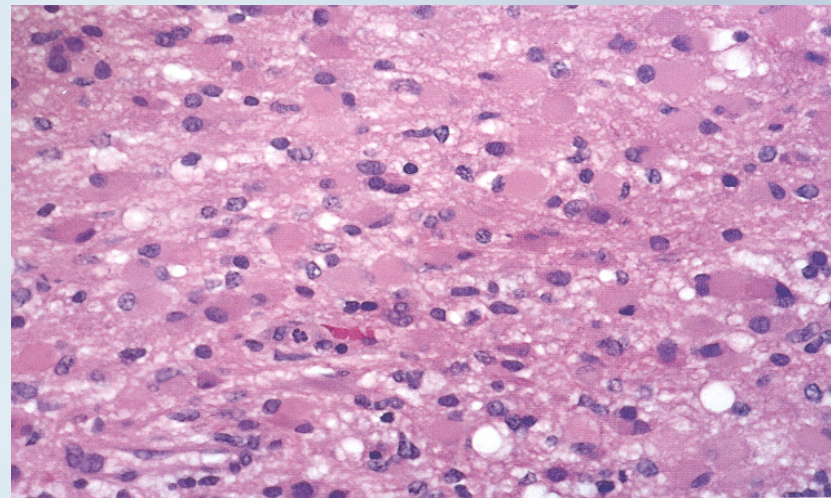
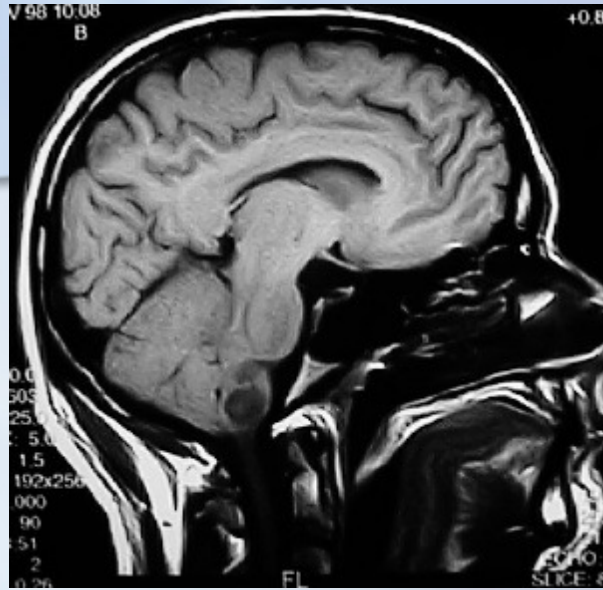




Disruptive Innovations in Medicine

“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

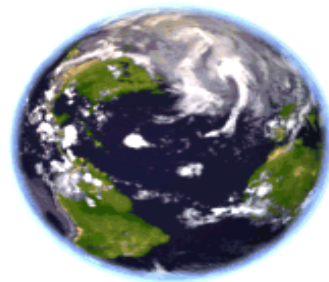
What is going on?

- 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

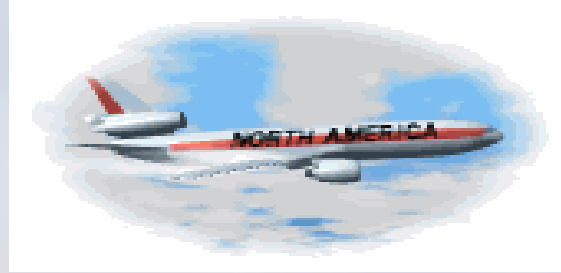
**Antithetical for
Organizations To Be
Disorganized**





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



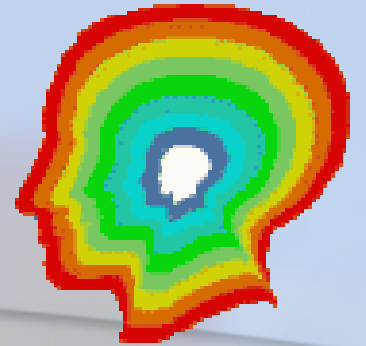


Creativity

- 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



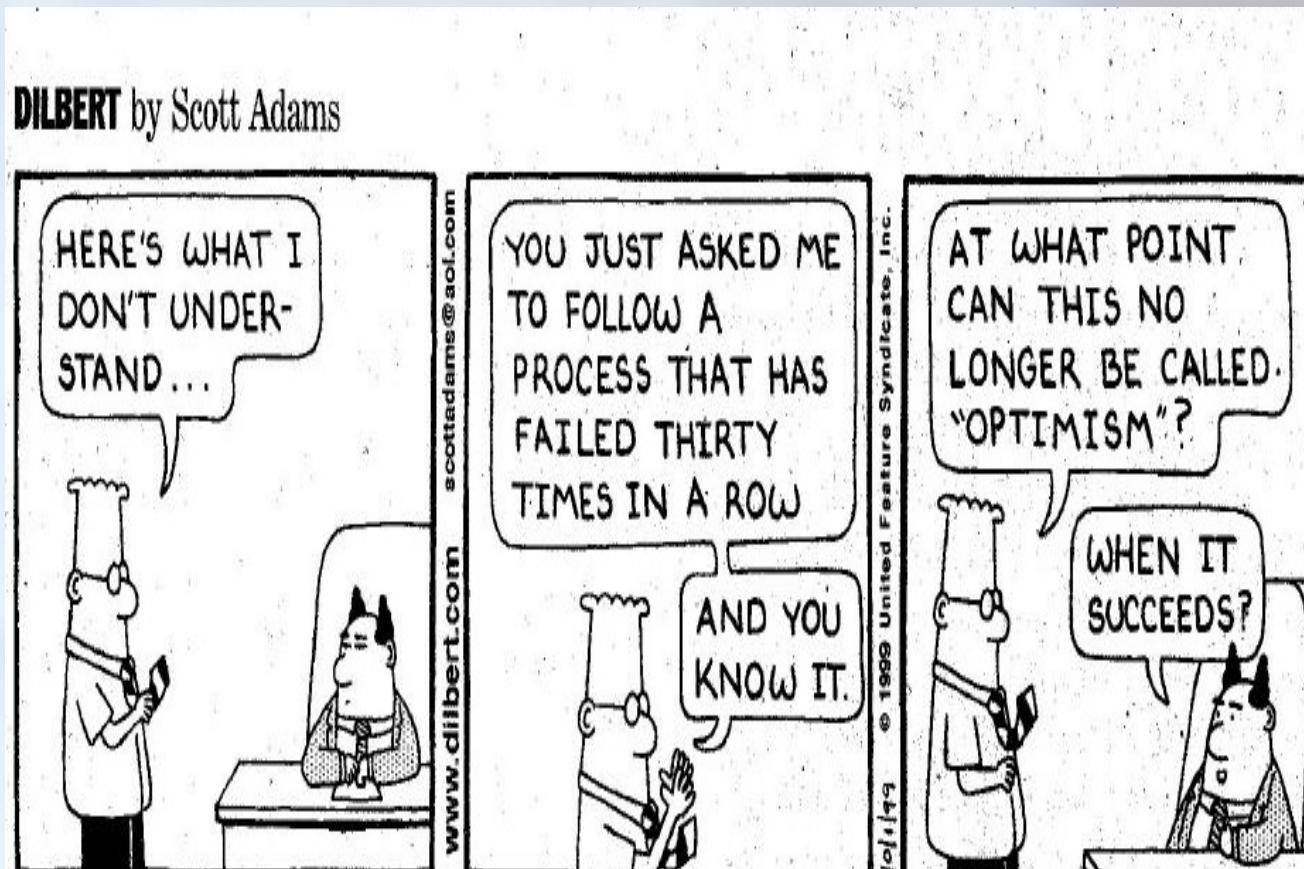


Is Disruptive Innovation A Cure For Our Health Care System's Flu?






Innovation in Our Bloated, Inefficient Health Care System





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

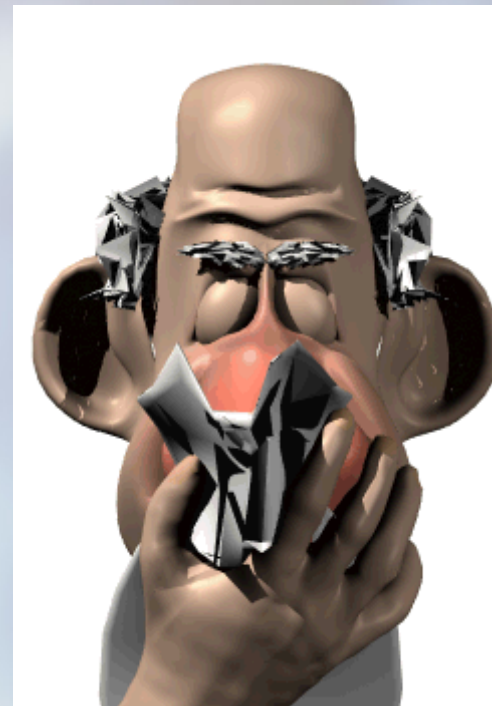


Present Solutions (that are not working)

- 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

Ineffective

- 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





“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



Present Approach

- 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

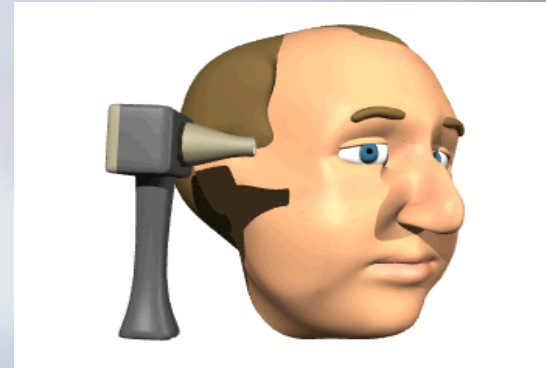


Disruptive Innovation

- 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



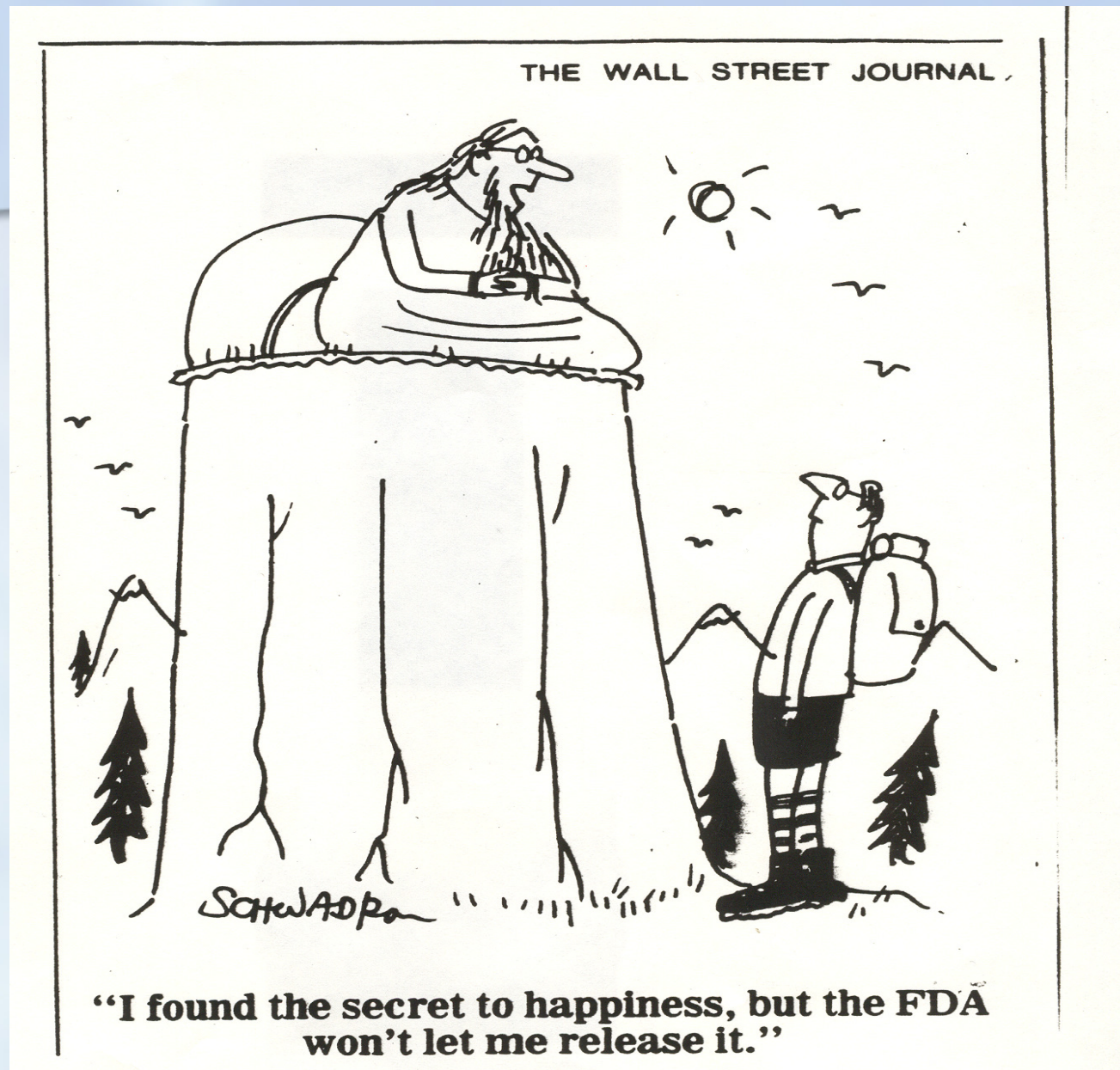
Health Care

- Regulation pours concrete around the status quo.



U.S. Food and Drug Administration

CENTER FOR DEVICES AND RADIOLOGICAL HEALTH



Wall Street Journal circa 1990



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



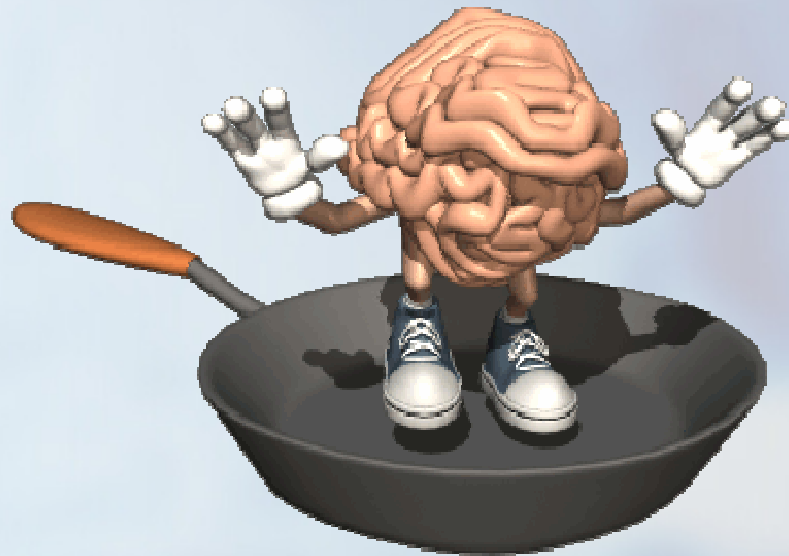
Duke and the Third Party Punishers

- 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?

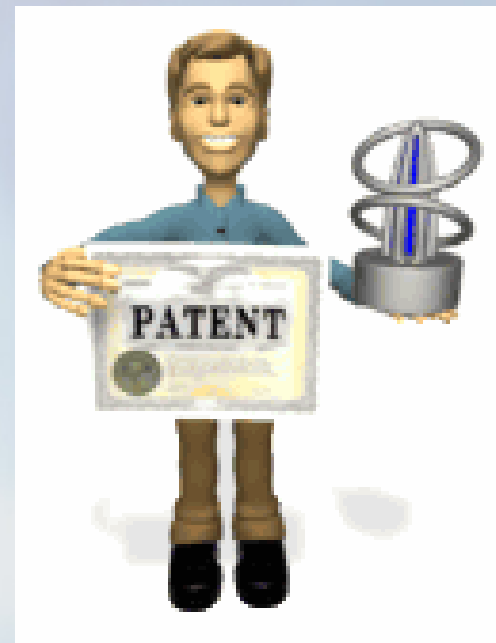
- Estimated that \$400 billion is excessive costs of delivering care in hospital activities with quality measures not improving





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



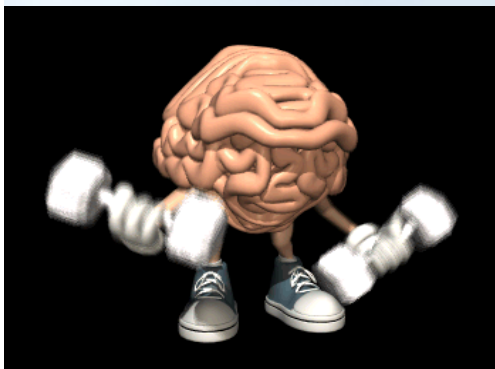
More Examples

- MEDICAL INFORMATICS • MODELING AND VISUALIZATION • NANOMEDICINE • NETWORKED BIOSENSORS • NEURAL CONTROL • NON-INVASIVE SURGERY • ORGAN ASSISTANCE • ORGAN SUBSTITUTION • PERSONAL MEDICAL DEVICES • PERSONALIZED THERAPEUTICS • PERVASIVE 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



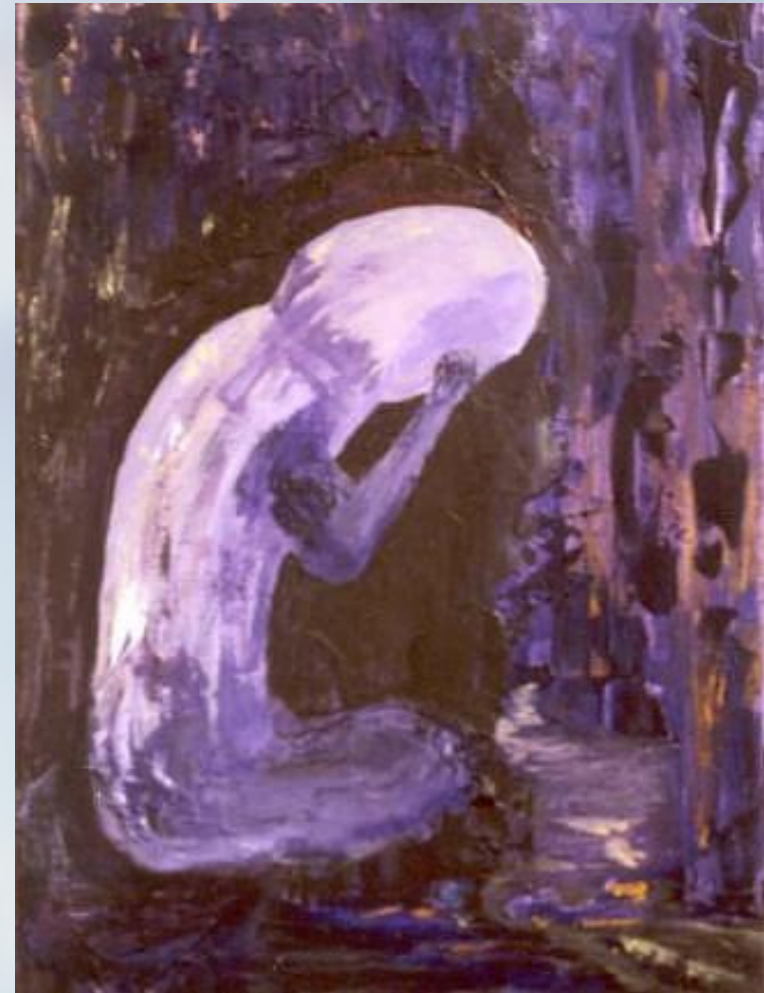
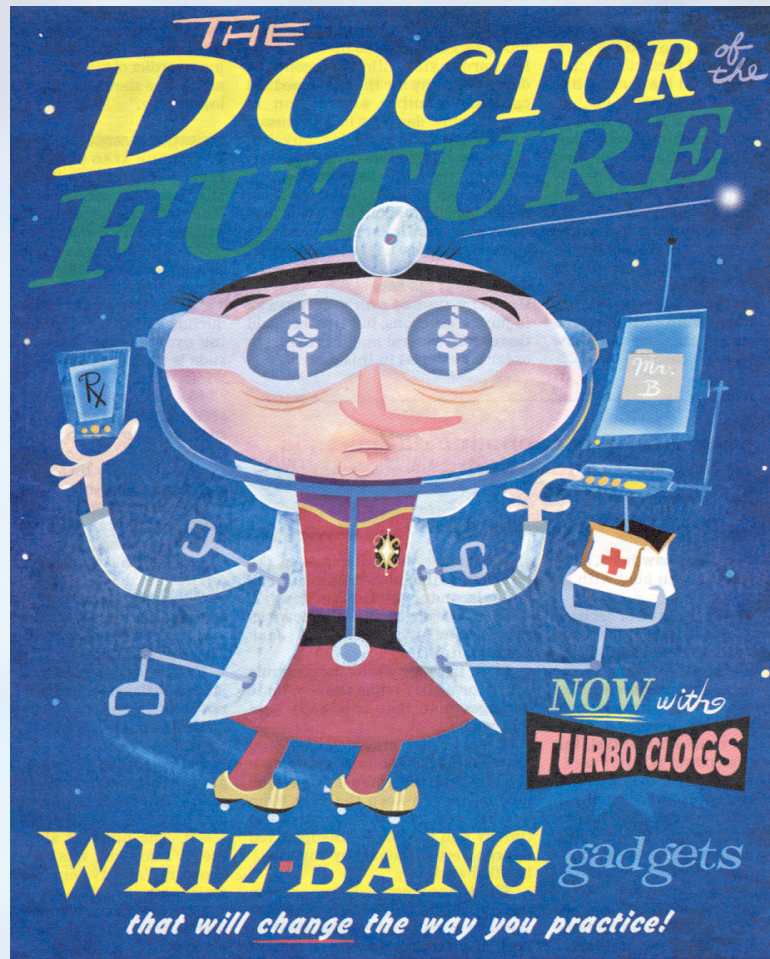
Focus on a Few Innovations

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





Schizophrenia of the Future





Overshot the Needs of the Chronically Ill

- 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?

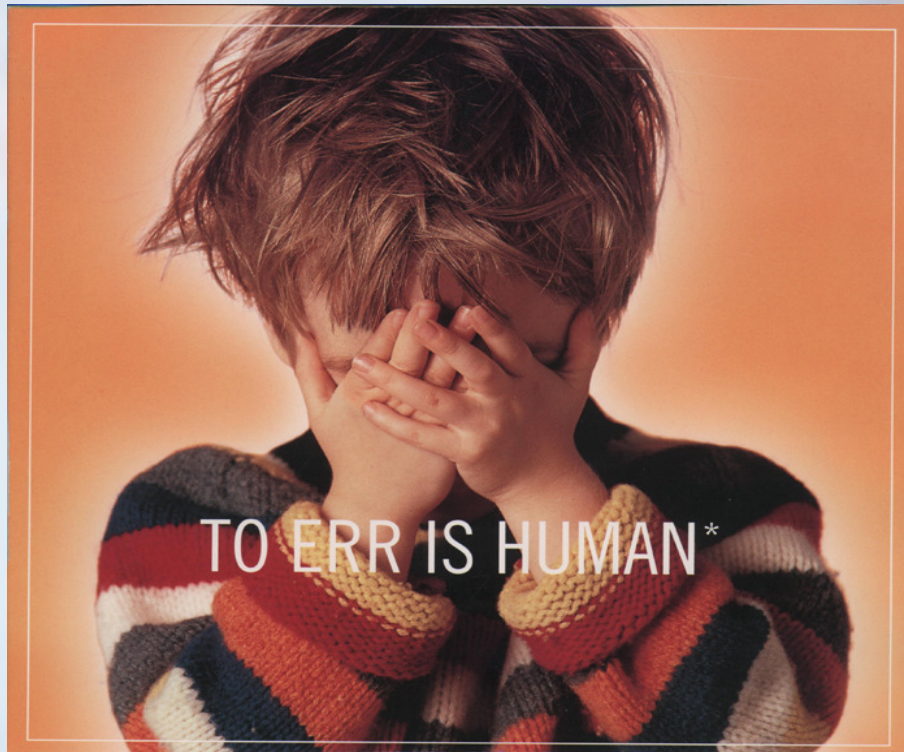


Convenient and Accessible





Reduces Errors



TO ERR IS HUMAN*

Prescription Errors



MEDICAL CENTER HOSP

NO. 400 W. 4TH STREET
CORPUS CHRISTI, TEXAS

NAME Vaquez, Ramon

ADDRESS W. 14th St. #10

NO. REFILLS 20 mg P.O. Q6hr

REFILL Ferron sulfate 300mg

LABOR 300mg P.O. TID E.M.

Hemulin N

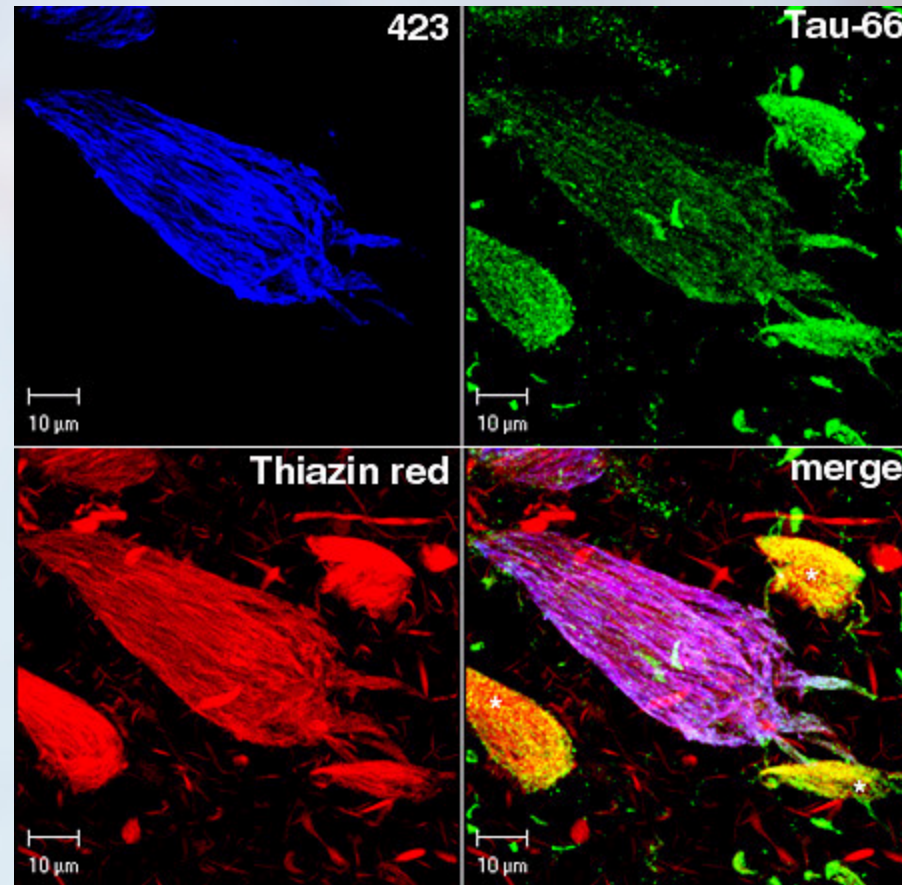
30 units SQ



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.”

Thank You

