Science and engineering that brings transformational improvements in the affordability, accessibility, quality and simplicity of health care solutions.
A Unique Partnership
Finding the right questions to answer

Deploy @ Highmark Health

Develop @ CMU

SPARK Retreats
<table>
<thead>
<tr>
<th>Diagnostics and new tests</th>
<th>Innovative therapies and medical devices</th>
<th>Improved care delivery</th>
<th>Health care policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac MRI</td>
<td>New tools for combating biofilm based infections</td>
<td>Transplantation</td>
<td>Health care costs and policy</td>
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<tr>
<td>Home health technologies</td>
<td>Tools to assist with vision impairment</td>
<td>Coordinated care delivery</td>
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<td>Enhanced detection of colon cancer</td>
<td>New technologies to alleviate youth trauma</td>
<td>New approaches in palliative care</td>
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<td>Point of care pathology</td>
<td>Next generation biohybrids</td>
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<td>Comprehensive concussion care</td>
<td>Medical robotics in Anesthesiology</td>
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<tr>
<td>Transnasal endoscopy for better outcomes in esophageal cancer</td>
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<td>Medical simulation</td>
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<td>Detecting infections in failed implants with sensors</td>
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<td>Wearable devices</td>
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The Disruptive Innovation Challenge for the Next Decade

Technology that delivers the right care, in the right place, at the right time, at the right cost....enabled by the RIGHT technology
Medicare Benefit Payments, 2013

Where is the “right place”?

Total Medicare Benefit Payments = $583 billion

NOTE: *Consists of Medicare benefit spending on hospice, durable medical equipment, Part B drugs, outpatient dialysis, ambulance, lab services, and other Part B services; also includes the effect of sequestration on spending for Medicare benefits and amounts paid to providers and recovered.

Chart 7-7. Cumulative change in total admissions and total outpatient visits, 1998–2008

- Hospital outpatient service use grew much more rapidly from 1998 to 2008 than inpatient service use. Total hospital outpatient visits increased about 32 percent from 1998 to 2008, while total admissions grew more than 12 percent.
- There were 624 million outpatient visits and nearly 36 million admissions to community hospitals in 2008.
- The cumulative percent change in total outpatient visits increased by 4.4 percentage points from 2007 to 2008, or nearly 21 million visits. This year was the largest single-year increase in the last 10 years.
- The cumulative percent change in inpatient admissions increased by 1.3 percentage points from 2007 to 2008, or more than 400,000 admissions. This increase comes after the slight decline in admissions observed from 2006 to 2007, the first of its kind in at least 15 years.
But most technology development has been targeted to in-hospital settings

1950
- Artificial kidney
- X-Ray
- ECG & Pacemakers
- Antibiotics
- Defibrillator

1960
- Heart valve replacement
- Ultrasound
- Vascular grafts
- Blood analysis

1970
- CT-Scans
- Artificial joints
- Angioplasty
- Endoscopy
- Biological plant/food engineering
- Glucometer

1980
- MRI
- Laser surgery
- Vascular stents
- Recombinant therapeutics
- Pulse oximeter
- iRobot assisted surgery

>1990
- Genomic sequencing and micro arrays
- PET Scanning
- Image-guided surgery
- Health IT
Wearable Technology Vendor Landscape

Fitness and Wellness
- BodyMedia
- Jawbone
- Suunto
- Lark
- Timex
- Zephyr
- Electric

Infotainment
- Samsung
- Sony
- Looxcie
- Martian
- GoPro
- Qualcomm
- Qualcomm
- Motorola
- Google
- Pebble
- Vuzix
- Lumus

Healthcare and Medical
- Dexcom
- Medtronic
- Nonin
- Cardionet
- OrSense
- Cardiac Science
- Proteus
- Corventis
- Starkey
- Lumos
- Avern
- Nuubo
- BioWatch
- Bioning
- InnoVega

Industrial & Military
- Eurotech
- General Dynamics
- Knapp
- SAP
- Quantum3D


IHS Electronics & Media
Wearable Technology
Vendor Landscape

FDA

Carnegie Mellon University
Disruptive Health Technology Institute


IHS Electronics & Media
Success for this retreat

• Identify 2-3 focused initiatives that would be attractive to stakeholders for funding. Identify participants & writers in the focused initiatives.

• Develop 2-3 white papers that can be used to engage partners on those topics. (Months 1-3).

• Engage partners and stakeholders to generate funding for focused initiatives (Months 3-6).

• Launch Projects
Breakout Groups

• Focused on high priority targets
• 90 Minutes
• Groups in Meeting Room (1), Lobby (1), Restaurant (2)
• Identify 5-10 specific sub programs that would attract stakeholders to join and fund our teams
• Create list of team members for each sub-topic and a coordinator
  • Consider topics where CMU produces human capital versus IP in a joint proposed program
• Selected raconteur to report back to group on plan and participants
Breadth or Depth?

- Select areas which many have recognized as important?
  - Fall Prevention
  - Rehabilitation
  - Cardiac Health
  - Mental Health
  - Inducing & Measuring Behavioral Change
  - Compliance/Adherence

- Select niche areas where CMU has unique strength and depth?
  - Computational Health Masters Degree Program with focus in wearable devices
    - Charlotte Emig
M.S. in Computational Health Care

- Interdisciplinary and Intercollegiate Professional Master in Computational Health Care

- 96 credit – 2 year program
  - physical simulation
  - engineering
  - computational modeling
  - virtual reality
  - health care data analytics
  - robotics
Coursework

- **Core Courses**
  - Introduction Course
  - One core course and one elective in 2 of the below focus areas
    - Robotics
    - Medical Simulation and Engineering
    - Data Mining
    - Medical Image Analysis
- **Research Project**
- **Capstone Course** – Innovation in Health Care

<table>
<thead>
<tr>
<th>REQUIREMENTS</th>
<th>Semester 1</th>
<th>Semester 2</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Introduction Course</td>
<td>Elective/Focus Area 1 (12 units)</td>
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<tr>
<td></td>
<td>Computation (12 Units)</td>
<td>Elective/Focus Area 2 (12 units)</td>
</tr>
<tr>
<td></td>
<td>Core Course/Focus Area 1 (12 Units)</td>
<td>Research Project (12 units)</td>
</tr>
<tr>
<td></td>
<td>Core Course /Focus Area 2 (12 Units)</td>
<td>Capstone Course</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Innovation in Health Care (12 units)</td>
</tr>
</tbody>
</table>
• **Development of Academic Plan – Key Considerations:**

  - As students graduate, what is the strength/scope of the job market they are entering? Is it developed enough for specialized Master’s program?
  - Identify direction of the program
  - Consider the global CMU community – other campuses with medical schools, incubators for simulation partnership
  - Identify potential strategic partners outside CMU
    - Student interaction with potential job placement

• **Potential Initial Strategy:**

  - Development of team taught courses to leverage student/faculty interest
    - 1-2 courses either upper undergraduate or graduate

• **Broad Strategy:**

  - Alignment of vision to the mission of CMU’s College of Engineering
  - Engage and discuss with appropriate and interested faculty (Dean, department heads, program directors) for feedback and input.
  - Identify program and curriculum structure
  - Identify target student population
Fall Prevention and Rehabilitation

Location: Restaurant

• Christoforetti
• Akhavan
• Park
• Gilgunn
• Washburn (*)
• Beck
• Emig
Heart
Location: Restaurant

• Lui
• Sokos
• Smailagic
• Stager (*)
• LeJeune
• Zido
• Brusco
Mental Health
Location: Meeting Room

• Nickell
• Hong
• Zhang
• Chang
• Grover
• Miller (*)
• Snider
• Farringdon
• Munsch
Behavior Change

Location: Lobby Seating

- Vinson
- Sahud
- Zimmerman
- Cassell (*)
- Stevens
- Dey
- Sweeney
- Moehle
- Russell