Disruptive Innovations in Medicine

“Teaching Old gods New Tricks”

Dr. Robert Corona (MD)
Welch Allyn’s Chief Medical Officer
There are two classes of people who tell us what is going to happen in the future:

Those who don’t know, and those who don’t know they don’t know

-John Kenneth Galbraith
Overview

- Define Disruptive Innovation
- Take a historical look at innovations in medicine
- Correlate creativity, imagination, adoption and the way humans think
- Cover a few examples of innovation that create significant disruption in the delivery of medical care
- Potential innovations in the future
Disruptive Innovation

- While dominant players focus on the present, they miss less complex, more convenient and affordable innovations designed for simpler, less demanding needs.
- The new methods eventually improve to meet the mainstream and supplant the leaders with high quality solutions that are reliable, accessible and at a lower cost.
Disruptive Innovation

- Sustaining innovations (contrasted to disruptive)
- What mature companies do
- Usually outstrips the ability of customers to utilize the new features
- Overshoot the needs of less demanding customers
  - Eg. Simple therapies do not need intensive monitoring
“The significant problems we face today cannot be solved at the same level of thinking we were at when we created them.”

Most new technologies improve performance (sustaining)

Disruptive technologies often result in worse performance but have some fringe advantage such as: cheaper, smaller, simpler and often more convenient.
Disruptive View
What is going on?

- Are winners in the game of innovation smarter and do they try harder?
- The very skills and success of the present leaders prevent them from developing new products and services
- Capabilities become disabilities
Innovation is Messy

Antithetical for Organizations To Be Disorganized
The innovator makes enemies of all those who prospered under the old order, and only lukewarm support is forthcoming from those who would prosper under the new.

-Niccolo Machiavelli
Remember That The Airplane Takes Off Against The Wind, Not With It

-Henry Ford
A Brain Pathologist’s View
How Our Brains Work

- Memory-Prediction Framework of Intelligence
- Is How Our Brains Work
- Creativity
- Imagination
- Prediction
Creativity

- Make predictions by analogy
  - occurs everywhere in the cortex
- Occurs along a continuum (sensory function of hearing a sound then compose a symphony)
- Involves invariant memories
  - use to make predictions
  - invariant memories are sequences of events (observations/experiences)
- Prediction is the application of invariant memory sequences to new situations
- Therefore our prediction ability is based on our experience
Imagination

- Each cortical area makes predictions based on patterns from senses or lower memory hierarchy
- The predictions become inputs
  - you follow the consequences of your predictions
  - “If this happens, then this happens and so on!”
- Allows us to understand the consequences of our actions before we do them
- Close your eyes and you will “see” what you imagine
Adoption of Innovation
5 Keys to Acceptance
-Everett Rodgers’ study on innovation

- relative advantages over what currently exists
- compatibility with existing values and behaviors
- lack of complexity
- ability to be subjected to experiment
- produces results that are obvious to all
Use Your Imagination

- I will seek and find you
- I shall take you to bed and have my way with you
- I will make you ache, shake & sweat until you moan & groan.
- I will make you beg for mercy, beg for me to stop
- I will exhaust you to the point that you will be relieved when I'm finished with you.
- And, when I am finished, you will be weak for days.
Love,
The Flu
Is Disruptive Innovation A Cure For Our Health Care System’s Flu?
Innovation in Our Bloated, Inefficient Health Care System

DILBERT by Scott Adams

Here's what I don't understand...

You just asked me to follow a process that has failed thirty times in a row.

And you know it.

At what point can this no longer be called "optimism"?

When it succeeds?
US Health Care System

- $2.2 Trillion Dollars (17% GDP)
- Safety and Quality Issues
- Health Care Worker Shortages
- 40 million + uninsured
- Claim to have the world’s best health care system but lack the quality outcome metrics to back it up
Present Solutions (that are not working)

- Decrease available healthcare
  - Managed care

- Get more cost and value out of the system
  - Quality, downsizing, cost cutting, productivity improvements and technology solutions

- Increase reimbursement
  - Government and private subsidy
If the Health Care System were a patient and the symptoms were found to be persisting despite intensive therapy, the diagnosis should be questioned and new treatments considered!
Intelligence, time, effort, energy and money have been spent.

Need a disruptive view of the problem.
Response to the Disruptive Viewpoint

Dilbert, I'd like you to meet the humorless Blob I hired.

Blob is our new creative director. His job is to foster innovation.

I have some ideas.

Whoa, loose cannon.
“Innovator’s Dilemma”

- Disruptive innovation is almost always ignored or opposed actively by leadership.
- Doing and improving what they do best causes them to overshoot the needs of many they serve and miss great but simpler opportunities.
- While we are designing robotic surgeons, the chronically ill are not having their basic needs met.
Industry in crisis results in
- Paralysis due to financial underpinnings of institutions eroding

Typical Response
- Ignore
- Discredit
- Actively oppose innovations

Developers of new technology must meet the needs of their best customers-established institutions

Investment and effort flows toward extending what we already know and do
Needed Approach

- Solution will come from outside and under
- Coordinate and remove barriers that prevent simple innovations from developing to meet more complex needs
- Imagination
Legend of the Gordian Knot

- 333 B.C. Alexander the Great invaded Asia Minor and came to a town called Gordian
- Ox cart tied to a pole by a King 100 years before
- Legend that first person to untie the complex knot would become the King of Asia
- Rather than deliberating on the problem, Alexander took his sword, cut the knot in two and then went on to conquer Asia
What Might Work?

- Target undemanding applications where patients will be delighted to have simpler, more accessible care.
- Allow patients to access treatment formerly only available in inconvenient and centralized settings.
- Start simple and small.
  - Success is built on replicating effective principles.
Disruptive Innovation Traits

- Technologically simplistic but functionally appropriate
- Unattractive or ignored by industry leaders
- Ability to minimize organizational and regulatory barriers
- Do not require existing customers to change but expands to meet needs of new ones
- Capability of less costly, less skilled staff to perform work formerly done by expensive, less-accessible specialists
Disruptive Innovation in Surgical Care

- Hospital based surgery
  - Improved surgical techniques, personnel, equipment and facilities
  - Good for heart surgery and very sick patients but not necessary for low end surgery with healthy patients

- Level of functionality “overshot” the needs of many patients

- Emergence of ambulatory care surgery centers
Disruptive Innovation

- Convenience and low cost of surgery centers and office based surgery
- Hospitals barely noticed this trend as they focused on profitable high-end procedures
  - 5 million in 1984
  - 31 million in 2000
- Hospitals began losing business and eventually converted to supporting outpatient surgery facilities
OK...Here is the “But” in the Dysfunctional System

- Funding
- Policy
- Technology
- Customers
- Regulators
Support the “Status Quo”

- Political process
- Regulation
- Subsidy
- Health care is so complex that regulatory bodies kill novel ideas by sapping the energy
Regulation pours concrete around the status quo.
“I found the secret to happiness, but the FDA won’t let me release it.”
Innovation Killers

- Legislators and insurance companies
  - Set prices and specify procedures making entrepreneurs avoid
- “Peer review” process
  - Shameful self-serving “peers” who use their powers to suppress innovation
    - Dr. Judah Folkman
      - cancer anti-angiogenesis theory (vascular endothelial growth factor)
      - Now there are 30 drugs of this type fighting cancer
        - Avastin
Duke and the Third Party Punishers

- Innovative new program in heart failure
- Hospital visits reduced and resource use plummeted saving $8000/patient/year (40%)
- Payers pay for treating sick people so the innovators are penalized for making people healthy
- Duke did not benefit
Where are the Innovations in Health Care?

- Estimated that $400 billion is excessive costs of delivering care in hospital activities with quality measures not improving.
Where are the Innovations?

- Markets
- Processes
- Products
Some Successes

- Surgery, anesthesia, antisepsis
- Angioplasty
- Out-patient Surgery
- Out-patient Lab and Imaging
- Non-invasive vascular diagnosis
What are the Future Disruptive Innovations?
Examples

- Adaptive Prosthetics
- Arthroscopic Surgery
- Artificial Intelligence
- Artificial Tissue
- Biomimetics
- Complementary Medicine
- Data Mining
- Digital Hospital
- Digital Labs
- Disease Simulations
- Electronic Medical Records
- Endoscopic Surgery
- Enterprise Healthcare
- E-Prescriptions
- Evidence-Based Medicine
- Gene Therapy
- Genetic Profiling
- Genomic Profiling
- Home Pregnancy Tests
- Implanted Devices
- Inhaled Therapy
- Intelligent Healthcare Agents
- Life Extension
- Medical Informatics
- Medical Robotics
- Medical Savings Accounts
- Medical Tourism
- Memory Augmentation
More Examples

- MEDICAL INFORMATICS • MODELING AND VISUALIZATION • NANOMEDICINE • NETWORKED BIOSENSORS • NEURAL CONTROL • NON-INVASIVE SURGERY • ORGAN ASSISTANCE • ORGAN SUBSTITUTION • PERSONAL MEDICAL DEVICES • PERSONALIZED THERAPEUTICS • PERSVASIVE NETWORKING • PORTABLE ULTRASOUND • REMOTE PATIENT MONITORING • RFID • SELF-CARE • SELF-TESTING • STEM CELLS • TELEMEDICINE • TELEMETRY • WEARABLE MONITORS • WEB-BASED MEDICAL INFORMATION • WELLNESS MONITORING • XML MEDICAL FORMATS
Focus on a Few Innovations

- Imaging
- Diagnostics (Pathology and Laboratory Medicine)
- Nanotechnology/Nanomedicine
- Information and Communications Technology
- Minimally Invasive Surgery
- Genomics/Proteomics
- Theragnostics
Schizophrenia of the Future

THE DOCTOR OF THE FUTURE

NOW WITH TURBO CLOGS

WHIZ-BANG gadgets

that will change the way you practice!

Schizophrenia of the Future
Intervention needs are
- Frequent
- Simple
- Rules based
  - Diabetic or anticoagulant management

Physicians often actively oppose other healthcare providers that might challenge them by providing more basic, convenient services
Is Dr. Google in the House?

Google
MEDICAL
SCHOOL

Is this going to be another "According To Google" answer?

© Philipp Lenssen
blog.cuter-cout.com

Google
Convenient and Accessible
Reduces Errors

TO ERR IS HUMAN*
Prescription Errors
Drive Thru Brain Surgery
Medical Imaging
(Blurring of Boundaries)
Green Medicine
Environmental Stewardship

- Reduce
- Reuse
- Recycle
“Heart and Lung Songs”
A short history of medicine

“Doctor, I have an earache.”

- 2000 BC “Here, eat this root”
- 1000 AD “That root is heathen. Say this prayer.”
- 1850 AD “That prayer is superstition. Drink this potion.”
- 1900 AD “That potion is snake oil. Swallow this pill.”
- 1950 AD “That pill is ineffective. Take this antibiotic.”
- 2000 AD “That antibiotic doesn’t work anymore. Here, eat this root.”