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Forecasting, Comparing, and Preparing for Adopting Technologies on the Horizon

February 24, 2011
Institute of Health Economics
Edmonton, AB, Canada

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A Collaborating Center of the World Health Organization

- **Nonprofit healthcare information organization founded in 1968**
- **Collaborating Center, World Health Organization**
- **Evidence-based Practice Center, U.S. Agency for Healthcare Research and Quality (AHRQ)**
- **A U.S. federally designated Patient Safety Organization (PSO)**
- **Stringent conflict-of-interest operating rules**
- **Largest information provider worldwide for healthcare technology—its assessment, planning, selection, procurement, management, and risk and quality assessment.**
- **Consulting support and technical assistance worldwide**

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Agenda

- Background
- Planning for Emerging Technology
- Some Technologies on the Horizon for Cancer and Heart Disease
- Perspectives

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The robots are breeding like rabbits!






MEDICAL DEVICES/COMPARATIVE EFFECTIVENESS

COMPARATIVE EFFECTIVENESS HITS MEDICAL DEVICES

Converging provider, payor and regulatory forces are making comparative effectiveness and evidence of value top priority issues for device companies. Here are several principles and best practices designed to help companies succeed in this future environment.

MARCH 2010| IN VIVO: THE BUSINESS & MEDICINE REPORT| www.ElsevierBI.com

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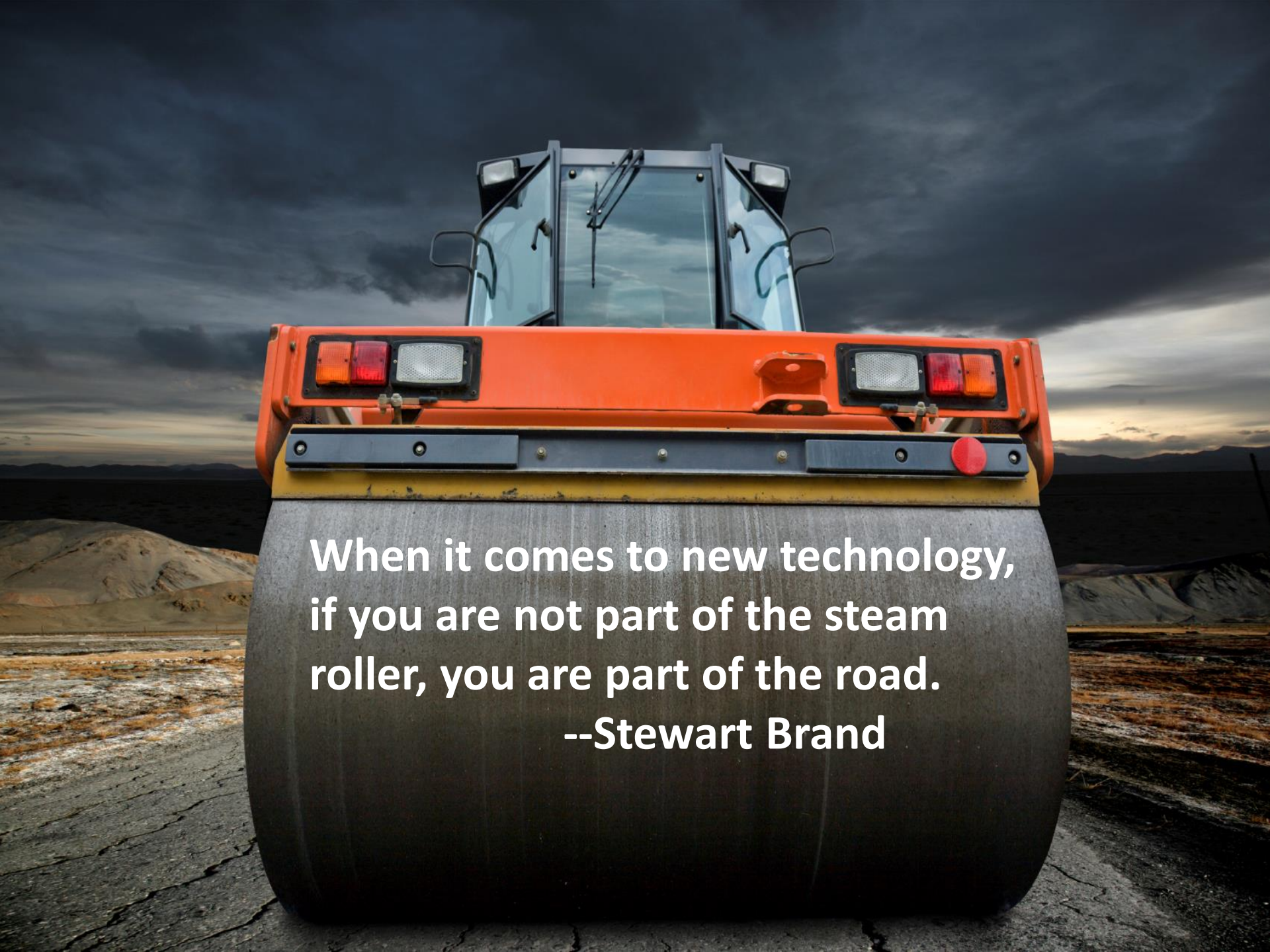
When it comes to new technology, if you are not part of the steam roller, you are part of the road.
--Stewart Brand


“Prediction is very hard…
especially when it’s about the future.”
Yogi Berra

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"So what do I do on Monday Morning?"

Balance an evidence-based approach to forecasting with comparative effectiveness in mind

Get excited, but don't get snowed.

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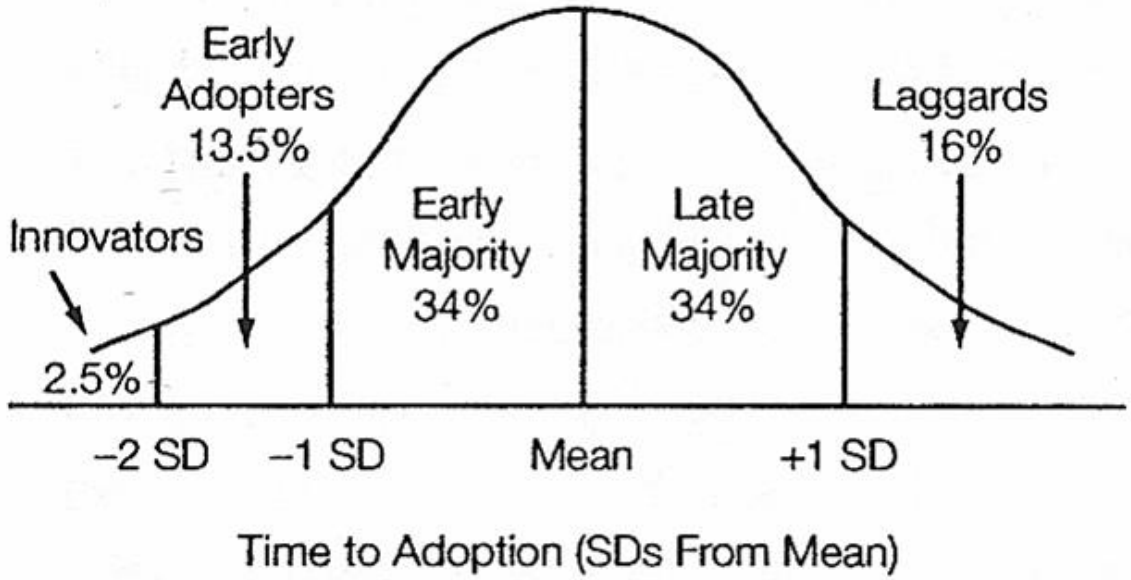
Strategies for Success

- **Map and write down the broad trends**
- **Use multiple inputs for trends:**
  - multiple internal and external sources from within healthcare, but also non-healthcare-specific sources
- **Implement rational technology decision-making process**
  - Implement Technology Assessment Program
  - Add organized forecasting (aka, horizon-scanning)
  - Forge understanding of the evidence

Is my Technology Adoption consistent with my Strategic and Clinical Priorities?

Figure 2. Adopter Categorization on the Basis of Innovativeness



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D. Berwick,JAMA, April 16, 2003-Vol. 289, No. 15 (Reprinted)

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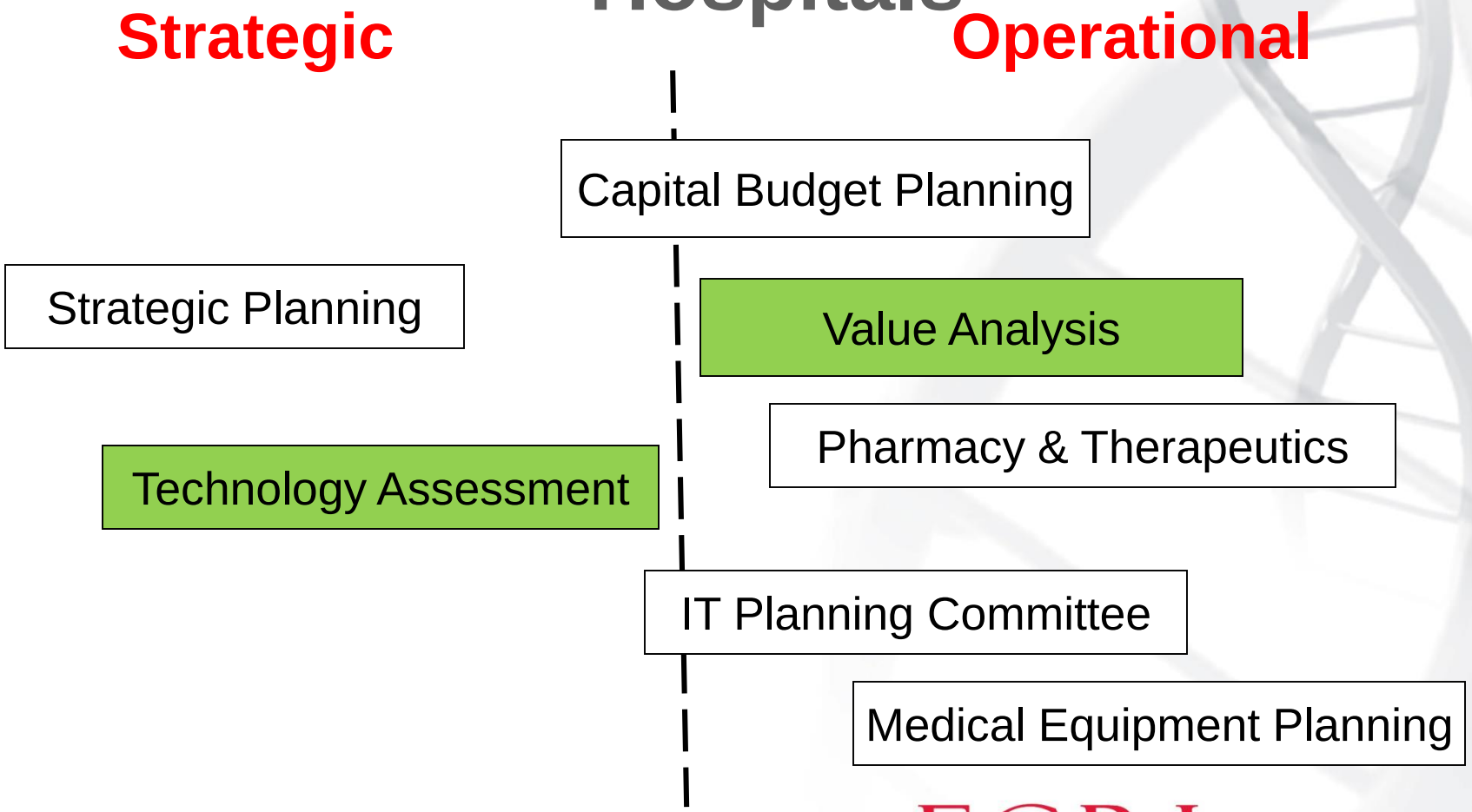
Technology-related Processes in Hospitals



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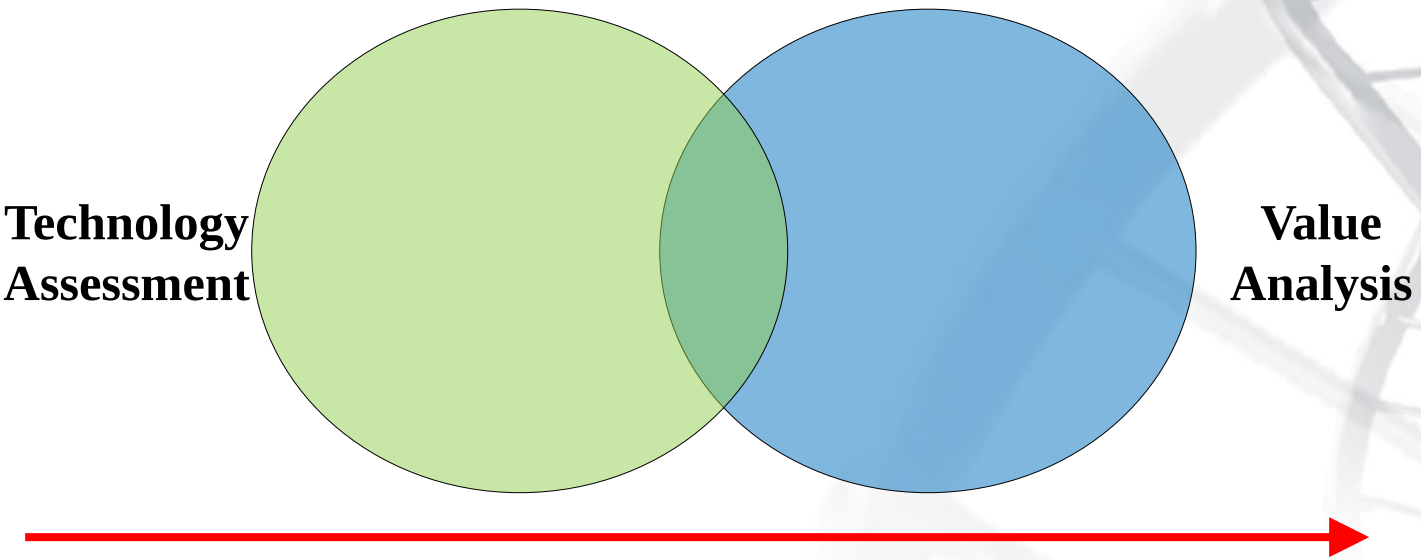
Value Analysis/Technology Assessment Synergy



Strategic

- New & Emerging
- Technology-centric
- Outcome-focus

Operational

- Existing
- Product-centric
- Cost-focus

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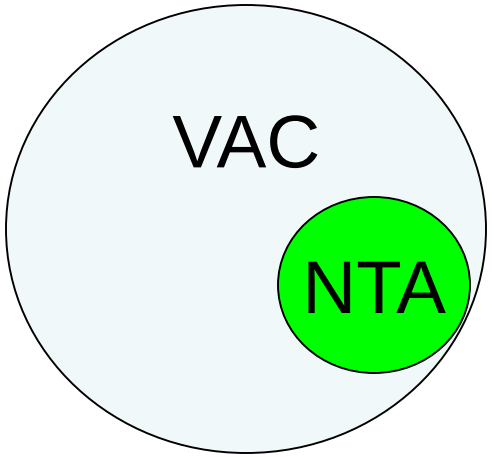
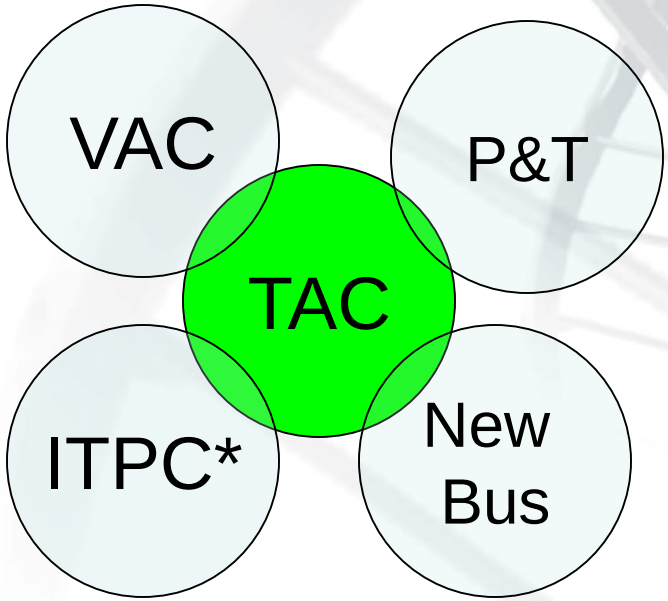
Common TA Models:

New Technology Assessment (NTA) within VAC



Technology Assessment Committee (TAC)



* IT Planning Committee

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Hitting cancer harder…

Protons join the fray.

Roberts Proton Therapy Center (at Penn)

Proton beam radiation therapy vs conventional photon beam

Clinical Trials Currently in Progress…

- **ECRI Institute searches identified 49 ongoing trials of proton beam radiation therapy; 4 of these studies will compare proton therapy to other modalities.**
  - **Loma Linda University is assessing 220 patients with localized liver cancer to determine overall survival using proton therapy or chemoembolization. The study will run from Jan 2009 to Jan 2011.**
  - **M.D. Anderson Cancer Center is assessing 168 patients with localized non-small cell lung cancer to determine whether proton beam radiation therapy reduces the occurrence of treatment-related pneumonitis (TRP) or tumor recurrence. The study will run from Jun 2009 to Jun 2012.**
  - **M.D. Anderson Cancer Center is assessing 126 patients with esophageal or gastroesophageal cancer to determine pathologic response rates and residual cancer in resected specimens. The study was scheduled to run from Apr 2005 to Apr 2010; results have not been published yet.**
  - **The National Cancer Institute and ACR/Proton Radiation Oncology Group are collaborating on a trial to assess 390 patients with localized prostate cancer to determine whether adding high-dose boosts to standard radiation therapy with photons will improve outcomes. Researchers began the study in Jan 1996. Investigators have not specified the trial's end date but presented interim 10-year results at the American Society for Radiation Oncology conference in Nov 2009.**

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Market Diffusion…

- Although proton beam technology was conceived more than 50 years ago, it was restricted to research labs until 1990.
  - Since that time, an estimated 70,000 people have received proton therapy, worldwide.
- At least 33 proton therapy centers are currently in operation worldwide.
  - In November 2010, proton therapy was available at 9 centers in the United States.
- Proponents believe that favorable reimbursement and the development of smaller scale systems could (and should) prompt wider diffusion of this modality.
- Critics support a more cautious approach that limits the diffusion of proton therapy (and reimbursement incentives) to research facilities until more definitive evidence is available.

❖ ***Despite the high cost and quality of current evidence, the number of proton centers in the United States and worldwide is expected to triple by 2013.***

Current diffusion phase: *EARLY Diffusion*

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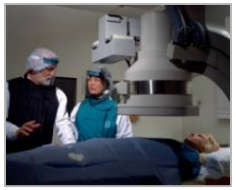
Effect on Other Technologies…

- **Complementary Technologies:**
  - **Proton therapy has been used in conjunction with photon therapy, surgery, and chemotherapy, and as a sole treatment method.**
  - **Researchers have developed two innovations that complement proton therapy: spot scanning and intensity-modulated proton therapy (IMPT).**
    - ✓ ***During spot-scanning (also called pencil beam therapy), numerous high-dose proton spots are superimposed on each other resulting in a 7 mm diameter dose that can be manipulated to conform to the tumor shape. The spot scan has a very precise, tumor-conforming path, the irradiation of which is timed for uniform distribution within the tumor.***
    - ✓ ***During IMPT, both the energy level and intensity of the beam are modulated. IMPT is intended to focus the proton beam even more precisely to specific spots within the tumor, which allows the protons to penetrate the tumor at greater depths and to sweep or paint the tumor from multiple directions rather than from one direction, as occurs during standard proton therapy.***



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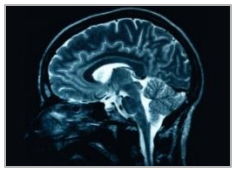
Effect on Other Technologies… (continued)

- **Competing Technologies:**
  - **Proton therapy competes with other modalities used to treat tumors that are irregularly shaped and/or are in close proximity to vital structures.**
  - **Competing technologies include other forms of external-beam radiation therapy (e.g., 3-D conformal radiation therapy, photon-based IMRT, image-guided radiation therapy, stereotactic radiosurgery) and internal radiation therapy (e.g., brachytherapy).**
    - ✓ ***IMRT and 3-D CRT are the main competitors to proton therapy because of their precision.***
    - ✓ ***Both techniques use computerized tomography (CT) scanning and magnetic resonance imaging (MRI) to enhance the visualization of the tumor and normal tissue.***
    - ✓ ***IMRT is more precise than 3-D CRT because each radiation beam's intensity can be adjusted for even greater accuracy.***



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Program Development

- A proton therapy program will have a **substantial impact** on a facility's physical setting, patient throughput, revenue generation, staffing, and maintenance costs.
  - Planners considering proton therapy will need to dedicate significant resources to building and equipping a treatment center.

- The **time** needed for equipment acquisition and construction is substantial.
  - One major vendor is currently projecting a 5-year lead time for delivery of new proton systems.
  - Average construction time is 2-3 years and new system validation can take up to a year.

- Because developing a proton therapy program is extremely **complex**, planners may need to contract with numerous entities, including:

✓ ***Architectural firms***
(site evaluation & design)

✓ ***Construction firms***
(building / renovation)

✓ ***Development firms***
(financial & operational issues)

✓ ***Manufacturers & suppliers***
(primary equipment needs)

✓ ***Medical equipment planners***
(support equipment needs)

✓ ***Private and government sources***
(program funding / research opportunities)

✓ ***Project consultants***
(treatment planning expertise)

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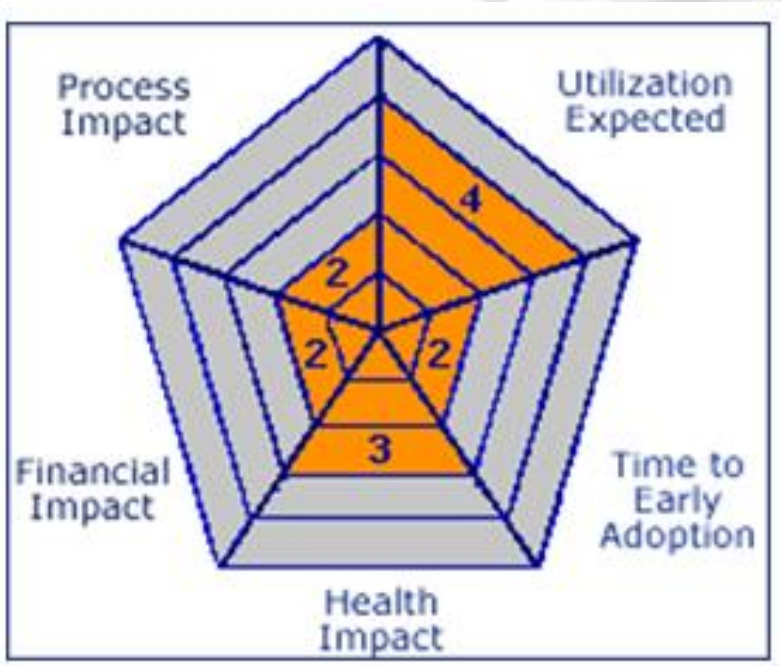
Therapeutic vaccines for colorectal cancer

- **Designed to harness body's immune response**
- **One compound has received fast-track designation from US FDA**
- **3-5 years until early adoption**



https://members2.ecri.org/Components/Forecast/Pages/10656.aspx

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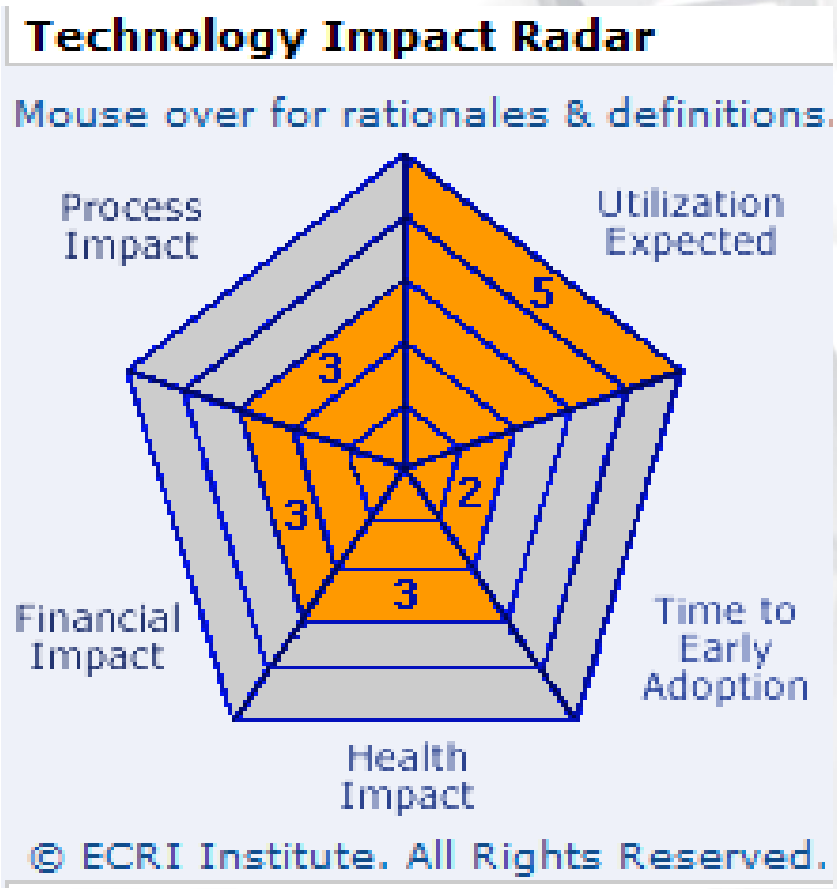
Virtual cancer patient software for selecting optimal chemotherapy

- **“Virtual cancer patient" software is a computer software algorithm that may help oncologists determine personalized chemotherapy regimens.**
- **May avoid the trial-and-error chemotherapy selection methods often used now.**



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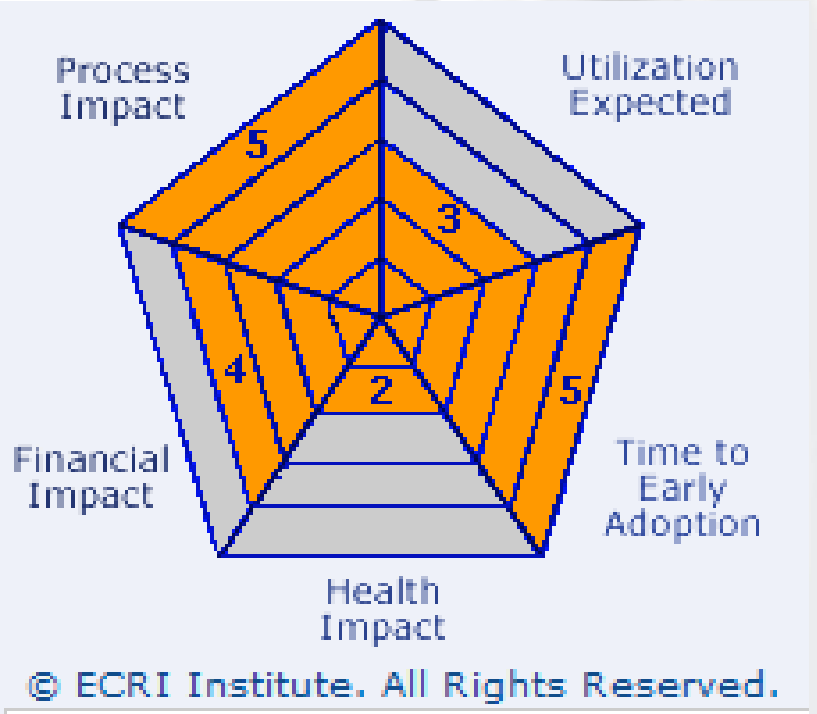
Robot-assisted surgery for all applications

- **Diffusion outpacing clinical evidence and reimbursement**
- **Replacement of 1st Generation Systems**



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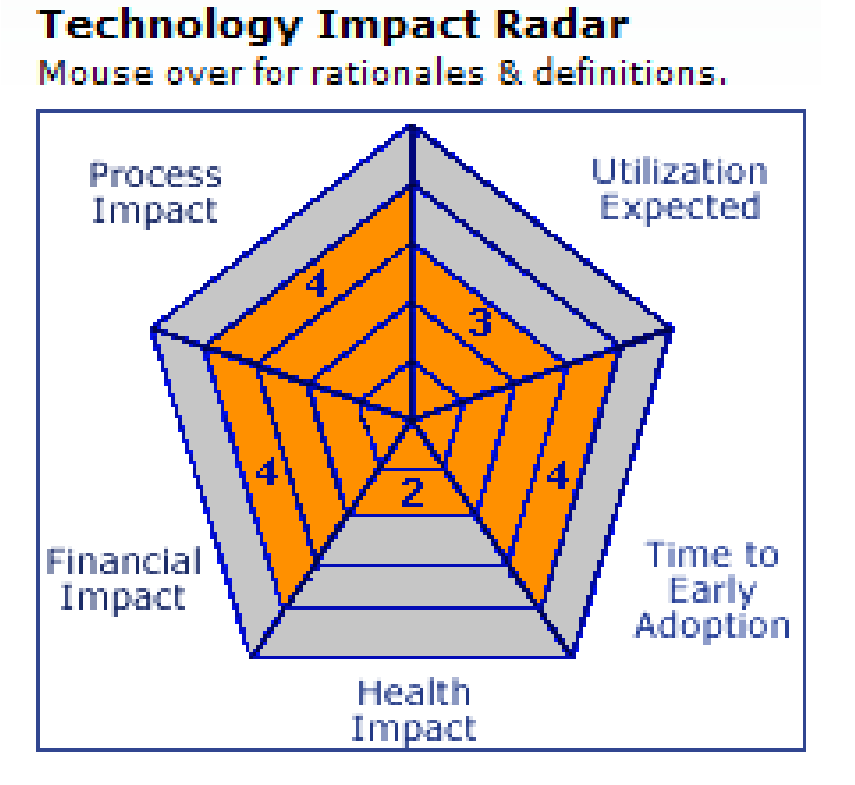
Digital breast tomosynthesis

- **Provides tomographic view –reduces overlapping tissue blurring**
- **May cost 20-60% more than digital mammo**
- **“Tomo-Upgradable” systems available**



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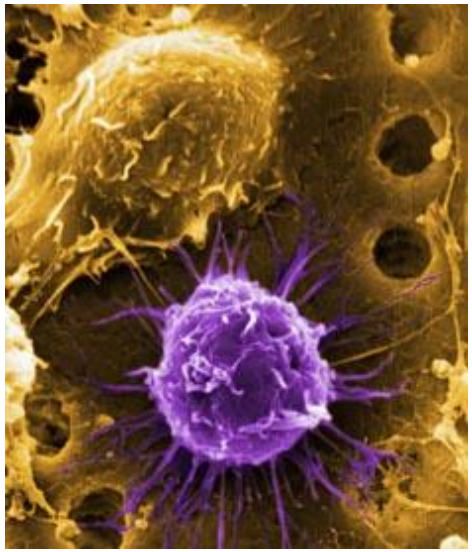
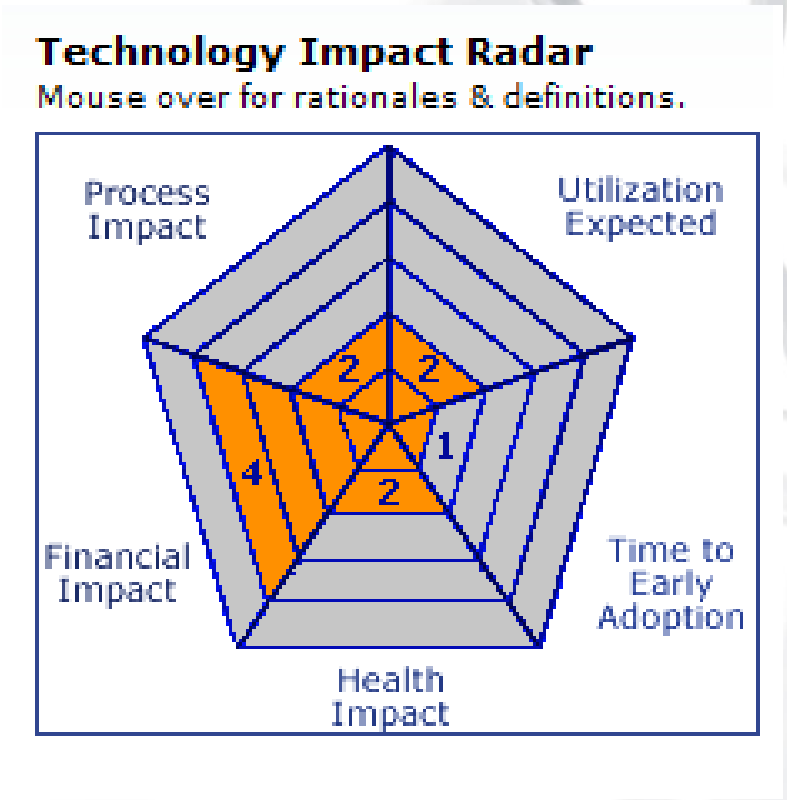
Autologous stem cell cardiomyoplasty

- Much attention given to this technology
- Limited evidence shows small benefit
- Mostly early stage clinical trials





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Hybrid Revolution

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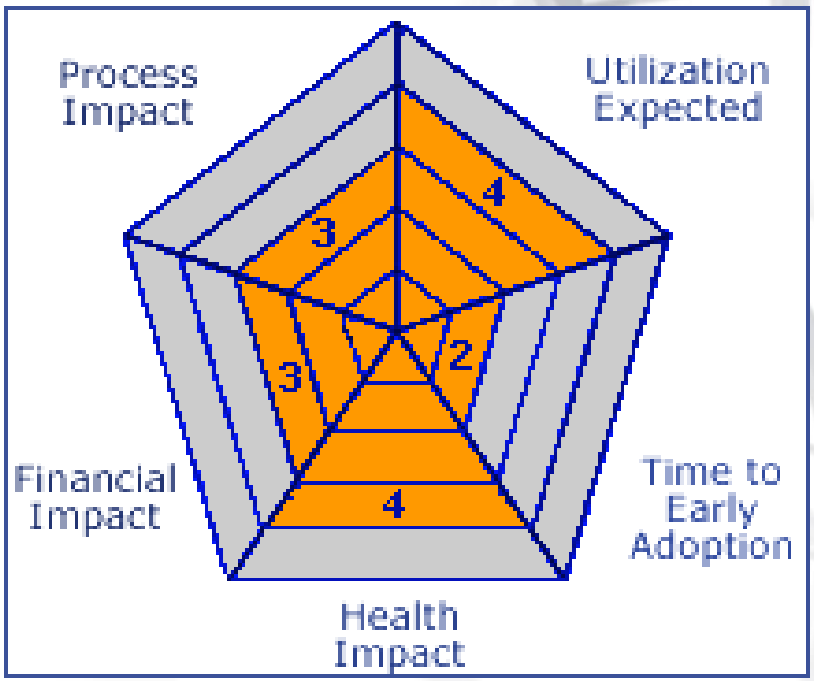
Hybrid Cath Lab/OR - Transcatheter aortic valve replacement

- New option for end-stage heart failure patients
- OR-ready cath labs required
- Similar technology to vascular surgeon Hybrid OR needs



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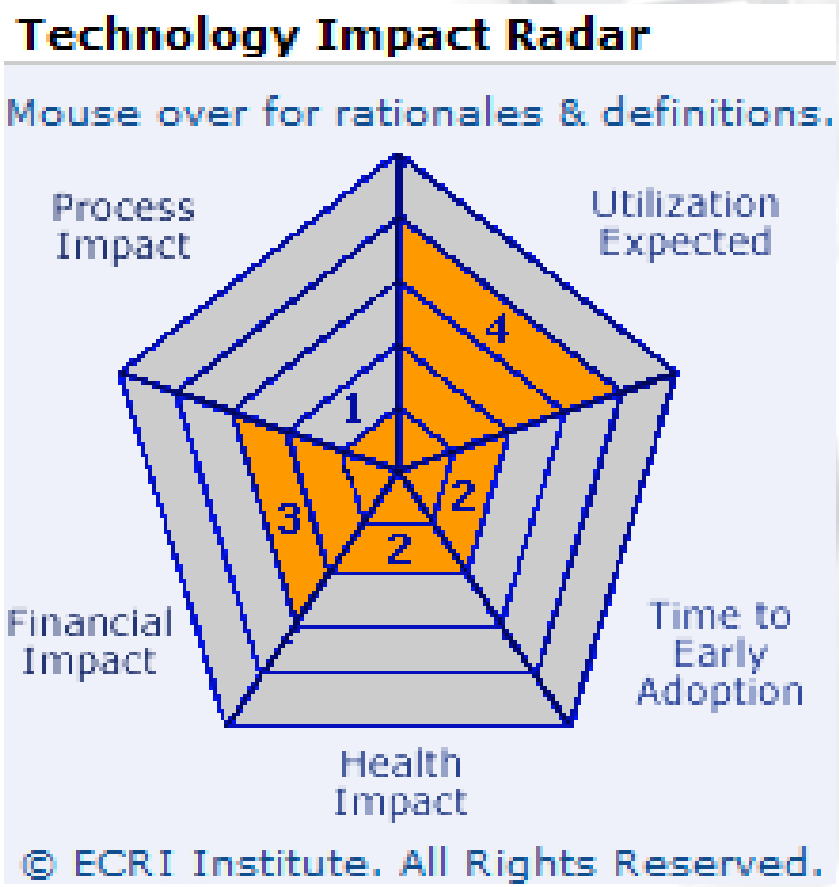
Bioabsorbable stents

- In development
- Stents “disappear” over time after implantation
- May reduce thrombus
- 3-5 years away



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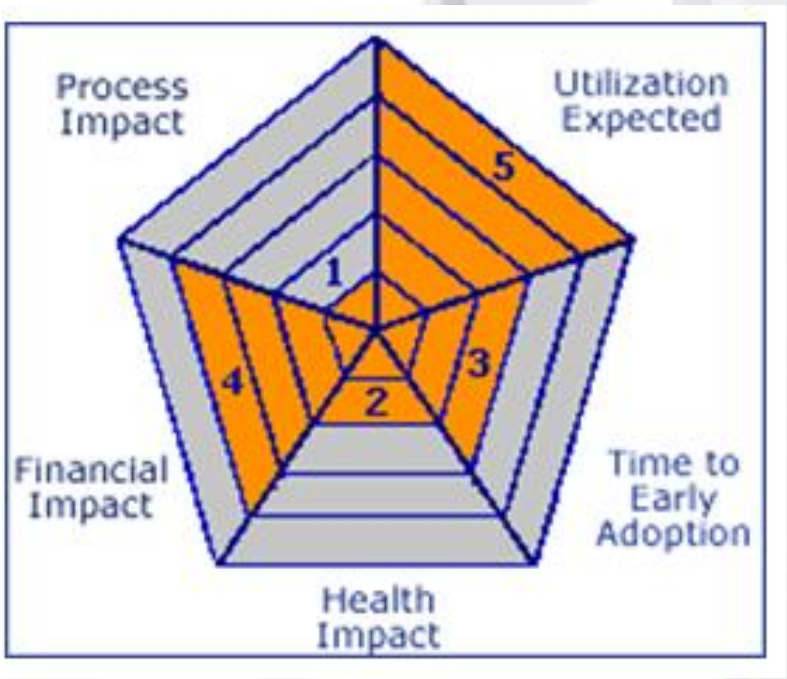
Drug-eluting angioplasty balloons

- Early adoption in 1-3 years
- Could reduce the use of drug-eluting stents
- Several products have approval from European Union



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Thank You