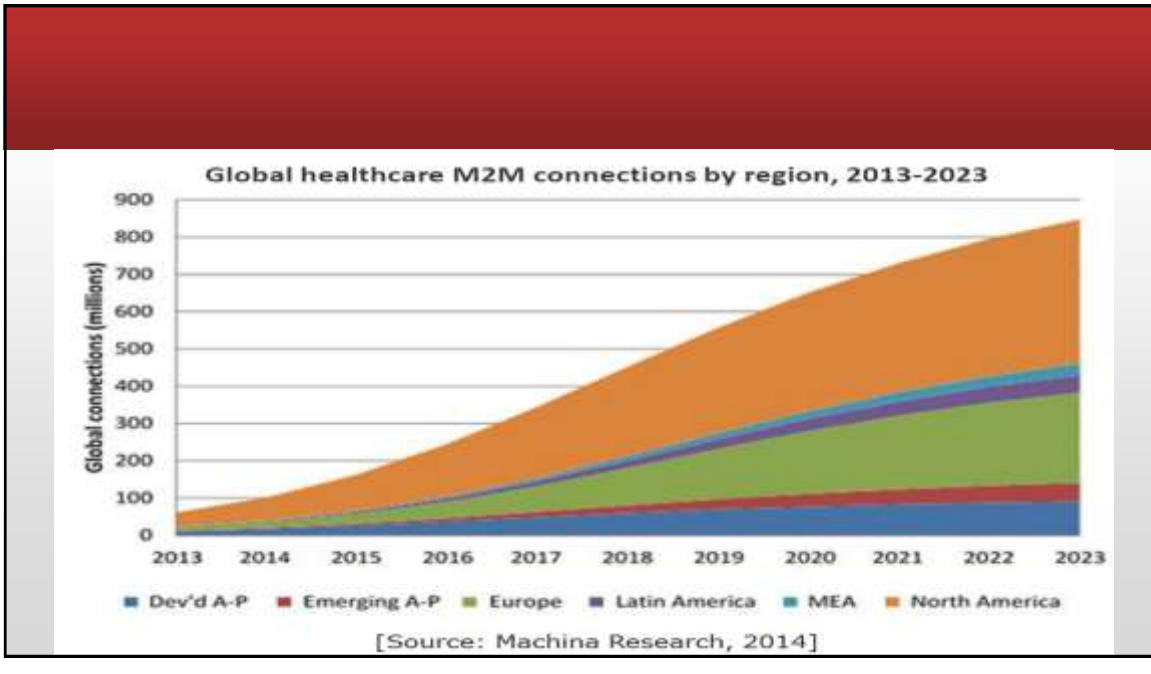
Sensors for Monitoring: Technology Timeline




Global smartphone penetration
Japan
Australia
USA
Netherlands
UK
New Zealand
France
Germany
China
Brazil
Philippines
Russia
India
0%
10%
20%
30%
40%
50%
60%
70%
80%
Smartphone penetration
Smartphone growth
Source: Kleiner Perkins Caufield Byers, as of Q2 2013


Global healthcare M2M connections by region, 2013-2023
Global connections (millions)
900
800
700
600
500
400
300
200
100
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Dev'd A-P
Emerging A-P
Europe
Latin America
MEA
North America
[Source: Machina Research, 2014]

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Productivity and the e-Physician

	Old Doctor	New Doctor
Visits	27	6
Time	10”	30”
E-mail Time	0	4 hours
E-mail Contacts	0	40
Pts/Day	27	46
Contacts/1000	2.25	3.83

You can lead a horse to water ..
but how do we get physicians to drink?

Don Moran, AEI

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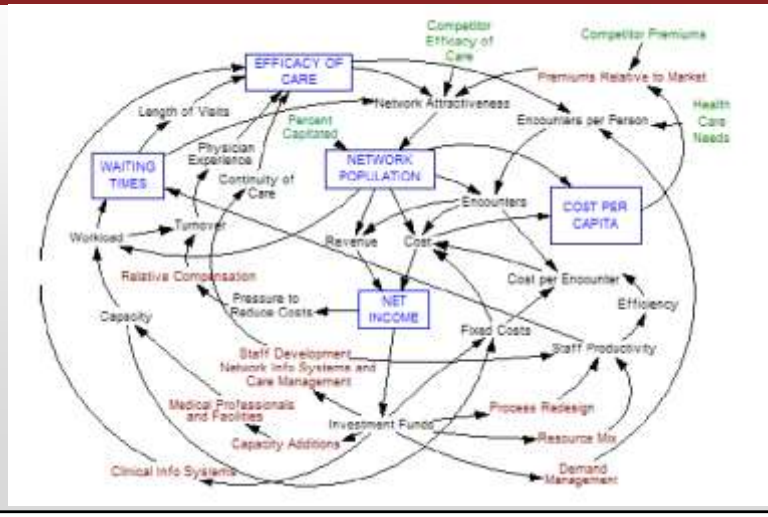
Cyber Physicians

- The number and form of “infomediaries”–knowledge brokers will proliferate
- All the information available to professional will be available to patients
- Cyber Physicians will look after people’s health, detecting changes through sensors, prompting preventive activities and treatments

The P's of Future Medicine

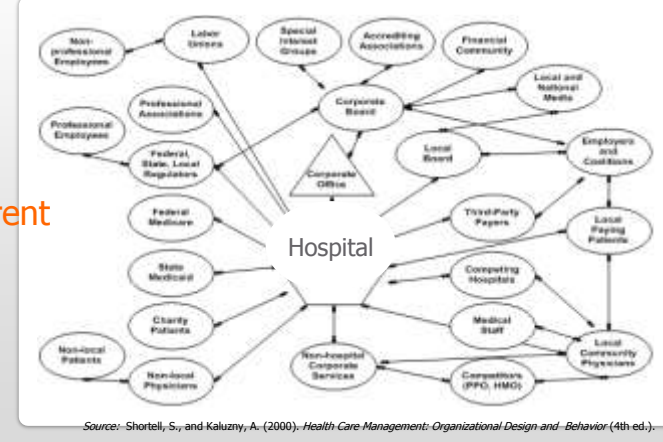
- Predictive
- Preventive
- Point of care
- Precise
- Panoramic
- Personalized
- Participatory

Understanding the system and the levers



Healthcare Stakeholder Map

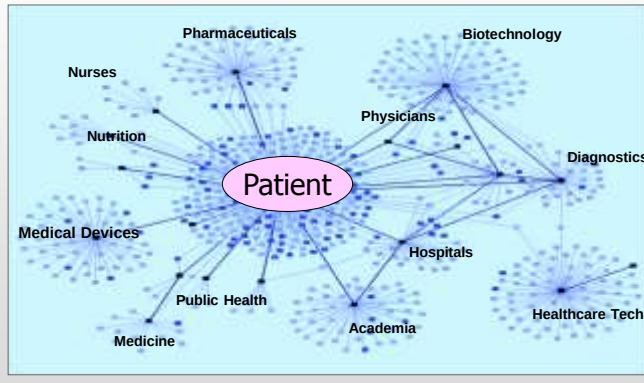
Current



Source: Shortell, S., and Kaluzny, A. (2000). *Health Care Management: Organizational Design and Behavior* (4th ed.).

Future Healthcare Network

The Patient Will Become the Nucleus of Healthcare



Healthcare Horizons

Horizon	2010	2025
Centers of Care	**Institutions** Clinics, surgery centers & hospitals	**Home** Avatar, online, "smart" technology
Gatekeeper	**Primary care physicians**	**AI** via portable electronic diagnostics and automated "care"
Genetics	**Simple -** Testing for simple disorders reaches affordability critical mass ($350/profile)	**Universal -** Testing, treatment and prevention is mainstream including reproductive health
Implants & Prostheses	**Manmade materials** surgical repair materials, drug delivery, and synthetic biochemical materials	**Regenerative biochemical** process and technological advances (regenerative organs, artificial haemoglobin, etc.)
Longevity	**Degenerative** 80 to 90 years, aging and metabolic breakdown	**Nearly non-degenerative** 125+ years, increased quality of life
Hospitals	**Treatment center for disease** - LOS in days	**Teaching center for patients**,– LOS in hours

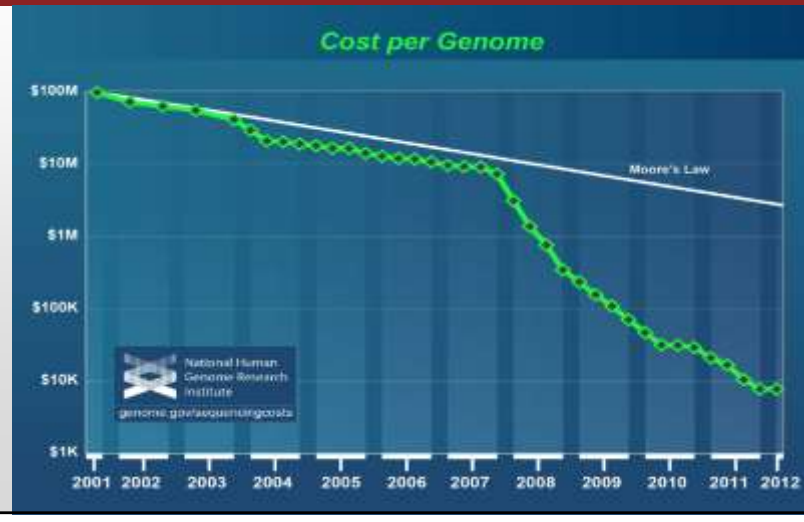
Source: Updated from Coates, J., Mahaffie, J., and Hines, A. (1997). *2025: Scenarios of US and global society reshaped by science and technology.*

Blood Protein Diagnostics

- ***In vitro*** blood protein diagnostics
- Major organs or cells secrete protein blood **molecular fingerprint**
- **Single** cell analysis
- Blood fingerprint will report **organ status**, distinguish **health from disease**, and **which disease**

Genetics

- HapMap ↓ £/€/$ of human genetic variation (disease diagnosis)
- "Gene Chip"– **multiple** gene examination
- Personal **genome sequencing** direct-to-consumer (DTC)
- Identified **origins** and **causal relationships** of complex diseases
- **"Epigenetic"** factors linked to diseases, heritability across generations
- **Stem cell** transplants
- Human reproductive **cloning**



The Nanomedical Universe

- Nanomedicine
- Nanobots
- Nanorobotic therapy
- Nubots
- Nanosensors
- Bionanobots
- Nanotechnology

Smart Living

- Smart clothes
  - Sense body functions
- Smart bathroom
  - Evaluate body fluids
- Smart kitchen
  - Prepare body nutrients
- Smart house
  - Elderly can live at home

Virtual Reality Surgery

- **Remote** 3D diagnostics
- **Robotic-assisted** procedures
- **Minimally invasive** surgeries
- **Global access** to experts

Remote Tele-Treatment

Electronic ICU (**eICU**):

Sentara Hospitals **achievements**:

- Multi-site access to **Intensivists**
- **25% reduction** in ICU hospital **mortality rate**
- **17% decrease** in ICU **LOS**
- **20% increase** in **ICU capacity** created by shorter ICU LOS
- **26% reduction** in hospital **costs** for ICU patients

Source: Pronovost, P. (2002). "Imagining the ICU of the future." *The National Coalition on Health Care and The Institute for Healthcare Improvement.*

Bionics

- **"Neuroprosthetics"** - brain implants to prevent disease
- Health avatars capable of **artificial thought**
- Bionic eyes/ears/limbs/organs
- Bionic everything!!!
- **Where does this leave pharmaceuticals?**

No frills airlines to no frills care?

You get what you pay for

Future Mental Model Shifts

Mental Model 1	Mental Model 2
Curative	Preventive
Pharmaceutical	Complementary
Western Medicine = The Health System	Western + Contemporary = The Wellness System
Nutrition based	Nutrition focus
Institution based	Home/Location based
Face to face treatment	Space to place treatment
Government responsibility to health	Individual responsibility mediated by government
Information control by professional experts	Open system information

Source: Marsh, N., McAllum, M., Purcell, D. (2002). *Strategic foresight: The power of standing in the future.*

New Model - The Imperative

- Health Care improvement is our lifeblood.
  - Most of the systems are broken
- Complex Systems of Systems is the New Market
- Most start-ups are only one product company
- Development is focused on exit
- Fast to Market is a key – The old guard is slow to change – Start ups in HC are slow – Regulations and approvals are slow
- **A NEW INNOVATION MODEL IS NEEDED**

Innovation is at a Crossroads

- Innovation today: Incremental (lower risk) vs break though or disruptive innovation
- Approach today: “Quick idea” vs “Big idea”
- Goal today: “let’s be acquired soon” vs “let’s build a sustainable company”
- Support systems today: “Incubators” trying to save the dying and Universities focused on proprietary IP

Need for New Model

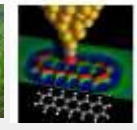
- Entrepreneur Focused: Healthy parents (entrepreneurs) will lead to healthy children (companies)
- Collaborative Approach: Global partnerships between start-ups, large companies, government, universities, & research centers
- Support Systems: Building companies who excel at continuous innovation
- Outcome/Goal: Fast, responsive development of revolutionary technology companies who address critical market needs

As the world gets smarter, infrastructure demands will grow

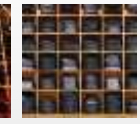

Smart traffic systems


Intelligent oil field technologies


Smart food systems

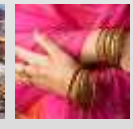

Smart healthcare

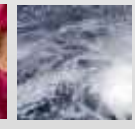

Smart energy grids


Smart retail

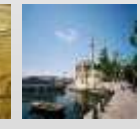

Smart water management


Smart supply chains


Smart countries


Smart weather


Smart regions


Smart cities

"I Believe There Is a Train Under Here Somewhere!"

Solution Approach

- While certain areas of healthcare require long-term R&D and years to release products, there are many problems that can be solved quickly.
- These problems are the low hanging fruit that we can solve today!
- To solve them, we will need small teams that can iterate rapidly and are not hampered by larger bureaucratic organizations
- While certain clusters of healthcare related companies exist, the problems require and technology enables virtual collaboration by private and public stakeholders.
- While the need to collaborate is critical, the profit incentive of the individual teams cannot be compromised otherwise innovation will fail.
- These teams need technology components they can leverage, administrative services, capital, access to industry experts, partners they can collaborate with, and distribution channels

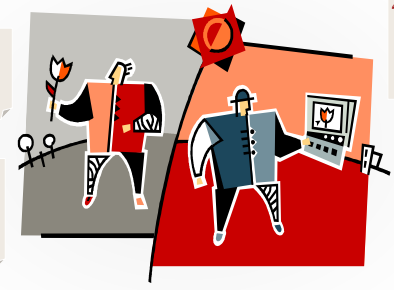
Innovation:

'The real voyage of discovery consists not in seeing new lands, but in seeing with new eyes'
(Source: Marcel Proust)

'Innovation = creative idea and implementation'
(Source: Glossary of Electronics)

'A new method, idea, product, etc'
(Source: Oxford English Dictionary)

'Innovation: change that creates a new dimension of performance'
(Source: Peter Drucker)



'An innovation to be effective has to be simple and it has to be focused'
(Source: Peter Drucker)

'Value innovators look for what customers value in common'
(Source: Kim & Mauborgne)

'Firms need to manage steady state innovation and radical change because continuous improvement is no longer enough'
(Source: Tom Peters)

'Innovation is the process by which new products or methods of production are introduced, including all the steps from the inventor's idea to bringing the new item to market'
(Source: Baumol, Economics: Principles & Policy)

Press

*As incentives shift, so will investment dollars start flowing into healthcare IT. **Forbes** recently called this "Healthcare's Trillion Dollar Disruption" and "the opportunity in healthcare is so big that most startups are thinking too small."*

EHR COSTS -- EHR Deployment Costs Approach $30,000 Per Doctor.
--InformaionWeek

Health App Services Market May Reach $26 Billion by 2017
Mobile Market Watch.com

The use of data mining in the healthcare field is perhaps more important than any other industry. While businesses may use such tools to improve customer service, healthcare organizations may end up improving how hospitals take care of their parents.
Digital Reasoning

*Healthcare is up next for transformation. Healthcare is the largest segment of our economy. Few people are satisfied with the current American healthcare system. It gets more expensive while innovations that actually improve the patient experience are rare. While there may be innovative new treatments and surgeries, basic functions for healthcare practices like storing and sharing electronic health records between physicians are still a pain. -- **TechCrunch***

*With more Electronic Health Record systems continuing to fall short of providers' expectations, a new report by Black Book Rankings suggests that 2013 may indeed be the "year of the great EHR vendor switch." -- **HealthCare IT News***


The *only* way
you can control your destiny
is to be *more flexible*
than your environment
- The Law of Requisite Variety


The journey of creating the future
"The healthcare system as it is now looks nothing like a capitalist market in which competition pushes prices down and consumers make informed tradeoffs between price and quality. "
"The difficulty bringing free-market forces to the healthcare industry helps explain why Americans spend the most on healthcare, with only mediocre results. If we're lucky, market forces are beginning to have a tangible, if subdued, impact. We need a lot more."

Thank You!

David Smith

President

SocialCare

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