Dr. Alan Russell, Highmark Distinguished Career Professor, CMU
Chief Innovation Officer and Executive Vice President, Allegheny Health Network

The Carnegie Mellon University
Disruptive Health Technology Institute
The Dirty Laundry of Medical Research

30 Years

Idea → Research → Funding → Research → Development → Clinical Trial → Change
Why is bench to bedside so slow?

• Academic Health Care Centers receive most of the investment targeted for bench to bedside research
  – Technology transition is counter-culture
  – No financial incentive to disrupt their own business
  – Tend to focus on long term game changing projects

• The payer community, by choice, almost never participates in inventing the future of health care but instead just complains about the costs
Situation is not unlike the automobile industry in the 1950’s.

How and who drove change in highway safety in the 1960’s?

Insurance Institute for Highway Safety
Learning 50 Year Old Lessons

- Identify a world class innovation engine without medical school politics
- Use data mining and machine learning to identify targets for innovation that will drive down cost and improve outcomes
- Use competition to identify technology-based solutions to targeted areas
- Financially align payers with technology innovation at the outset of the process
Science and engineering that brings transformational improvements in the affordability, accessibility, quality and simplicity of health care solutions.
The Disruptive Health Technology Institute

- For 2013-2014, Times Higher Education ranked CMU #24 in the world, and #17 among U.S. universities.

- In a 2010 WSJ poll, job recruiters ranked CMU #1 in computer science, #4 in finance and #7 in business.

- WSJ ranked CMU #10 overall.

- 4th largest Blue Cross and Blue Shield-affiliated company in US

- 33.5 million customers nationwide

- contributes $78 million for community programs

- 7 hospitals

- Nearly 200 primary care and specialty care practices

- 2,400 licensed beds

- 17,000 employees: 7,400 health care professionals

Carnegie Mellon University

HIGHMARK®

Allegheny Health Network

PARTNERINGFORCURES
Targeting and Accelerating “Bench to Bedside”

- Targeted Concept Design
- SPARK Retreats
- Project & Implementation
The initial first year process targeted innovation in:

- accessibility of medical diagnostics
- behavior change
- chronic disease management

- data mining
- improved endoscopy
- improved diagnostic ultrasound
- infection prevention
### SPARK Retreats: Strategic Planning for disruptive innovation @ AHN, Highmark & CMU

**(updated October 1, 2013)**

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Retreats of interest: Diabetes, Biomaterials and Tissue Engineering for Health Care Cost Reduction, Genomic Pathology, Orphan Diseases, Cell Therapy, Non-healing Wounds.
A Wearable System For Home-monitoring of Chronic Movement Disorders:

- Chronic movement disorder like Parkinson’s disease (PD) costs about $25 billion in the US alone
- Motor impairment assessments during regular clinic visits are costly, inefficient and subjective in nature

PI: Jessica K. Hodgins, CMU

Investigators: Fernando De la Torre, CMU, Abhinav Gupta, CMU, Samarjit Das, CMU, and Michael Ohi, AHN
Enhanced Colonoscopy

Colonoscopies should have the potential to dramatically reduce colon cancer rates and associated deaths. However, studies show that there are high polyp miss rates.

• Develop video analytics for colonoscopy procedures
• Standardize the quality of exam measurements
• Provide real-time feedback to practitioners

PIs: Yang Cai, Director of Visual Intelligence Studio, CyLab, CMU, Shyam Thakkar, Director of Developmental Endoscopy, AHN
Beyond Next Generation ECG & Machine Learning Software

- Develop next generation ECG device to include higher frequency datalogging and analysis
- Develop high density patient electrode interface
- Develop machine learning software capable of detecting and diagnosing heart problems

PI: David Stager, CMU, NREC
**Novel Therapy Targeting Food/Water Poisoning**

**Shiga Toxicosis**
- Bacterial toxin
- Retrograde trafficking avoids host defense
- Causes severe dysentery & kidney failure
- No direct treatment, antibiotics contraindicated
- 150 million annual cases at cost of >$billion

**Mn²⁺ Treatment**
- Blocks toxin trafficking receptor
- Toxin shunted to lysosome & degraded
- Protects lethality in cell culture and mice
- High therapeutic index
- Inexpensive, widely available

Manganese (Mn²⁺) blocks toxin-mediated killing. Mn²⁺ blocks toxin entry into bypass pathway by rerouting the toxin to lysosomes where it is degraded. By this mechanism Mn²⁺ prevents Shiga toxicosis a result of contaminated food outbreaks that plague the food industry, cause tremendous pain, suffering and death, and generate significant health care costs. Bacterial toxins are also a biowarfare threat.

PI: Adam Linstedt, CMU
• The goal of this project is to produce anti-microbial surfaces with renewable activity.

• Use photosensitizer dyes that are activated by red light. Illumination of such dyes yields toxic, short-lived singlet oxygen.

• Red light in particular has good penetration through tissue.

PIs: Aaron Mitchell, Luisa Hiller, and Frederick Lanni, CMU
Scalability

• The same process can be applied to any target
  – The process & participants are the heart of the innovation

• The minefields are not re-established once destroyed
  – IP
  – Speed to deployment

• Crossing the valley of death
  – Load a few wagons
  – Cross at the narrowest point
  – Travel with friends
  – Build a road behind
Currently Partnering for Cures with:

- Patient Advocacy Groups
- Insurance Companies
- Health Care Systems

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