

The Value of Innovative Products

An Evidence-Based Technique to the Adoption of New Techniques and Technologies

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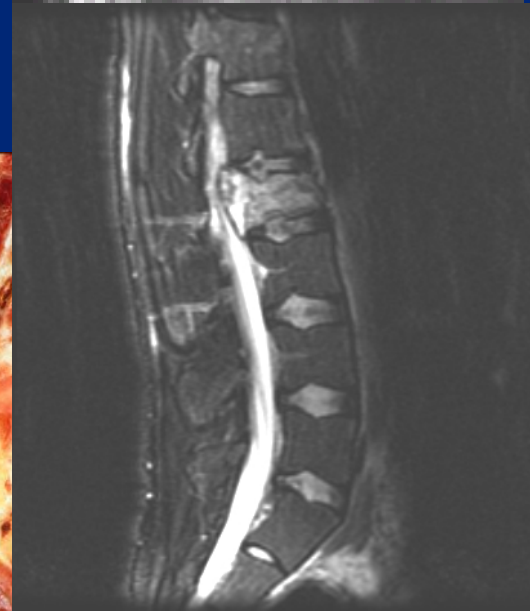
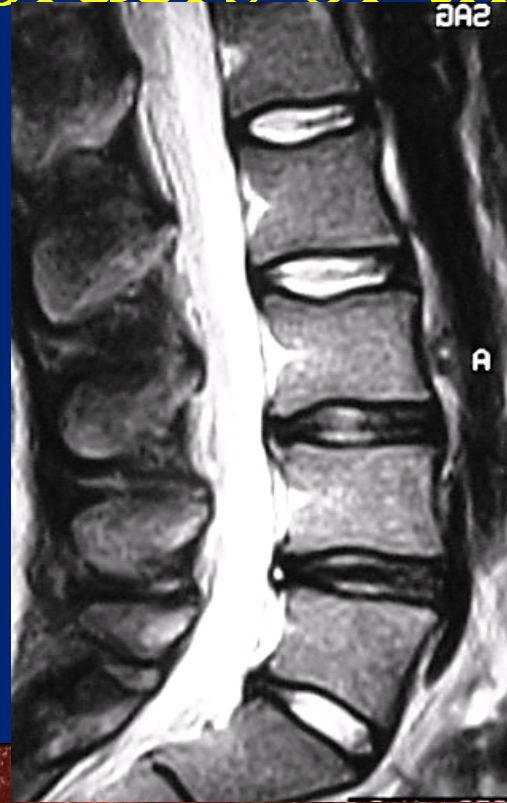
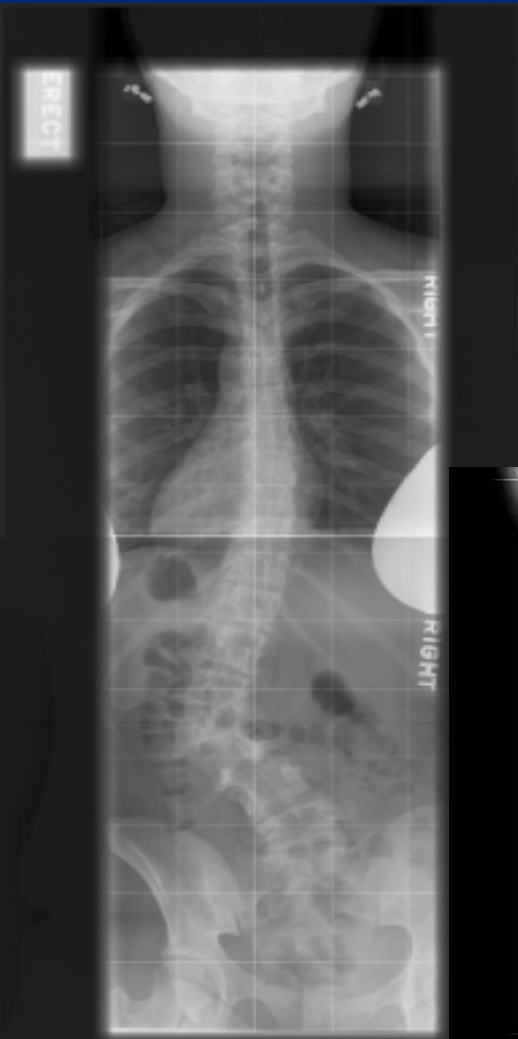
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Overview

- Broad Spectrum of Spinal Disorders
 - Variability in Approach to Common Spinal Disorders
- Innovations in Spine Surgery-
 - Patterns of Adoption ...and Abandonment
 - Osteobiologics/Dynamic Stabilization/Interspinous Spacers
- Incremental Value of New Technologies and Techniques
- Levels of Evidence to Compel/Support Change
- Goal of cost-saving innovations in healthcare to bend the cost curve
 - Disruptive Innovations in Spine Surgery

Spectrum Disorders of the Spine





The Burden of Musculoskeletal Diseases

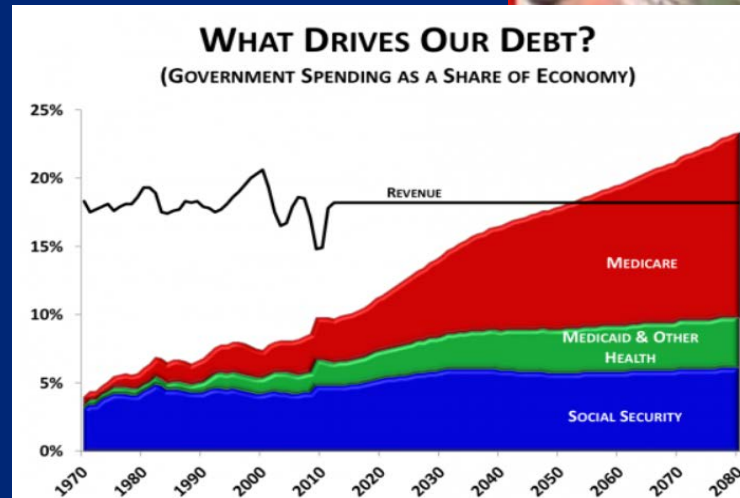
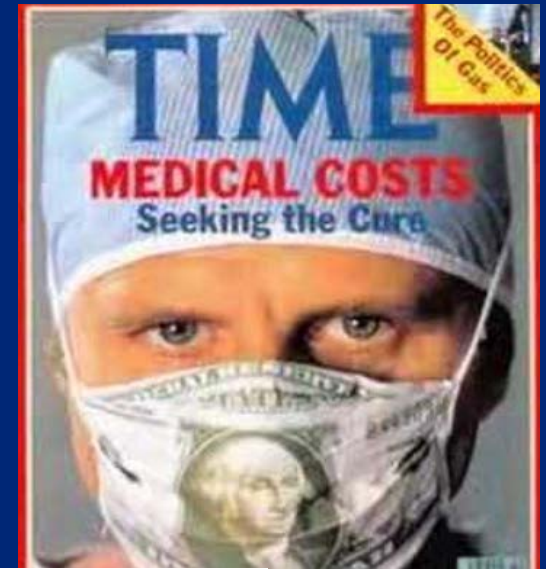
in the United States

Prevalence, Societal and Economic Cost

- IOM- 1998
 - In defining health priorities for research and funding, the burden of disease and impact on the health of the population needs to be a priority
- Measuring the Burden of Disease
 - Prevalence
 - National Health Interview Surveys
 - Healthcare resource utilization
 - Impact
 - Disability
 - Measuring patient-based assessments
 - Disease-specific and general health status instruments

Healthcare Deficiencies

- Unsustainable Cost
- Variability in Care
- Quality Deficiencies
- Inappropriate Use of Care



US HEALTH CARE CRISIS

THE FACTS



1/3 The portion of the population that is uninsured or poorly insured in the United States.

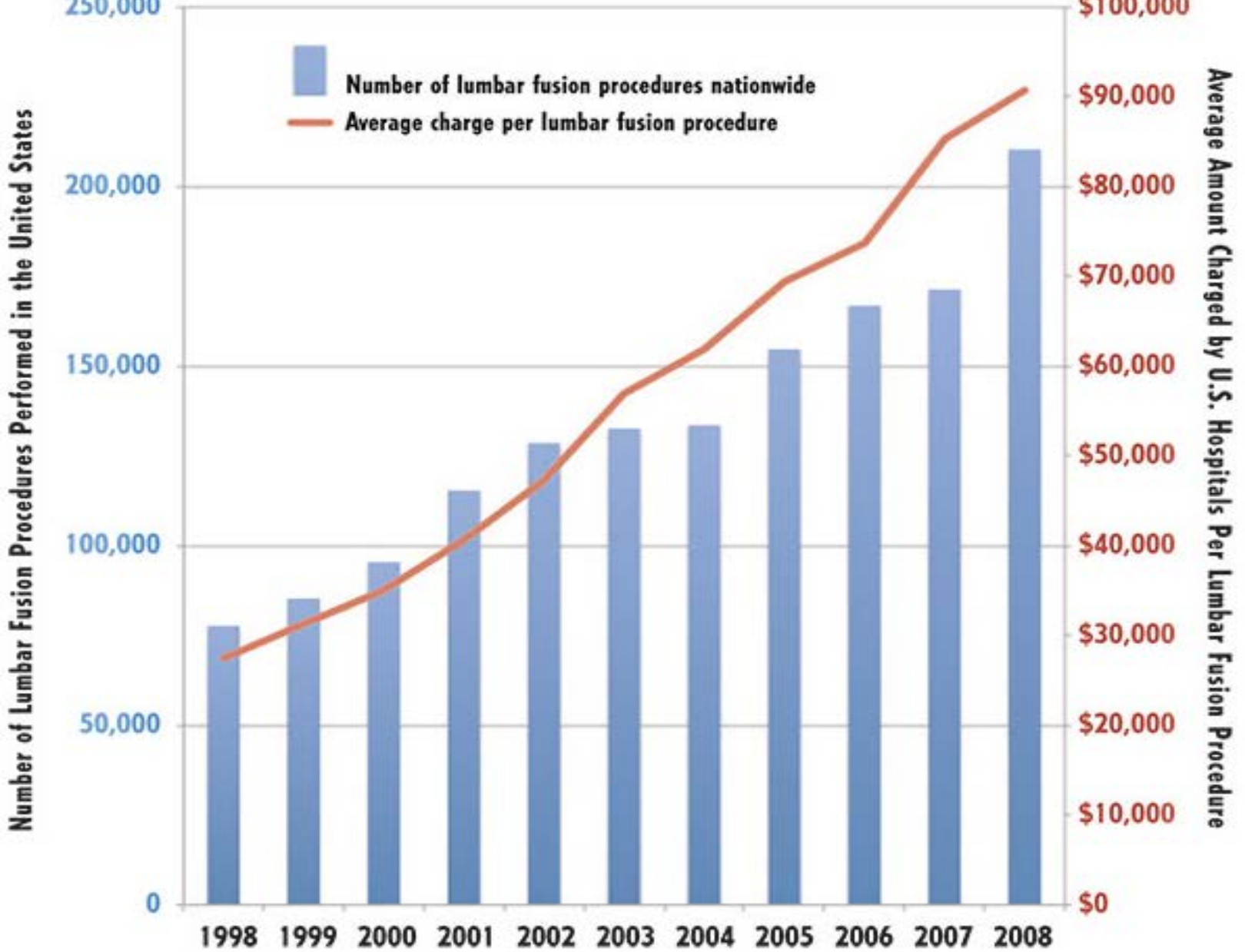
34,000 The number of people that would be insured by the salary of the CEO of United Health Group who makes \$122.7 Million / year.

37th The Rank of the United States among industrialized countries in health system performance in a report by the World Health Organization. The US is ranked 54th in Fairness, while Cuba is ranked 23rd in the same category. According to the same report, the US has a higher infant mortality rate than Cyprus and Slovenia.

101,000 People have died unnecessarily in the United States every year for the past five years due to insurance denials or lack of insurance

Medical Expenditures in Spine Surgery

- In the first decade of the 21st century:
 - Over 3.6 million fusion-based procedures
 - Over \$287 billion= \$80,000/case
- Within the Medicare population, the rate of complex spinal surgery has increased nearly 15-fold between 2003-2013
- The cost burden associated with spinal disorders is approaching the cost of common chronic medical conditions including diabetes and cardiovascular disease

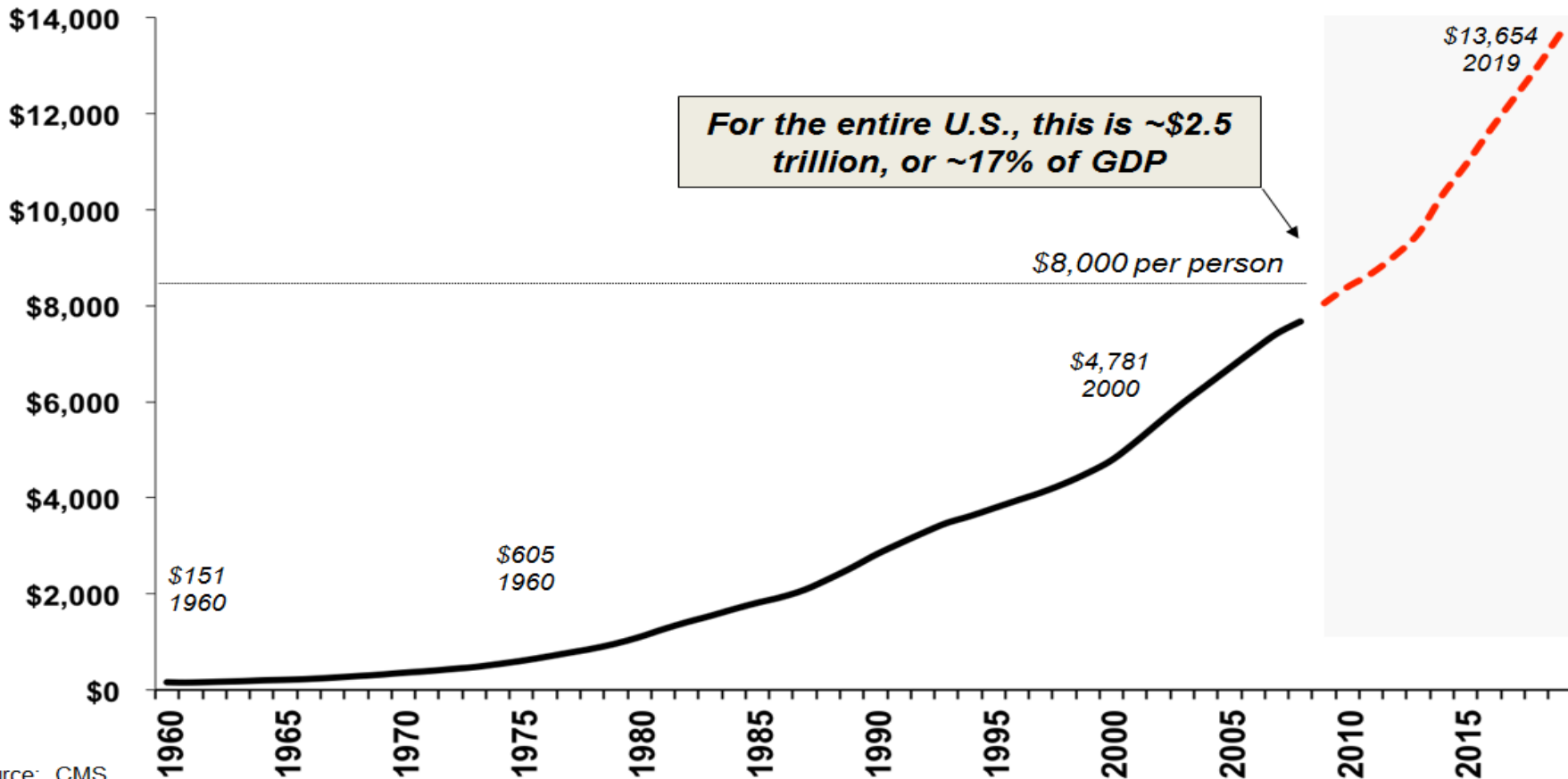


Rajae SS, Bae HW, Kanim LE, Delamarter RB.
Spine (Phila Pa 1976). 2012 Jan 1;37(1):67-76.

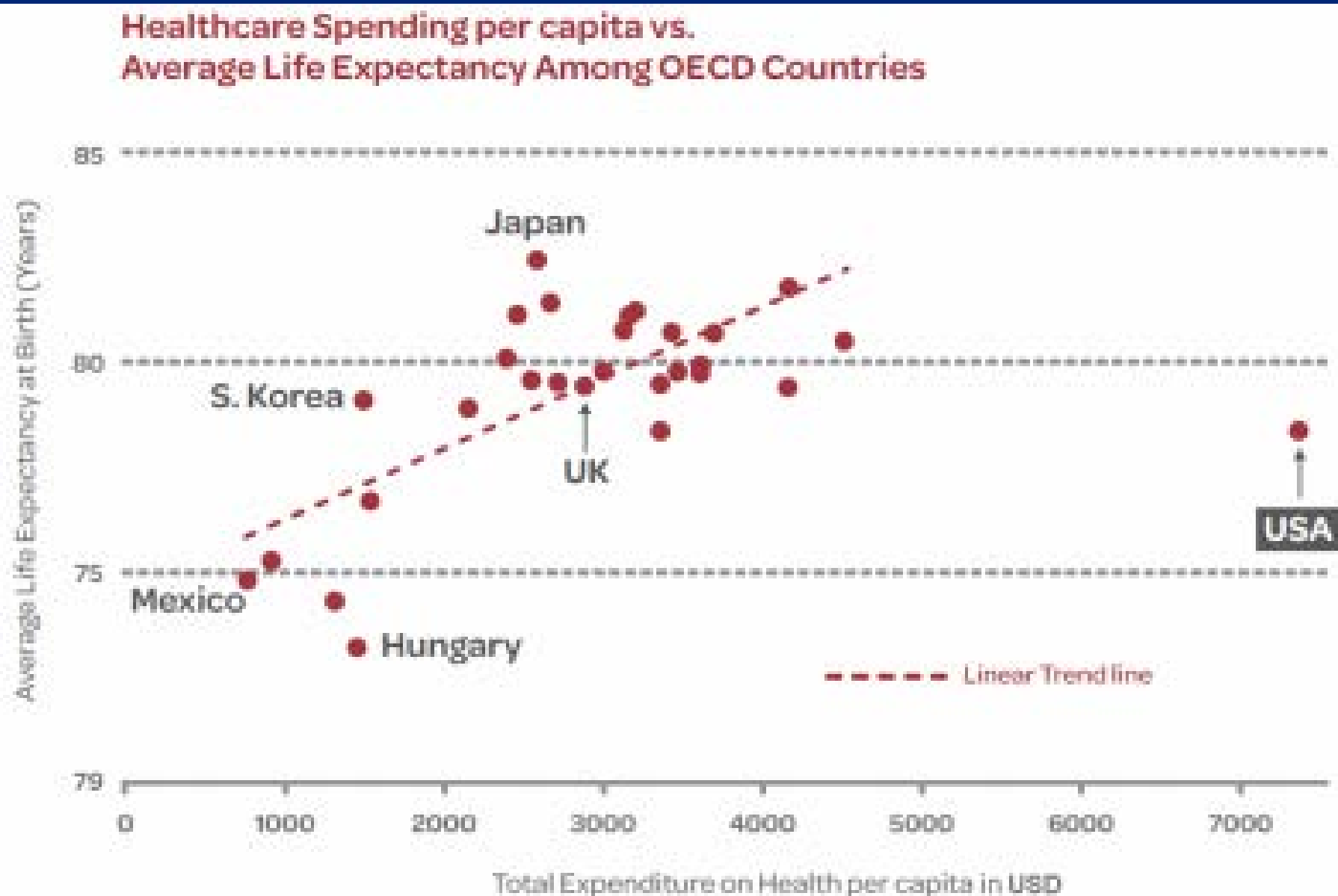
Cost of Healthcare

- 2013 US Healthcare budget= \$2.5trillion
– 17.3% of GDP

Per Capita National Health Expenditures



What do we get for what we spend?



\$85.9 Billion Spent on LBP in 2005

Expenditures and Health Status Among Adults With Back and Neck Problems

Brook I. Martin, MPH

Richard A. Deyo, MD, MPH

Sohail K. Mirza, MD, MPH

Judith A. Turner, PhD

Bryan A. Comstock, MS

William Hollingworth, PhD

Sean D. Sullivan, PhD

BACK AND NECK PROBLEMS ARE among the symptoms most commonly encountered in clinical practice. In a 2002 survey of US adults, 26% reported low back pain and 1.4% reported neck pain in the previous 3 months.¹ Low back pain alone accounted for approximately 2% of all physician office visits; only routine examinations, hypertension, and diabetes resulted in more office visits. Rates of imaging, injections, opiate use, and surgery for spine problems have increased substantially over the past decade.^{2,5} Such increases would likely result in increased health care expenditures, but it is uncertain how much expenditures have increased or how national expen-

Context Back and neck problems are among the symptoms most commonly encountered in clinical practice. However, few studies have examined national trends in expenditures for back and neck problems or related these trends to health status measures.

Objectives To estimate inpatient, outpatient, emergency department, and pharmacy expenditures related to back and neck problems in the United States from 1997 through 2005 and to examine associated trends in health status.

Design and Setting Age- and sex-adjusted analysis of the nationally representative Medical Expenditure Panel Survey (MEPS) from 1997 to 2005 using complex survey regression methods. The MEPS is a household survey of medical expenditures weighted to represent national estimates. Respondents were US adults (> 17 years) who self-reported back and neck problems (referred to as "spine problems" based on MEPS descriptions and *International Classification of Diseases, Ninth Revision, Clinical Modification* definitions).

Main Outcome Measures Spine-related expenditures for health services (inflation-adjusted); annual surveys of self-reported health status.

Results National estimates were based on annual samples of survey respondents with and without self-reported spine problems from 1997 through 2005. A total of 23,045 respondents were sampled in 1997, including 3,139 who reported spine problems. In 2005, the sample included 22,258 respondents, including 3,187 who reported spine problems. In 1997, the mean age- and sex-adjusted medical costs for respondents with spine problems was \$4695 (95% confidence interval [CI], \$4181-\$5209), compared with \$2731 (95% CI, \$2557-\$2904) among those without spine problems (inflation-adjusted to 2005 dollars). In 2005, the mean age- and sex-adjusted medical expenditure among respondents with spine problems was \$6096 (95% CI, \$5670-\$6522), compared with \$3516 (95% CI, \$3266-\$3765) among those without spine problems. Total estimated expenditures among respondents with spine problems increased 65% (adjusted for inflation) from 1997 to 2005, more rapidly than overall health expenditures. The estimated proportion of persons with back or neck problems who self-reported physical functioning limitations increased from 20.7% (95% CI, 19.9%-21.4%) to 24.7% (95% CI, 23.7%-25.6%) (1997 to 2005).

- JAMA cost analysis study
- “Expenditures for pain medicines increased about 423 percent from 1997 to 2005”
- Outpatient visits accounted for the largest proportion of total cost
- **Greatest relative increase was observed for medications**
- Side Note: Surgeons fees for lumbar spine surgery represent 0.46% of the total dollars spent on LBP.

You Get What you Pay For

In this world, you get what you pay for.

Kurt Vonnegut



Eric & Bill

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"Our financial advice is free
... and it's worth every penny of it."



Correlating Spending and Outcomes

- Patients in higher spending regions are:
 - Less likely to receive evidence-based treatments (effective care)
 - No more likely to receive elective major surgical procedures (preference-sensitive care)
 - Wennberg 2004
- Patients with selected serious conditions such as heart attacks over time found that survival was slightly worse in the higher spending regions
 - Fisher, 2003

Management of Spinal Disorders

- Characterized by significant variability in clinical presentation and in treatment strategies







Drivers of Increased Healthcare Expenditure in the US

Ginsberg PB. Controlling health care costs. N Engl J Med.

• 2004;351:1591–1593.

- Development of New Technologies that add cost without clear improvement outcome or performance
- Enthusiastic adoption of New Technologies
 - Pharmaceuticals
 - Surgical Techniques
 - Medical Devices



The Promise of New Technology

- Save Lives
- Improve Access to Information
- Increase Productivity
- Reduce Errors
- Improve Quality of Life



The Promise of New Technology



Computing Capacity



John Bardeen, William Shockley and Walter Brattain at Bell Labs, 1948.



microelectronics group

A replica of the first transistor,
invented at Bell Labs,
December 23, 1947

Lucent Technologies
Bell Labs Innovations



50 Years and Counting...

Moore's Law - 2005

Transistors
Per Die

10^{10}

10^9

10^8

10^7

10^6

10^5

10^4

10^3

10^2

10^1

10^0

1960

1965

1970

1975

1980

1985

1990

1995

2000

2005

2010

1K

4K

16K

64K

256K

1M

4M

16M

64M

128M

256M

512M

1G

2G

4004

8008

8080

8086

80286

386™ Processor

486™ Processor

Pentium® Processor

Pentium® II Processor

Pentium® III Processor

Pentium® 4 Processor

Itanium™ Processor

Itanium™ 2 Processor

- ◆ 1965 Data (Moore)
- Memory
- ◇ Microprocessor

Moore's Law turns 50, but will it soon cease to exist?

FORTUNE

APRIL 19, 2015, 10:00 AM EDT



Moore's Law Applied to Medicine

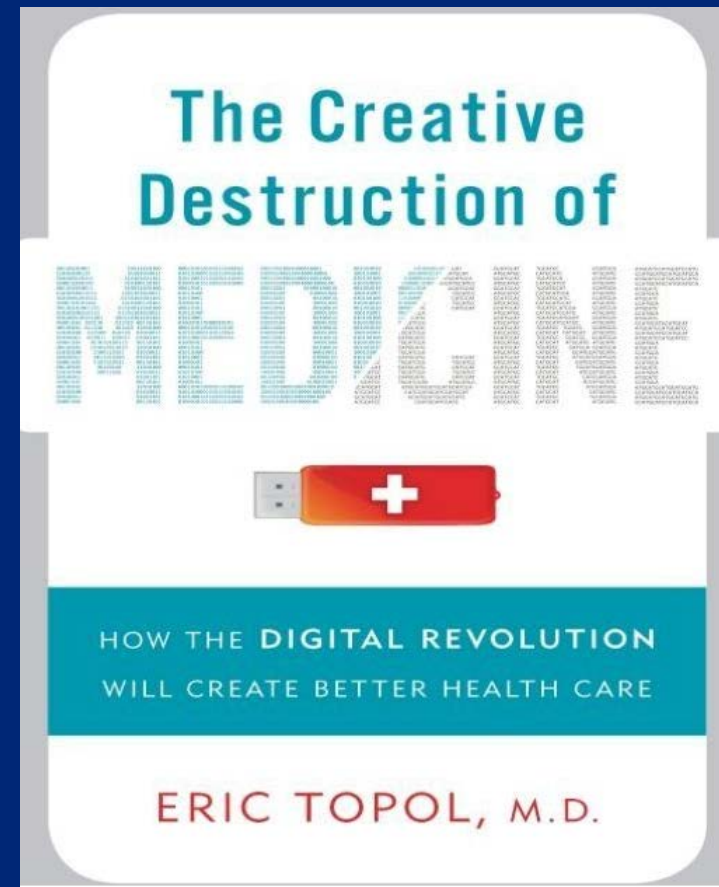
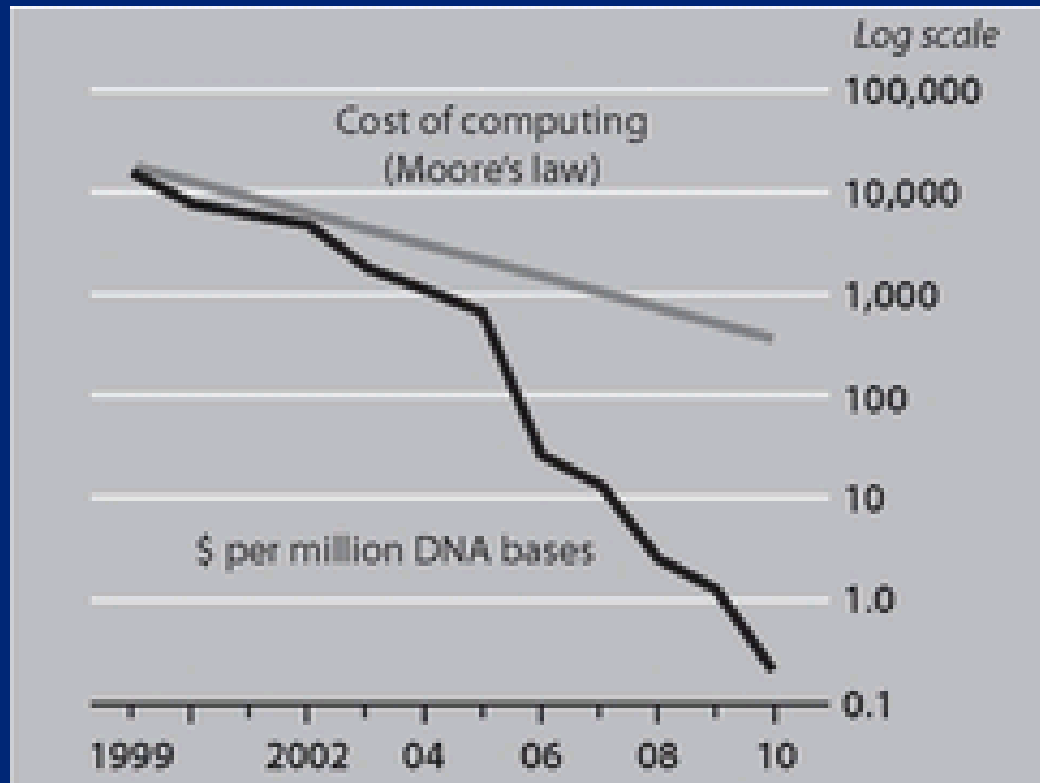
- Every 2 years would result in a halving of:
 - Infant mortality
 - Implant failure
 - Readmissions
 - Reoperations
 - Complications

Moore's Law Applied to Medicine

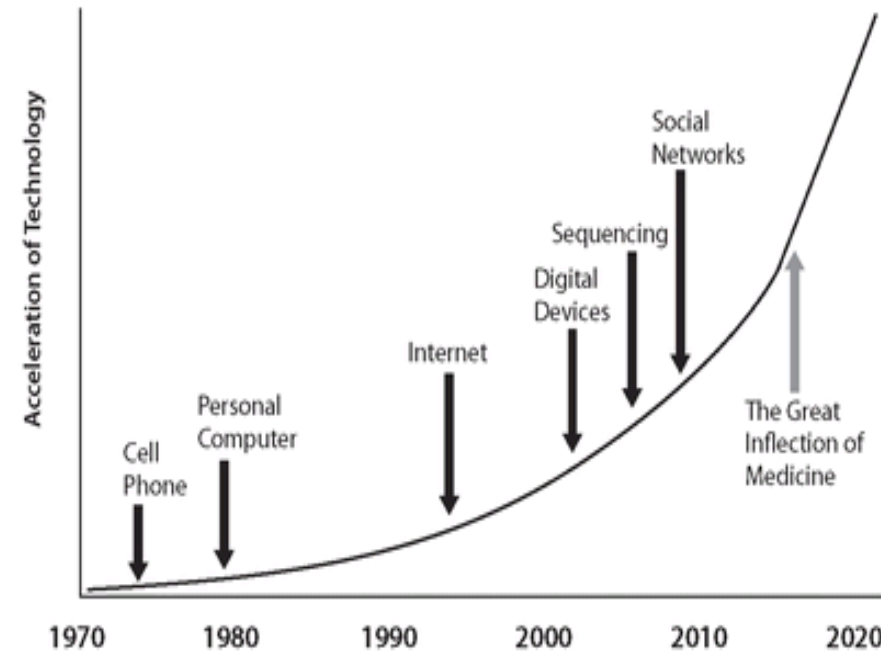
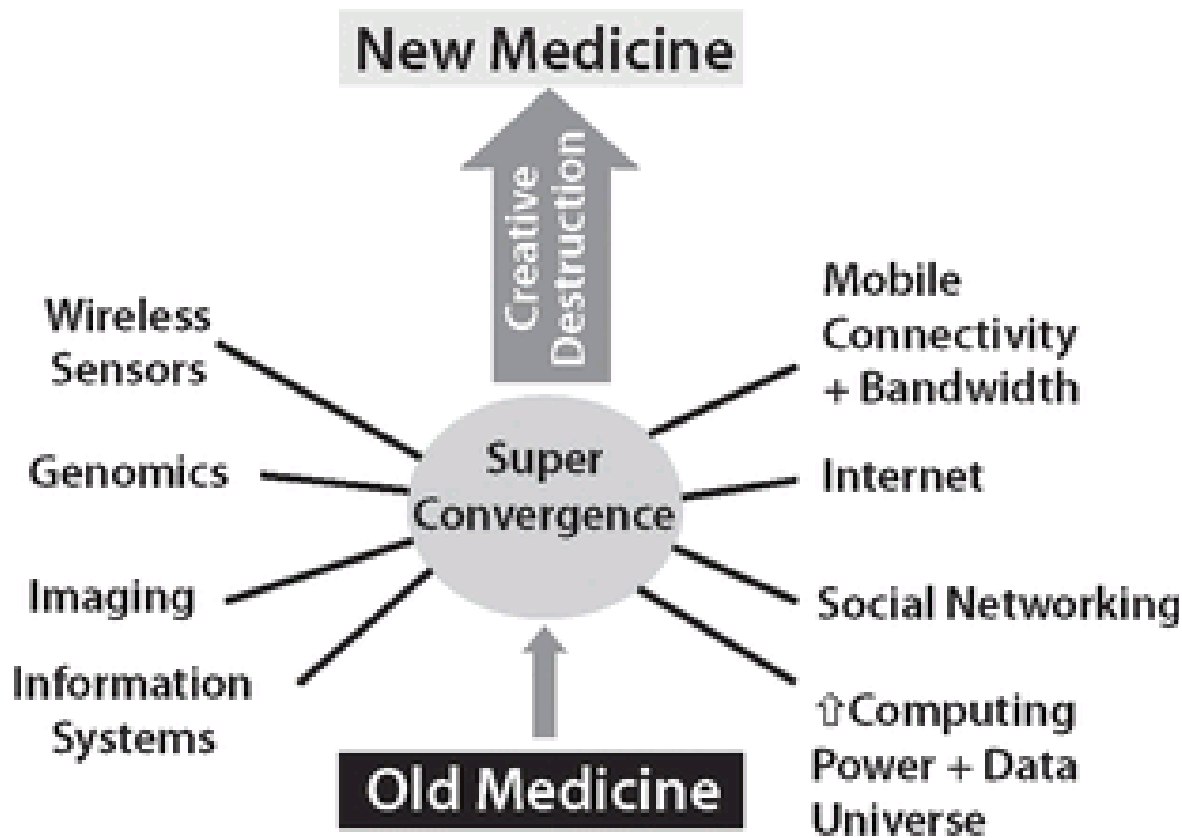
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Technology in Healthcare



Technology in Healthcare



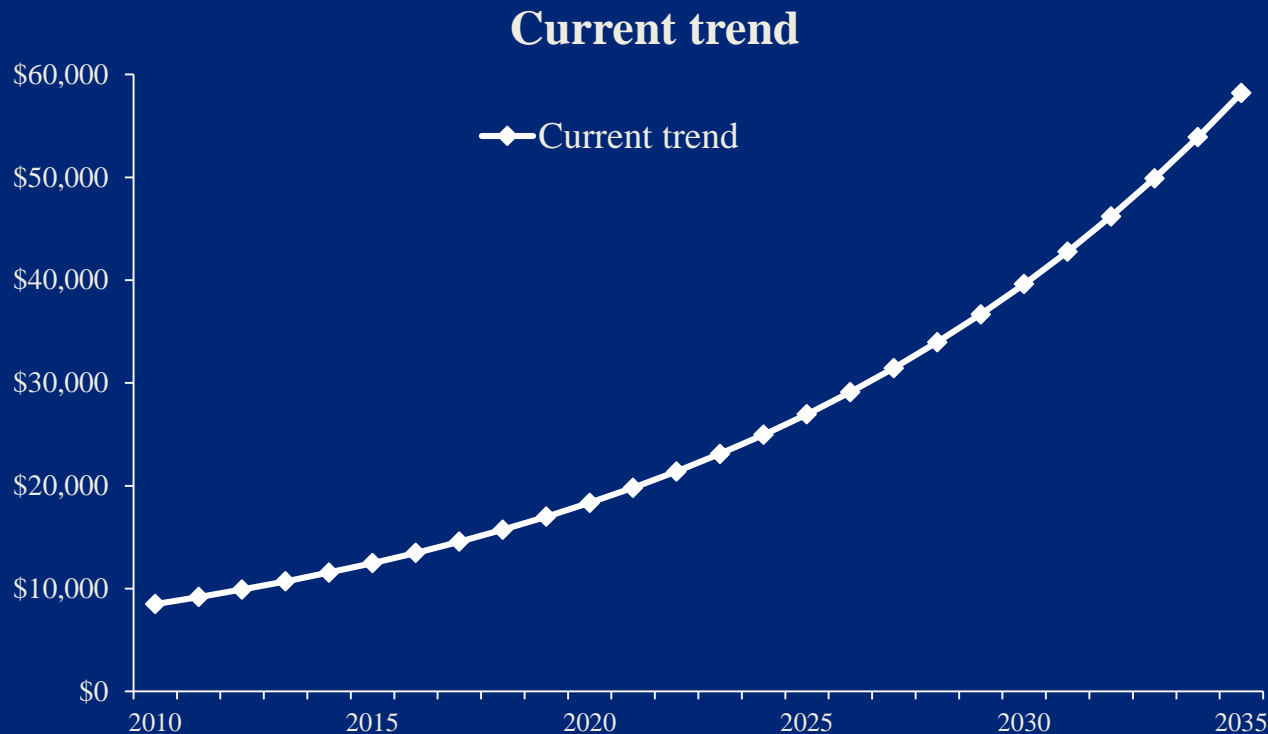
Disruptive Innovations in Spine Surgery

Innovations that add value or are cost-saving.

- Adding Value:
 - Improvement of Benefit/Outcome
 - Increased durability of outcome
- Cost-saving
 - Reduce price
 - Reduce need for readmission/reoperation
 - Improve outcome over time

Bending the cost curve in Musculoskeletal Innovations

- Rapidly increasing spending is largely accounted for by the widespread adoption of new technologies that do not provide an incremental improvement in clinical outcomes^{1,2}



- Geometric rate of rise in cost without corresponding benefit

Bending the cost curve in Musculoskeletal Care

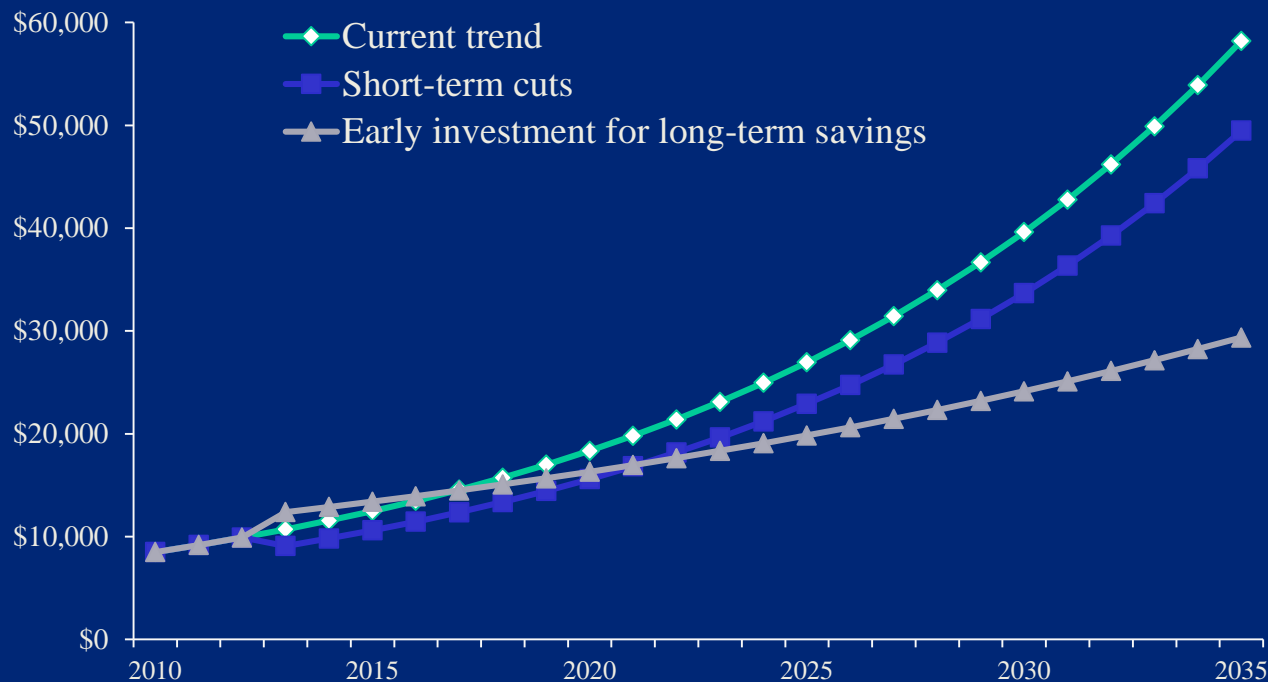
- Rapidly increasing spending is largely accounted for by the widespread adoption of new technologies that do not provide an incremental improvement in clinical outcomes^{1,2}



- 5% reduction across the board for reimbursement for healthcare

Bending the cost curve in Musculoskeletal Care

- Rapidly increasing spending is largely accounted for by the widespread adoption of new technologies that do not provide an incremental improvement in clinical outcomes^{1,2}



- A technology may add value if it improves outcomes or reduces costs
- A short-term investment in value-adding technologies may bend the cost curve and reduce spending over time

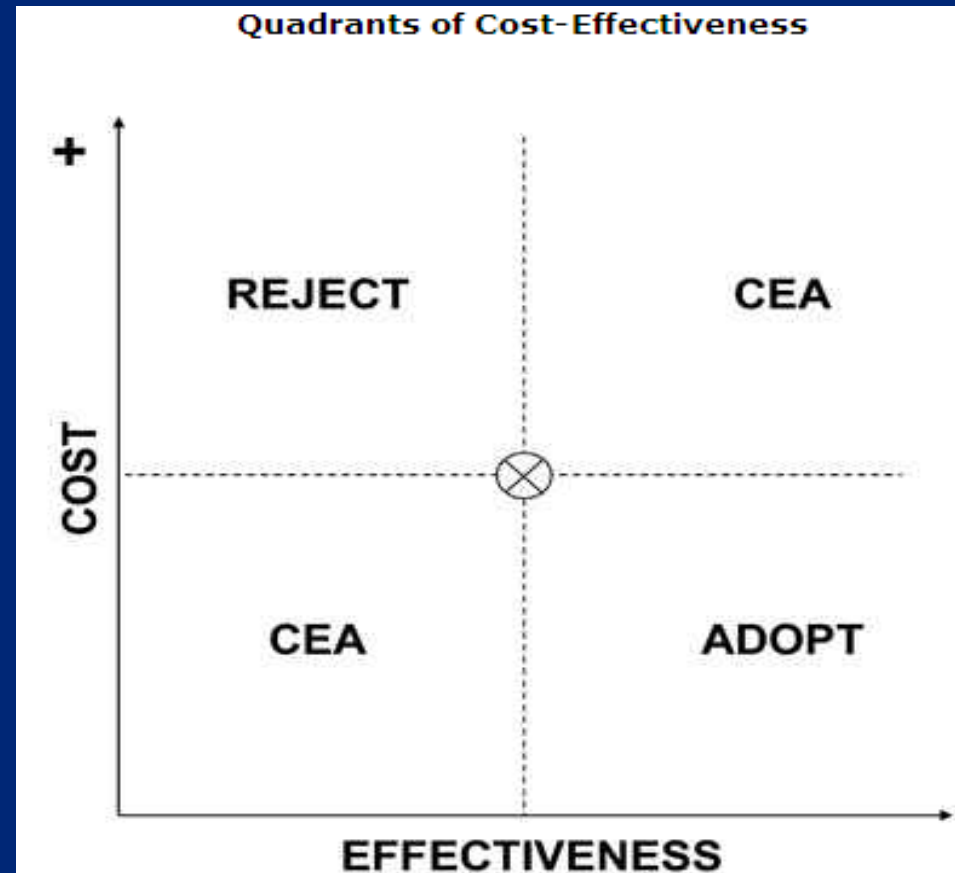
Value and Innovation

Incremental Cost-effectiveness in the Assessment of New Technologies



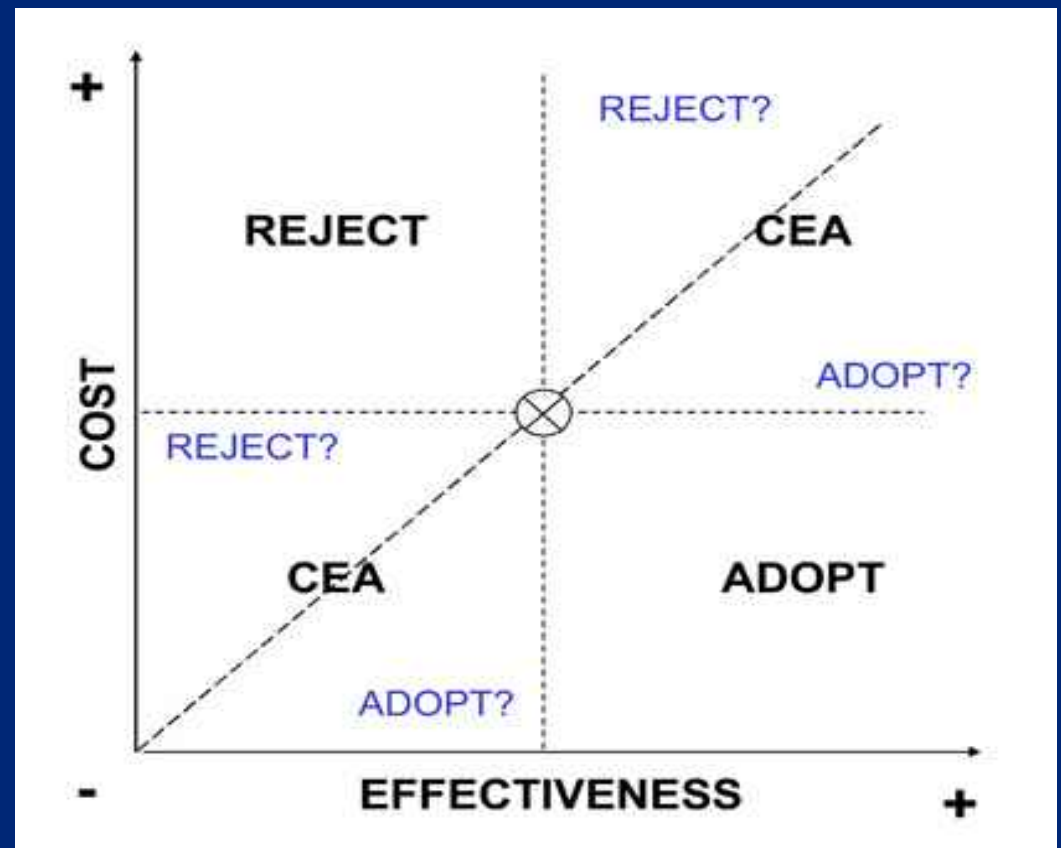
Cost-effectiveness of New Technologies

- Decision analysis in health policy and new technology adoption
- Effectiveness measured in:
 - Implant survival
 - Revision rates
 - Change in Health Status
 - Utility of Intervention



Cost-effectiveness of New Technologies

- Line of Clinical Equipose
- How Much are you willing to pay for an incremental gain?



Cost-Saving Innovations In Spine Surgery

- Novel Surfaces
- Navigation/Robotics
- Osteobiologics
- Minimally Invasive Surgery
- Non-operative Techniques
 - Neuromodulation

Conclusions

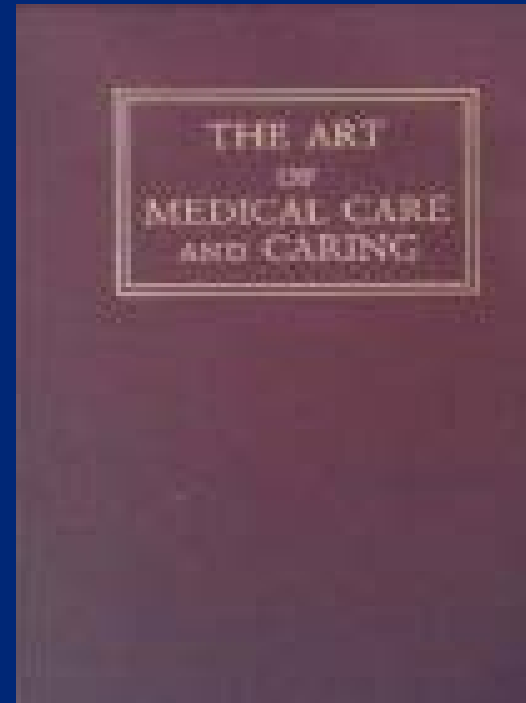
- Enthusiastic adoption of new technologies has been characteristic of spine surgeons in the US
- Many new technologies in spine surgery have been cost generating rather than cost saving, with limited evidence to support measurable improvements in outcomes.
- A responsible adoption of new technologies requires an assessment of the cost and incremental difference in outcome of innovations compared with predicates
- Patient centered focus in evaluating new technologies :
 - “The secret of care for the patient is caring for the patient”

Guidance for Innovation

- *One of the essential qualities of the clinician is interest in humanity, for the secret of the care of the patient is in caring for the patient*



Dr. Francis Weld Peabody





UCSF Center for Outcomes Research