




## Straddling a Medical Device IoT Startup Between Taiwan and the United States - Lessons Learned

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Stanford University

Presentation for CEAS/US-Asia Technology Management Center 4.23.19

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## Financial Disclosure



Dr. Wang is a co-founder and advisor of *MedicusTek*, a medical technology company.

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## Agenda



- Increasing role of technology in healthcare
- Startup straddling between Taiwan and the United States
- *MedicusTek*, a medical device iot startup
- Challenges for healthcare AiOT

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Painting by Sir Luke Fildes "The Doctor" (1891)

## Rise of intensive care units (ICUs)



Retrieved online [https://en.wikipedia.org/wiki/Intensive\\_care\\_unit](https://en.wikipedia.org/wiki/Intensive_care_unit)

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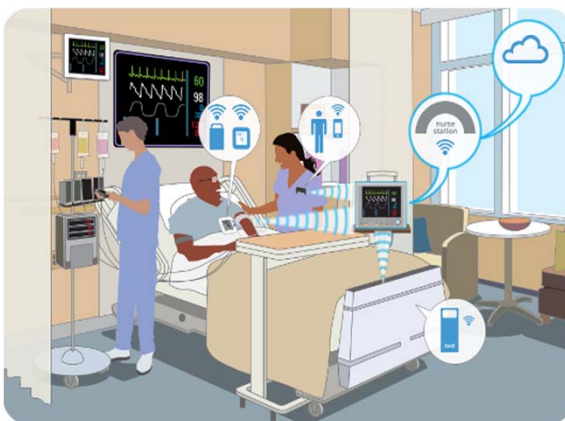
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## The Future of Healthcare is Here



### Connecting

- Hospitals
- Skilled Nursing Facilities
- Assisted Livings
- Homes



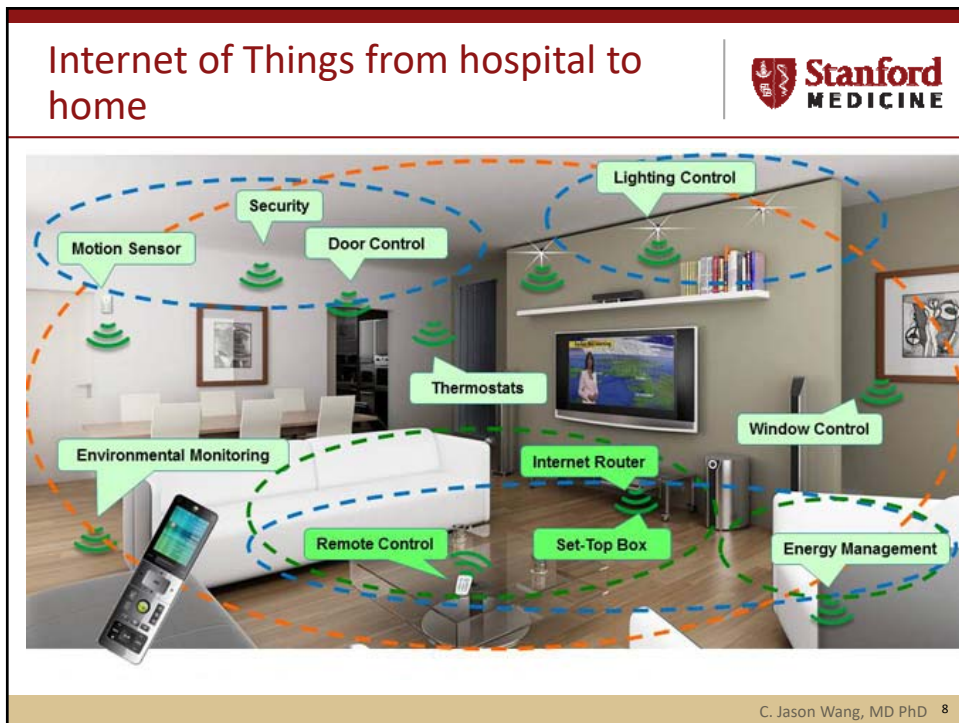
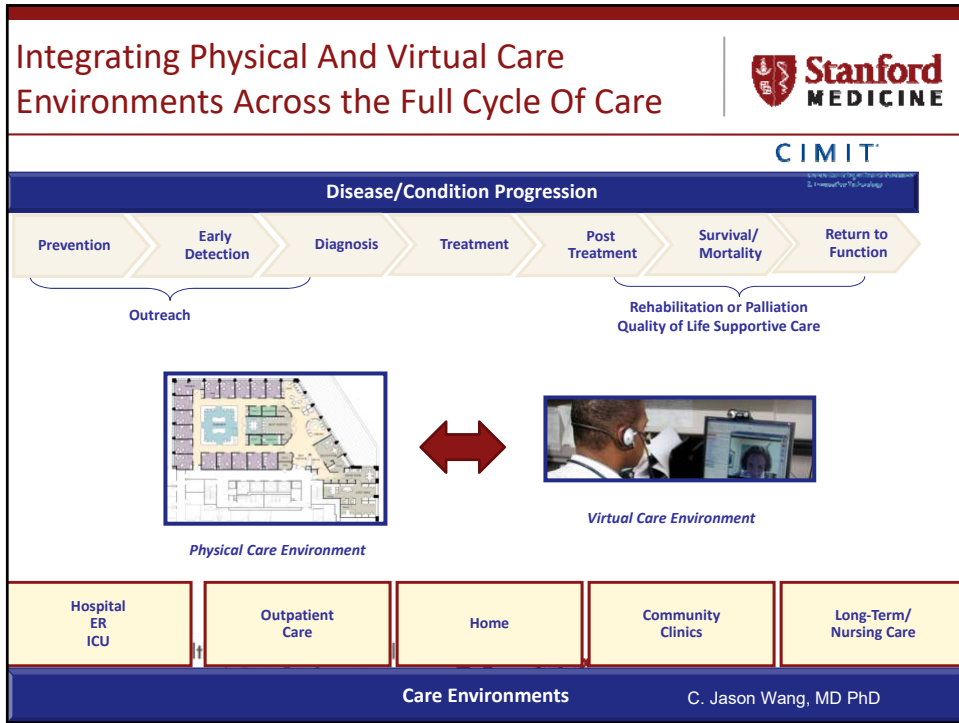
Smart Patient Room

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## Integrating Consumer Technology into Electronic Health Records can be Challenging



*Example: wearables such as Fitbit and Apple Watch*

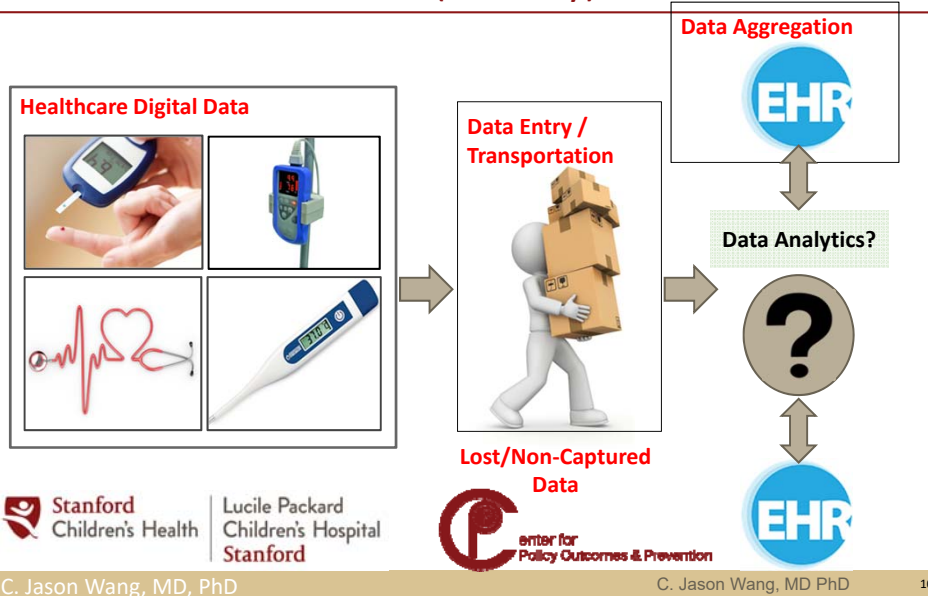
- Data Validity – clinical validity
- Data reliability – measurement reliability
- Over-wired – limited “real estate” for devices; hidden
- Open vs. closed systems
- Missing data or lost data



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## Healthcare Data are Lost with Stand-Alone Medical Devices (Veracity)



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## New Roles of Health Technology



- Data from EHR, mHealth/digital health, and telehealth:
  - Healthcare settings
  - Home
  - Individuals (citizen science)
- Data to be used in:
  - Health care
  - Research (e.g., outcomes)
  - Private sector (e.g., pharmaceuticals)

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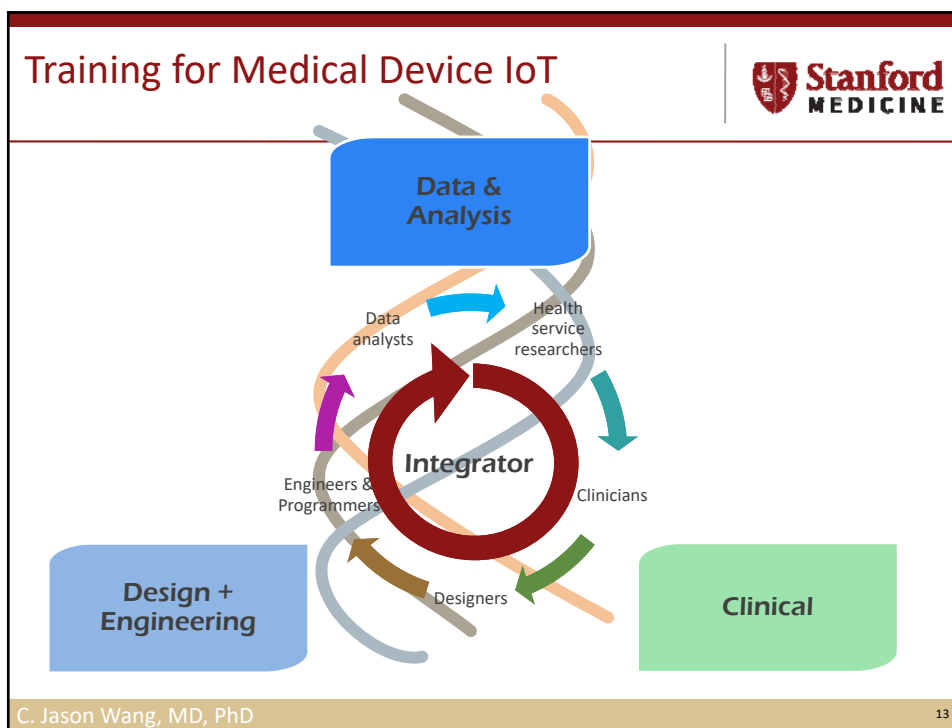
## Technology is a Tool - Contexts and Users are Important



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## Taiwan vs. the United States

**GDP: \$17.3 Trillion USD**  
**Population: 322 Million**




**GDP: \$529 Billion USD**  
**Population: 23 Million**



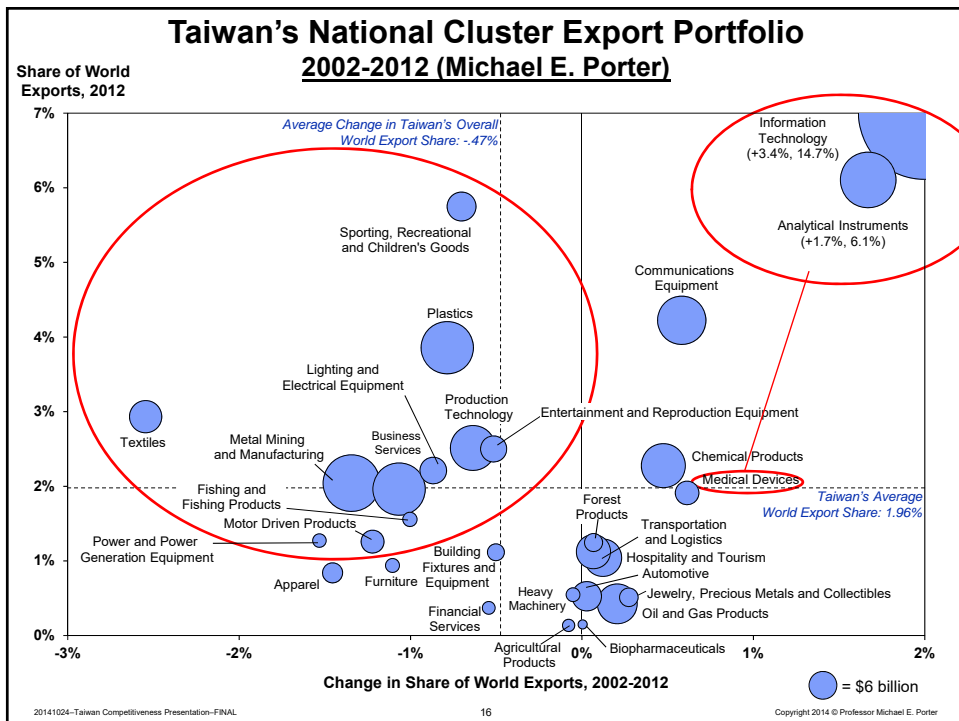


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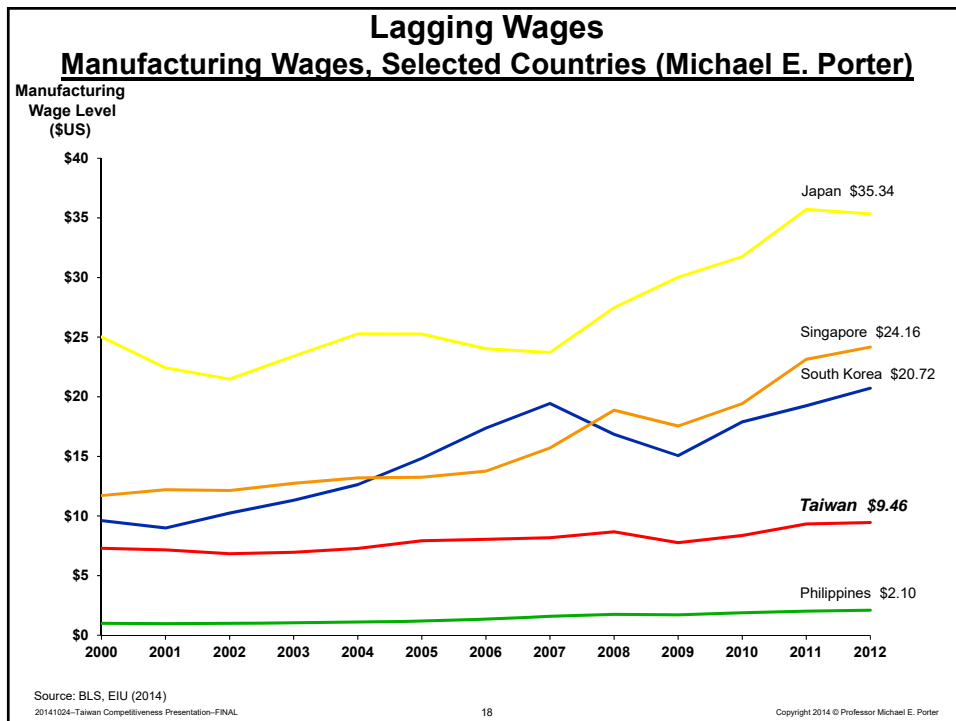
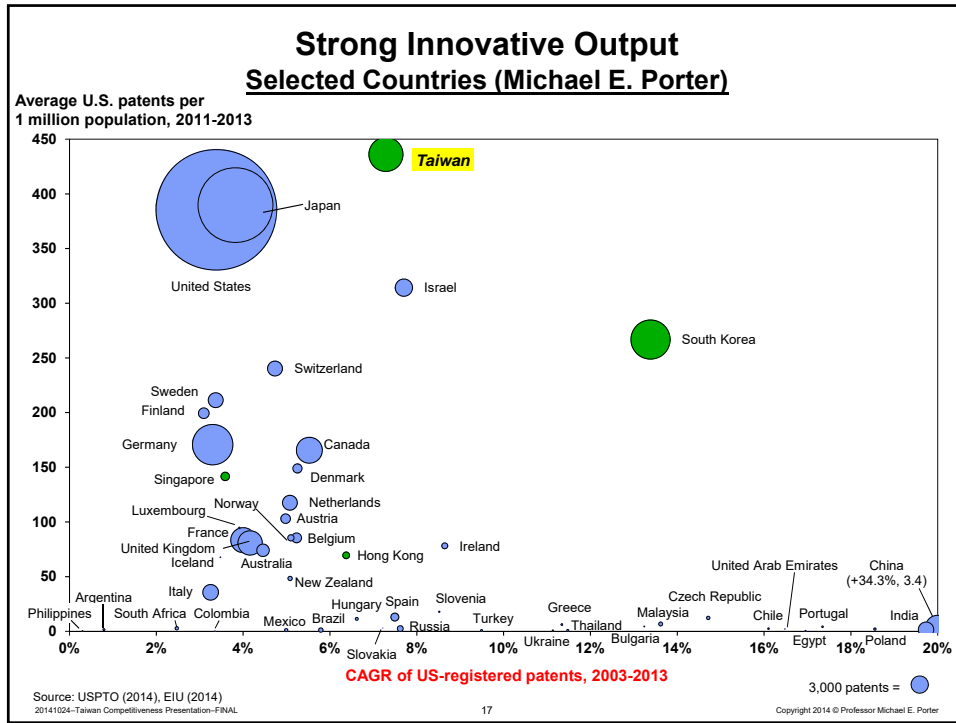


Center for  
Policy Outcomes & Prevention

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## Taiwan's Strengths and Weaknesses (Michael E. Porter)

### Strengths

- Some strong clusters
- Availability of scientists and engineers
- Math and science education
- University-industry research collaboration
- Intense local competition
- Solid IP protection
- Transportation and physical infrastructure

### Companies

- R&D spending

### Weaknesses

- Inefficient legal framework
- Brain drain
- Ability to attract and retain talent
- Doing business costs
- Distortive tax system
- Weak environmental regulations
- High tariffs
- Low prevalence of inward FDI

### Companies

- Professionalism of management
- Extent of staff training

20141024-Taiwan Competitiveness Presentation-FINAL

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## Toward a Taiwanese Economic Strategy What is Unique about Taiwan? (Michael E. Porter)

- **Gateway to China:** Strongest democracy, freedom of speech of any Chinese-speaking country
- Strategic location in the **Asia-Pacific region**
- **Entrepreneurial, flexible** business culture
- **SME** economy
- World class **technology**
- Strong **intellectual property protection**
- Large pool of **researchers**
- Strong **science** and **technology education**, as well as **research** institutions
- Some deep **technology clusters** in related industries
- **Logistics** strengthened in past 10 years
- Strong **outbound FDI**, so far mostly to China

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Companies are visiting Taiwan



Garage<sup>®</sup>

## Startup Global Program Fellow - 8th Batch



01 AMPLYFI - UK	10 Innoviz Technologies - Israel
02 Betalin Therapeutics - Israel	11 Manus Robotics - USA
03 C-Cube - The Netherlands	12 Nanograss Solar - USA
04 Deeplite - Canada	13 Polarr - USA
05 Dessa - Canada	14 TacSense - USA
06 Faromatics SL - Spain	15 ThinkData Works - Canada
07 Hex Technology - Hong Kong	16 TIHIVE TECH - France
08 Hyperion-Core - USA	17 3GSolar Photovoltaics - Israel
09 Incooling - The Netherlands	

Agenda



- Increasing role of technology in healthcare
- Startup straddling between Taiwan and the United States
- **MedicusTek**, a medical device iot startup
- Challenges for healthcare AiOT

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## Outline

- Who we are
- What problems are we solving?
- What is our competitive advantage?
- Evidence that our solution works
- Our market strategy and partnerships
- Our leadership team and advisors
- Investment opportunity


## About MedicusTek




**MedicusTek** was founded in 2012 by doctors and engineers from MIT/Harvard/Stanford and Taiwan



**Vision**  
Integrate technology for safer care environments




**Mission**  
Develop effective products to provide useful information for better healthcare

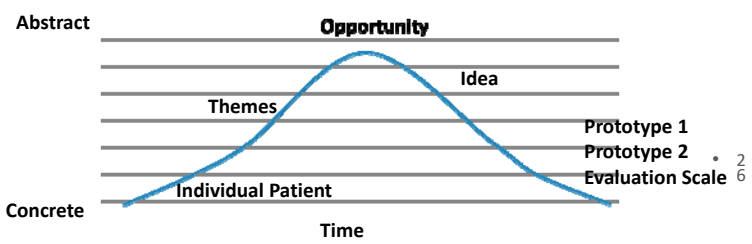


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## Clinician Driven Innovation



- Step 1
  - What is desired outcome?
  - Who is end user?
- Step 2
  - Process




Source: Barry Zuckerman, MD

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## MedicusTek Sensable® Care System Addresses Important Problems in Healthcare


**In-Hospital Falls**



**1 million**  
patient falls  
in hospitals each year<sup>1</sup>


**60-70%**  
are bedside falls<sup>2</sup>

**Pressure Injuries**








**2.5 million**  
patients affected  
each year<sup>3</sup>

**60-80%**  
acquired in the  
hospital<sup>4</sup>


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## Falls and Pressure Ulcers are Costly to the US Healthcare System: preventable conditions not reimbursed by CMS – hospitals are responsible for costs

Fall Liabilities	Pressure Injury/Ulcer Liabilities
 <p><b>\$34 billion</b> direct cost to treat falls each year<sup>1</sup></p>	 <p><b>\$9-12 billion</b> cost to treat hospital-acquired PIs each year<sup>5</sup></p>
 <p><b>\$14,000</b> avg. cost of fall with injury<sup>2</sup></p>	 <p><b>\$43,000</b> avg. cost of hospital stay per PI<sup>5</sup></p>


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## Most Existing Bed Alarms Are from 1970s: Can 21<sup>st</sup> century technology address these issues?



- Old sensor not aligned
- Often cries wolf
- Nurse alarm fatigue
- No time to react
- Sitters still required

“...is any hospital or nursing home so well-staffed that someone can materialize within seconds [for old sensors]?”  
- NYTimes

## Product development based on users' and customers' needs



### We are all DESIGNERS!



## Anthropologic Studies



 MedicusTek

## Human-Centered Design



 MedicusTek



## Rapid Prototyping



## Onsite User Experience Testing



# Prototyping



## MedicusTek's Sensable®Care Can Prevent Falls from Bed Using an Predictive Algorithm with IoT

Easy to Use: Only 15 Minutes of Training Needed



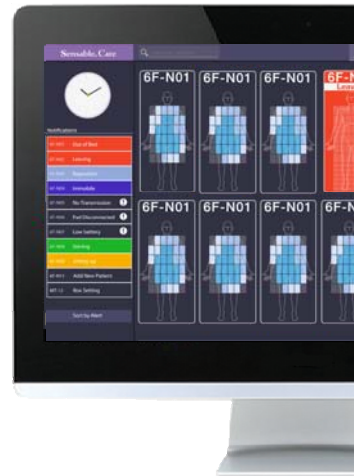
- Bluetooth
- Wi-Fi
- Ethernet



- Sensor Pad



- Apple iOS
- Android



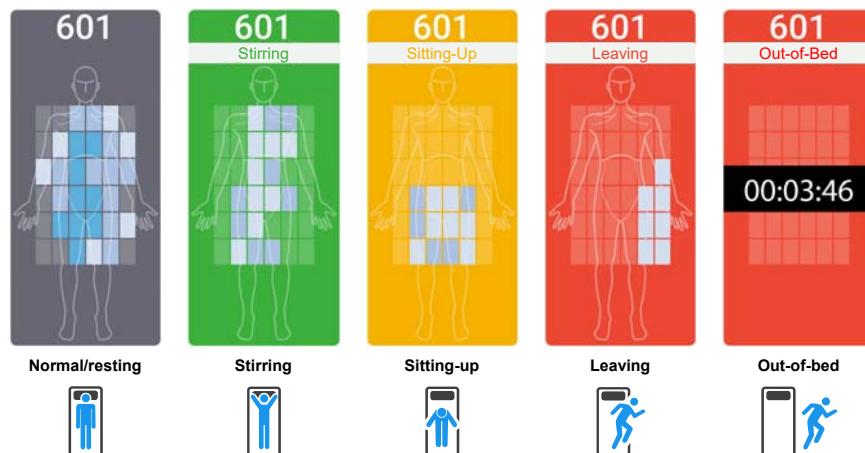
## Sensable®Care Predicts Bed Falls

~45 seconds of lead time before a patient bed exit



## Sensable®Care Alerts are Actionable

Intelligent Bed Leaving Algorithm



Studies show that 3 out of 4 Sensable®Care alerts are actionable which can decrease false alarms

## Sensable®Care's Central Monitor in Nursing Station

Real-Time "Birds-Eye" Monitoring of Patient Population

39 **MedicusRisk** Can monitor up to 30 beds per dashboard 39

## Sensable®Care Saves Money

Yields dramatic **cost savings**:

- Decrease sitter costs
- Reduce need for employees to monitor system
- Decrease patient length of stay due to falls
- Improve financial results due to risk avoidance
- Improve staff efficiency
- **Decrease incidence of falls/pressure injuries**



## Sensible® Care Fall Reduction Evidence

MedicusTek Products Used in a Variety of Healthcare Facilities

- 12,500+ patient days of data in the US & Taiwan
- 0 falls during US hospital trials
- 0.9 falls per 1,000 patient-days (MedicusTek) compared to US average of 3 to 12 falls per patient-days\*
- 1 journal publication for US fall prevention trial



Lahey Hospital and Medical Center

Kaiser Permanente Downey Medical Center

Clement Manor Nursing Home

\* Assume average of 5 falls per 1,000 patient-days (0.5%), a 200 bed hospital will have on average 1 fall per day

## Lahey Hospital Trial Had No Falls: Published in Peer-Reviewed Journal

Journal for Medical Internet Research

JOURNAL OF MEDICAL INTERNET RESEARCH Balaguera et al

Original Paper

Using a Medical Intranet of Things System to Prevent Bed Falls in an Acute Care Hospital: A Pilot Study

Henri U Balaguera<sup>1,2</sup>, MD; Diana Wise<sup>3</sup>, Chun Yin Ng<sup>3</sup>, MBA, MPH; Han-Wen Tso<sup>4</sup>, PhD; Wan-Lin Chiang<sup>4</sup>, MS; Aimee M Hutchinson<sup>1</sup>, MSN, RN; Tracy Galvin<sup>1</sup>, MSN; Lee Hilborne<sup>5</sup>, MD, MPH; Cathy Hoffman<sup>1</sup>, MHA; Chi-Cheng Huang<sup>1,2</sup>, MD; C. Jason Wang<sup>6</sup>, MD, PhD

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<sup>3</sup>MedicusTek USA Corporation, Newport Beach, CA, United States

<sup>4</sup>MedicusTek, Inc., Taipei, Taiwan

<sup>5</sup>David Geffen School of Medicine at UCLA, Department of Pathology and Laboratory Medicine, Los Angeles, CA, United States

<sup>6</sup>Stanford University School of Medicine, Stanford, CA, United States

Corresponding Author:

Henri U Balaguera, MD

Lahey Hospital and Medical Center

0 falls

- 35 bed med-surg ward
- 1 year clinical trial
- 234 patient-days
- Lahey Hospital outside Boston

"It allows us to learn more about our patients' behavior which in turn allows us to provide better care."

- Lahey Nurse Manager

## Kaiser Permanente Trial

Hospital Trial in 2017



# 0 falls

- 32 bed telemetry ward
- 3-month clinical trial
- 300 patient-days
- Downey Medical Center near LA

**“Our existing system alarmed frequently. Sensable®Care helps with alarm fatigue.”**

- Kaiser Permanente Nurse

## MedicusTek Value proposition

Average cost-savings for hospitals from reduced falls

# ↑ 450% ROI

## MD&M West 2017 Innovation Prize Winner

Awarded Out of 2000+ Vendors



MedicusTek wins the Medical Device & Manufacturing West 2017 Innovation Prize for its SensableCare System!



The prize is given to the most innovative new product, service, or technology at the **world's largest annual Medtech event.**



This year's award **recognizes MedicusTek's approach** to improving patient safety, lowering costs, and streamlining work processes by harnessing technology to reduce bed falls and pressure injuries in hospitals and nursing homes.

## 2017 National Innovation Award, Taiwan



With former Premier of Taiwan, Dr. Simon Chang (also former Google Executive)

Four cofounders:  
Jonathan, Kevin, Jason and Tony (Left to Right)



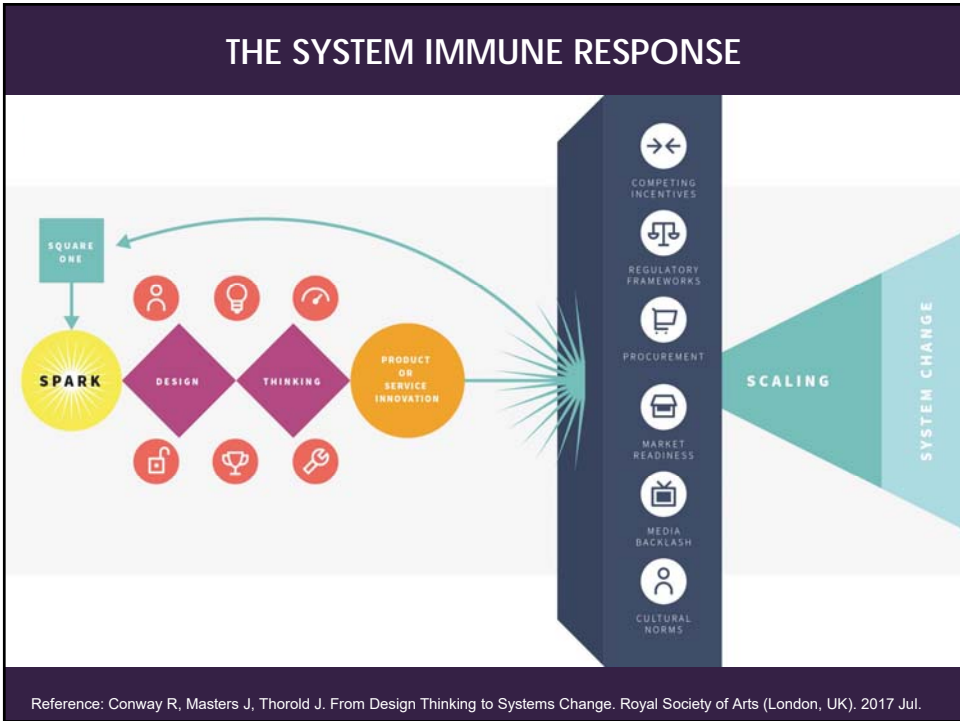
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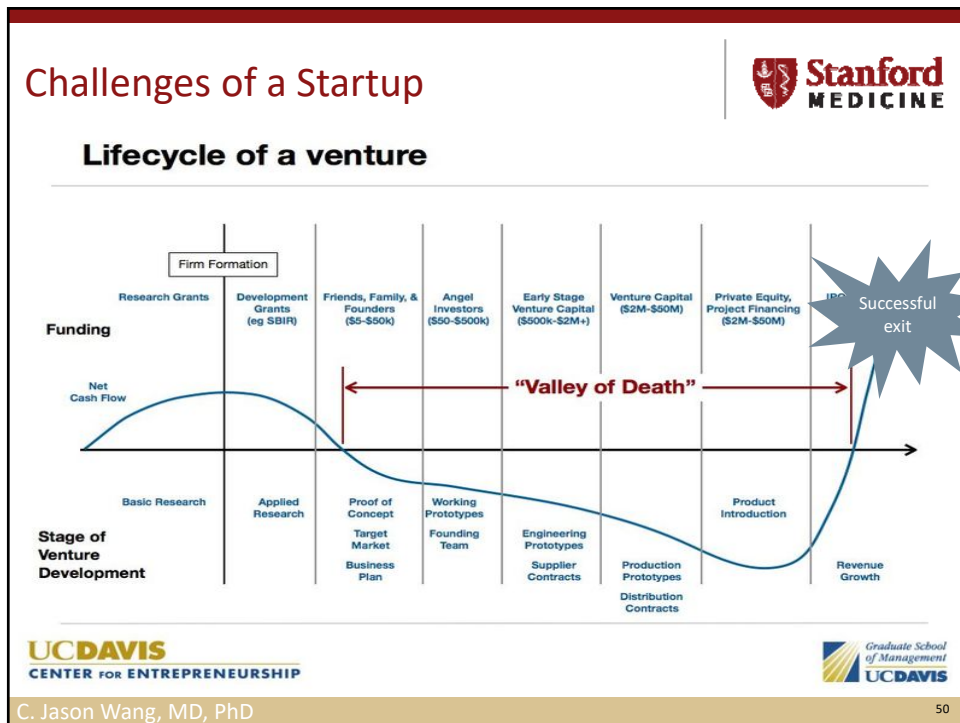
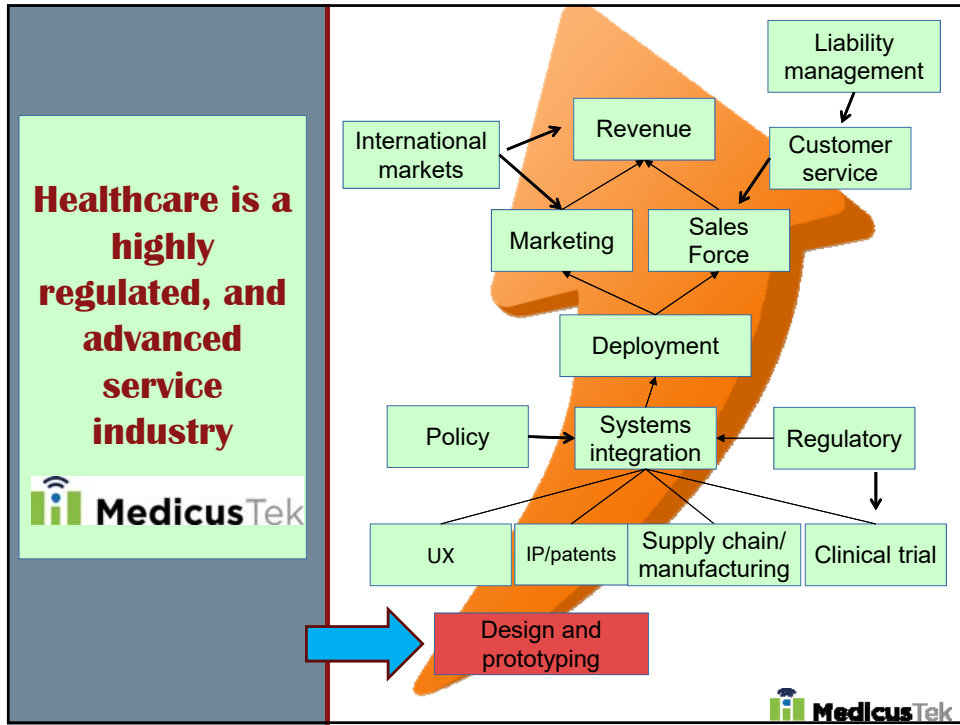
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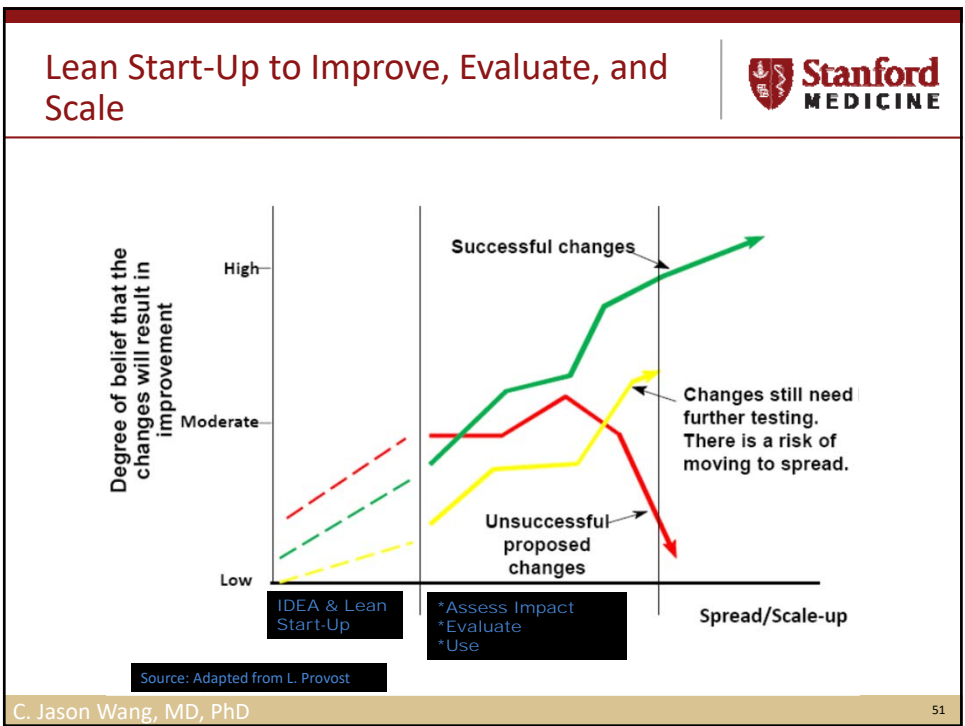
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Reference: Conway R, Masters J, Thorold J. From Design Thinking to Systems Change. Royal Society of Arts (London, UK). 2017 Jul.





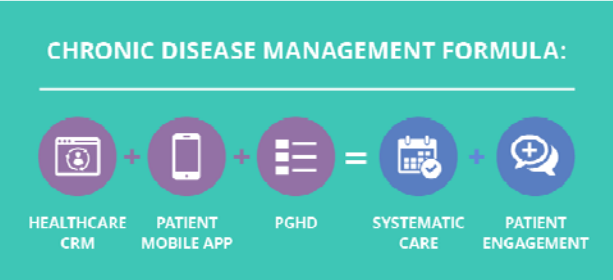


## Connecting EHRs and mHealth apps may lead to improved patient care



- Patients believe it is important to have access to their data electronically<sup>1</sup>
- mHealth application download and usage is expected to rise in the future<sup>2</sup>, and large amounts of data are collected from new sources
- Integration of mHealth applications with EHRs can allow providers to better understand patient’s daily life to provide improved care and engagement

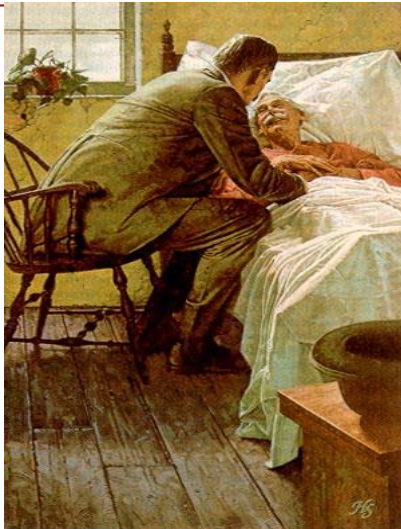
**CHRONIC DISEASE MANAGEMENT FORMULA:**



<https://www.scnsoft.com/blog/techrun-chronic-disease-management-model-when-caregivers-do-care>

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Thank you



“We shall not cease from exploration,  
and the end of all our exploring will  
be to arrive where we started and  
know the place for the first time.”  
T. S. Eliot

Painting by John Howard Sanden "Dr. Osler in the Almshouse" retrieved online <http://e.367art.net/final.asp?id=2819&page=3>

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# BACKUP SLIDES



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