

Technology's Promise & Failure in Preventing Readmissions

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in the Interest of Society (CITRIS) @ UC Berkeley.

National Medicare Readmissions Summit, Washington, DC
June 7, 2010

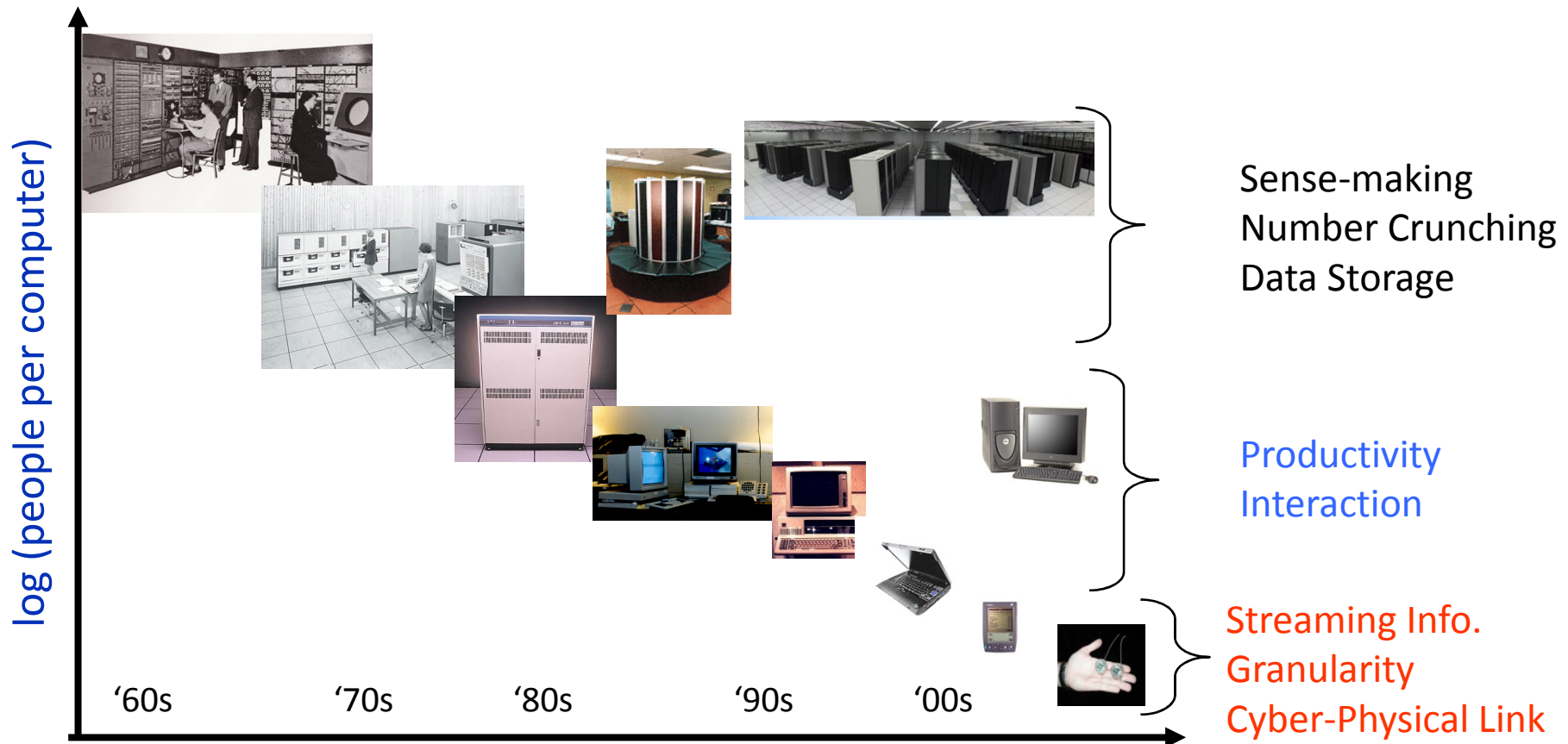
Agenda

- Disclosures
- Readmissions and its causes
 - Use CHF as example
- Trends
- Technology and its role
- Examples
- Q&A, time permitting

Disclosures

- Chief Strategist, 360Fresh, Inc. & co-founder
 - *semantic mining of medical records*
 - *predict risk of non-adherence, readmission, clinical deterioration, adverse care trajectory...*
- Co-founder of CalRHIO
 - *health information exchange (HIE)*
- UC Berkeley/CITRIS
- BOD of Lumetra Health Solutions
- BOA California Telehealth Network (CTN)
 - *State-wide broadband Telehealth project in California*

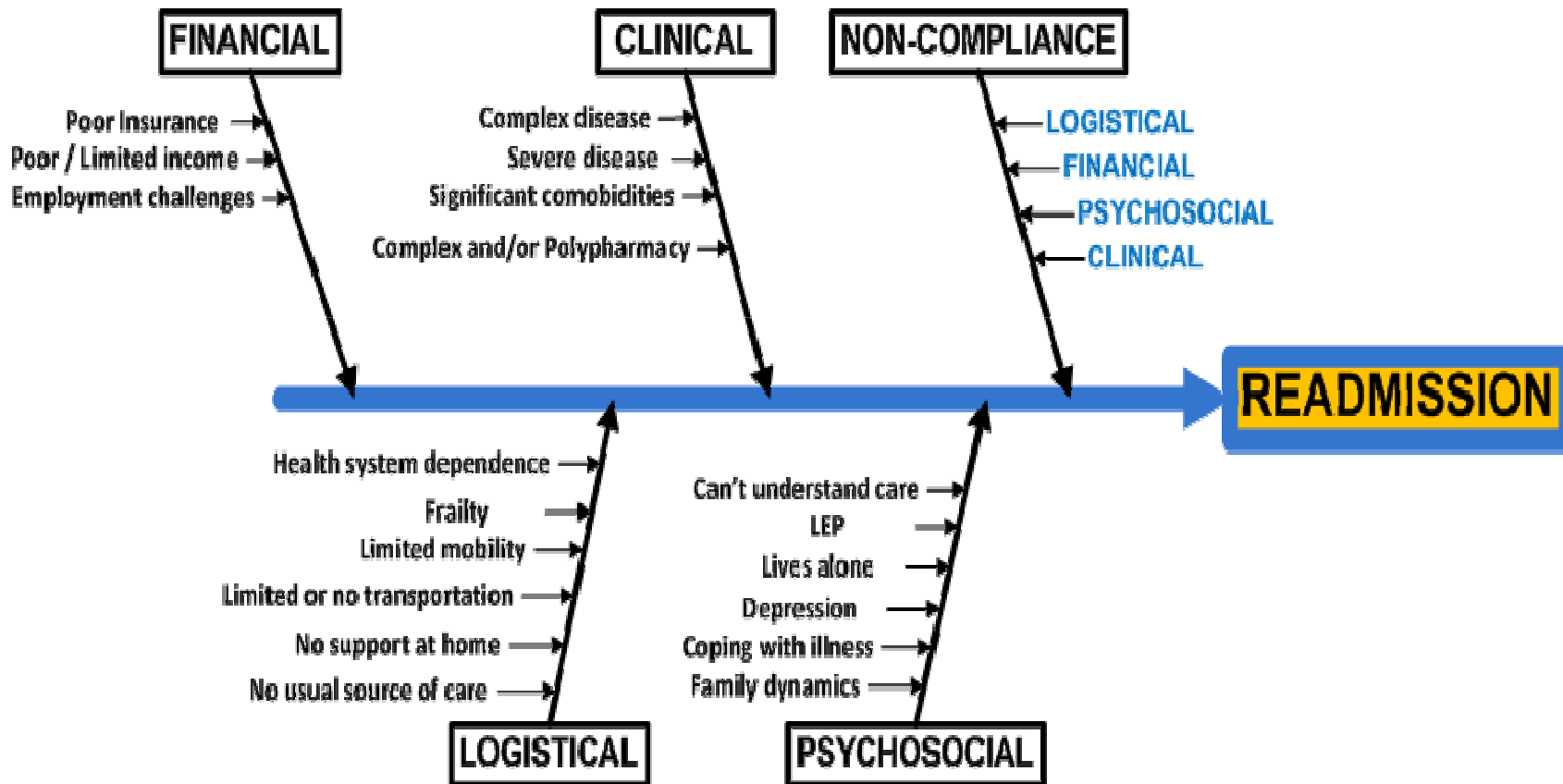
Underlying Trends: Bell's Law – New computer class every 10 years



- Enabled by technological opportunities & advances
- Smaller, more numerous and more intimately connected
- Ultimately used in many ways not previously imagined
- Ushers in a new kinds of applications, capabilities, and **services**

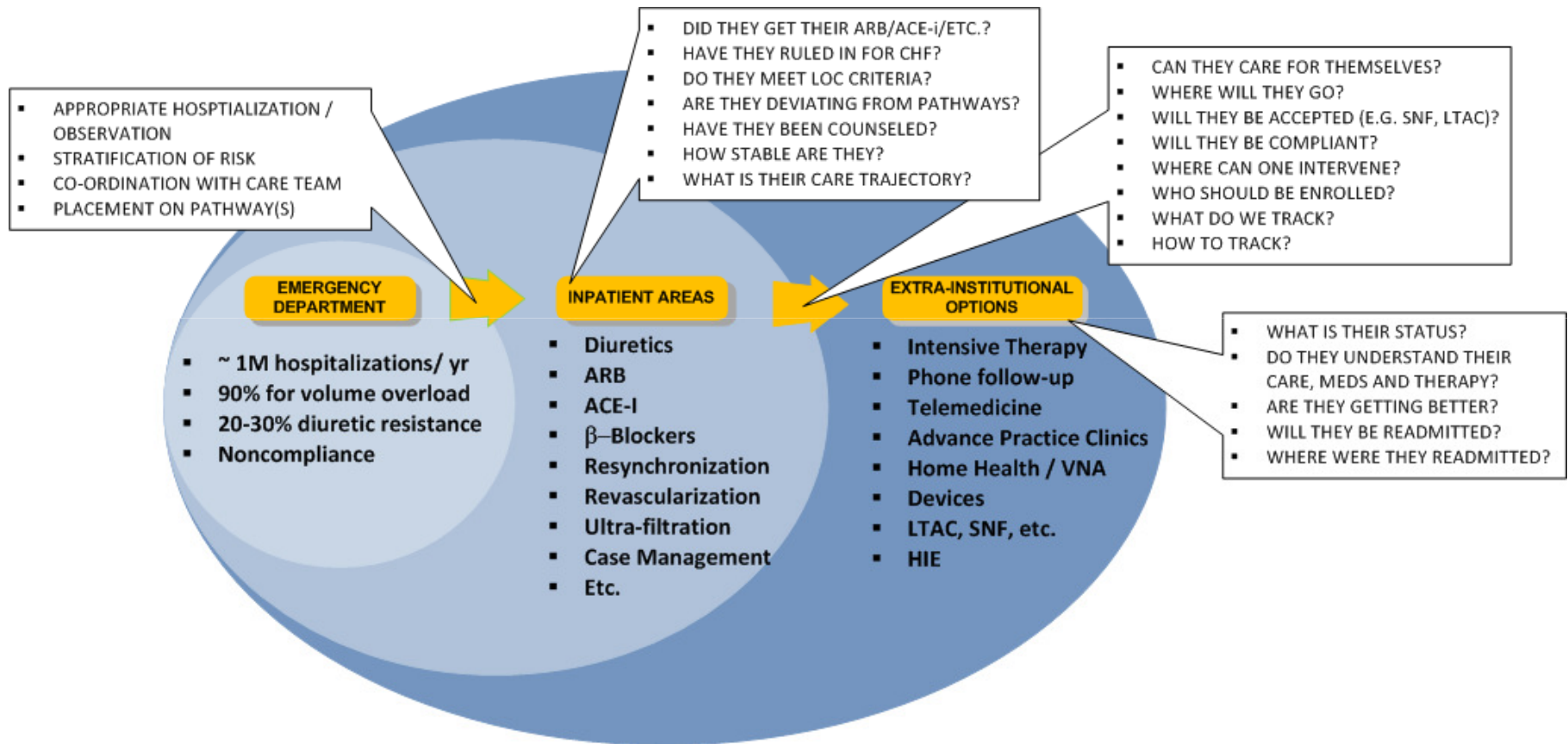
Complexity of Re-admissions

(not exhaustive!)



Int J Cardiol. 2008 Apr 10;125(2):220-31. Epub 2007 Jul 26. High impact of depression in heart failure: Early diagnosis and treatment options

Complex process of care (e.g. case of CHF)



Case Study: Admitting Diagnosis

Readmissions, Care Setting, and the Role of Technology



▪ ANALYTICS

- EMR
- DIAGNOSTICS
- HIEs

▪ ANALYTICS

- EMR
- DIAGNOSTICS
- MEDICAL DEVICES
- TELEMEDICINE

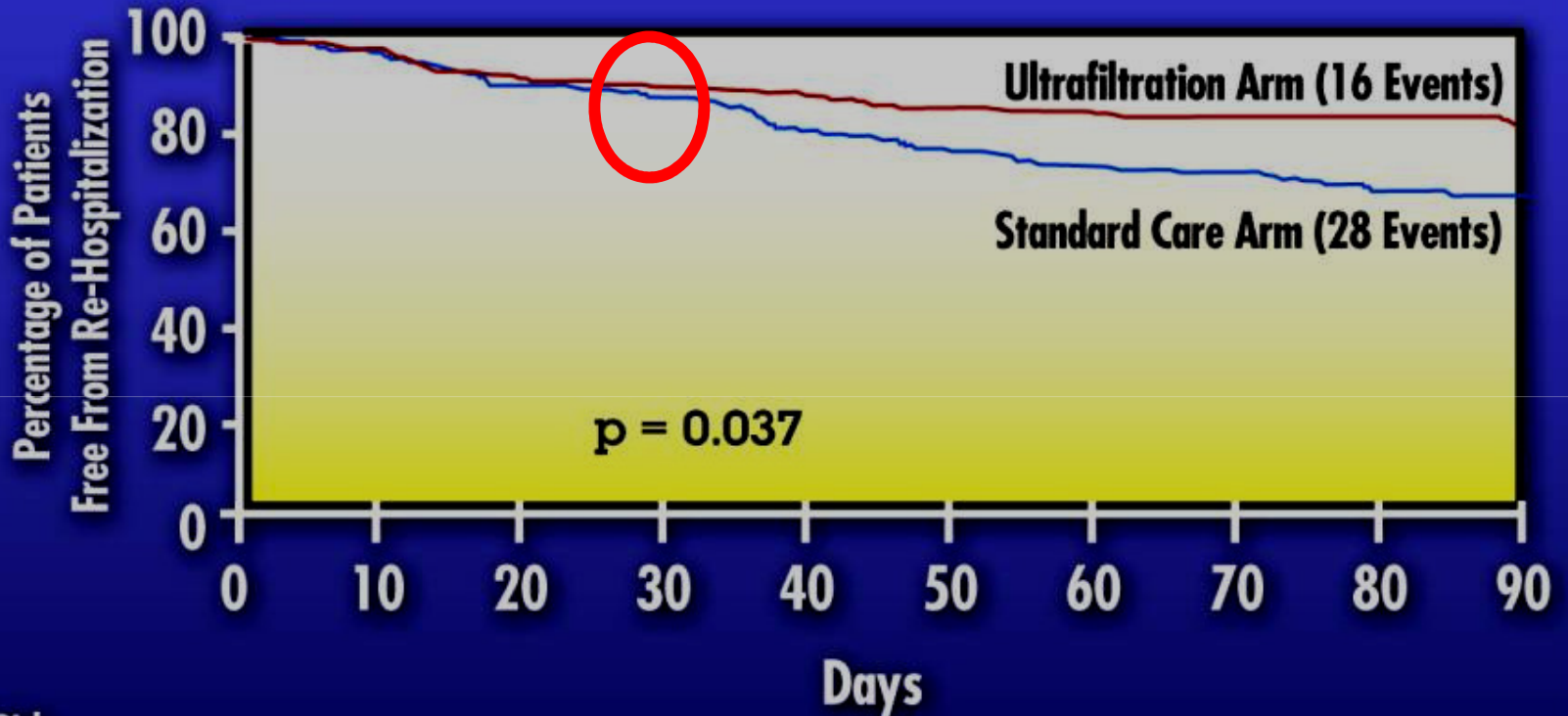
▪ ANALYTICS

- CARE MODELS
- HOME HEALTH
- HIEs
- MEDICAL DEVICES
- MOBILE DEVICES
- RPM / TELE-CARE
- SELF CARE
- SERVICE MODELS
- SOCIAL MEDIA

The Role of Medical Devices



**AQUADIX
SYSTEM**



No. Patients at Risk

Ultrafiltration Arm	88	85	80	77	75	72	70	66	64	45
Standard Care Arm	86	83	77	74	66	63	59	58	52	41

Technology: Remote Care Today

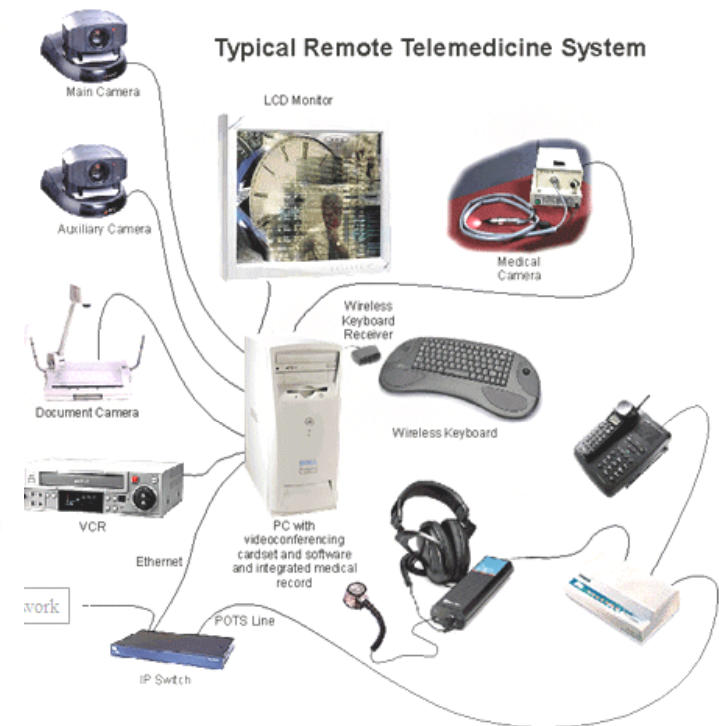
- Remote, but tethered
- Extension of sight & sound
- All care at the device
- Challenging workflow
- Limited “presence”
- Low knowledge mobilization
- No analytics
- No context sensitivity
- Scaling problems



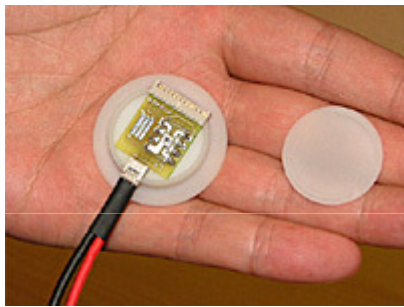
Tandberg



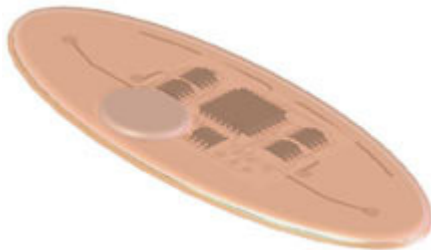
InTouch Health



Emerging Technology: Devices + Mobility



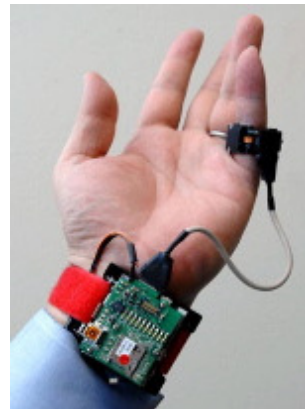
Triage Wireless (Sotera now).



Philometron "smart patch"
(Source: MIT Technology Review)



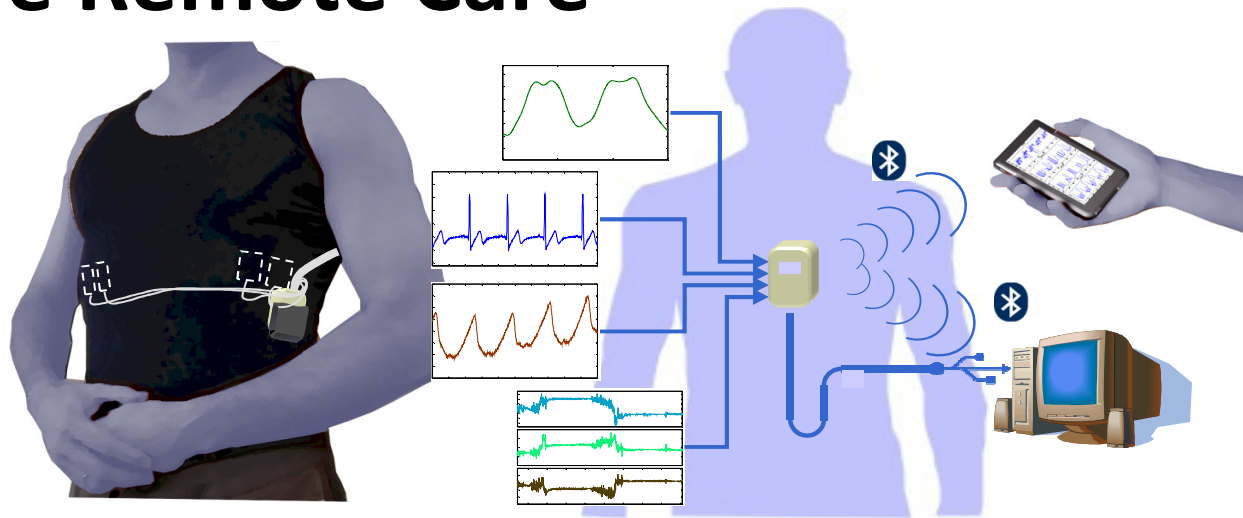
HealthPia



Cuff-less, Continuous
BP monitor
Dr. Harry Asada, MIT

- activity level
- apnea
- balance
- blood pressure (continuous)
- blood pressure (noninvasive)
- caloric intake
- communication
- FEV1 /spirometry
- fluid status
- glucose & HbA1C
- heart sounds
- location
- medication compliance
- metabolism
- oximetry
- pollen
- respiratory rate
- sleep phases
- sleep quality
- vital signs

More Remote Care



VG-Bioinformatics



Proteus Biomedical (Raisin).

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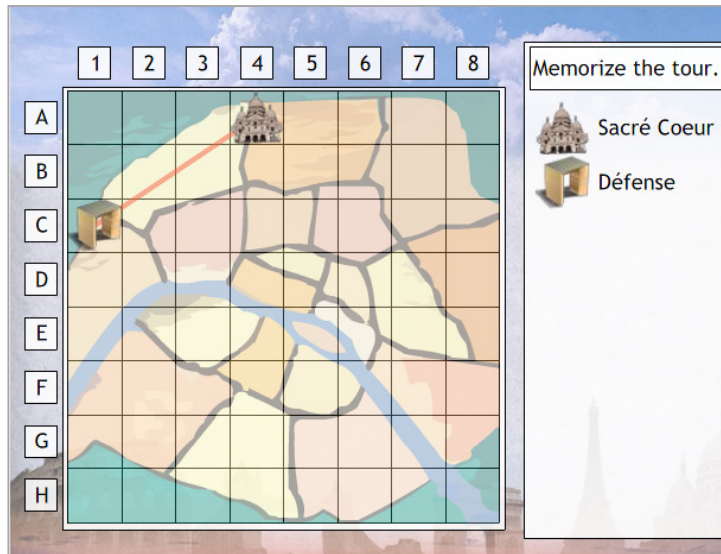
CardioNET, Inc.

Serious Games for Health Behavior

Brain Health, Education, Quality, Wii-hab



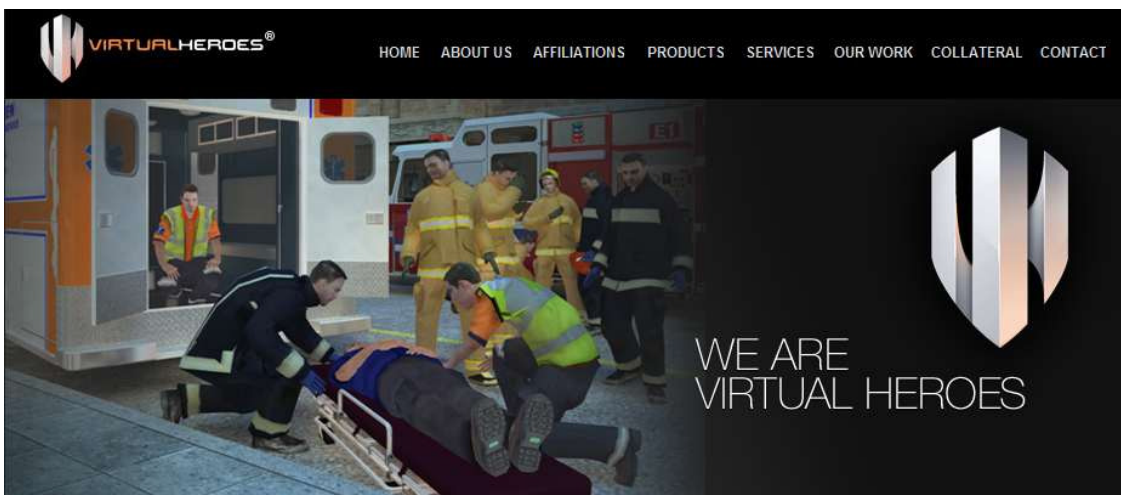
www.HumanaGames.com



- Gaming & Simulation can effectively teach & bring people together
- Peer pressure can be a strong motivator for behavior & change
- Games can scale to societal levels
- Games can be combined with real life, devices, and knowledge.
- Games can raise **self efficacy**

Happy Neuron, for Humana

Gamercize



Readmissions: The problem of Data

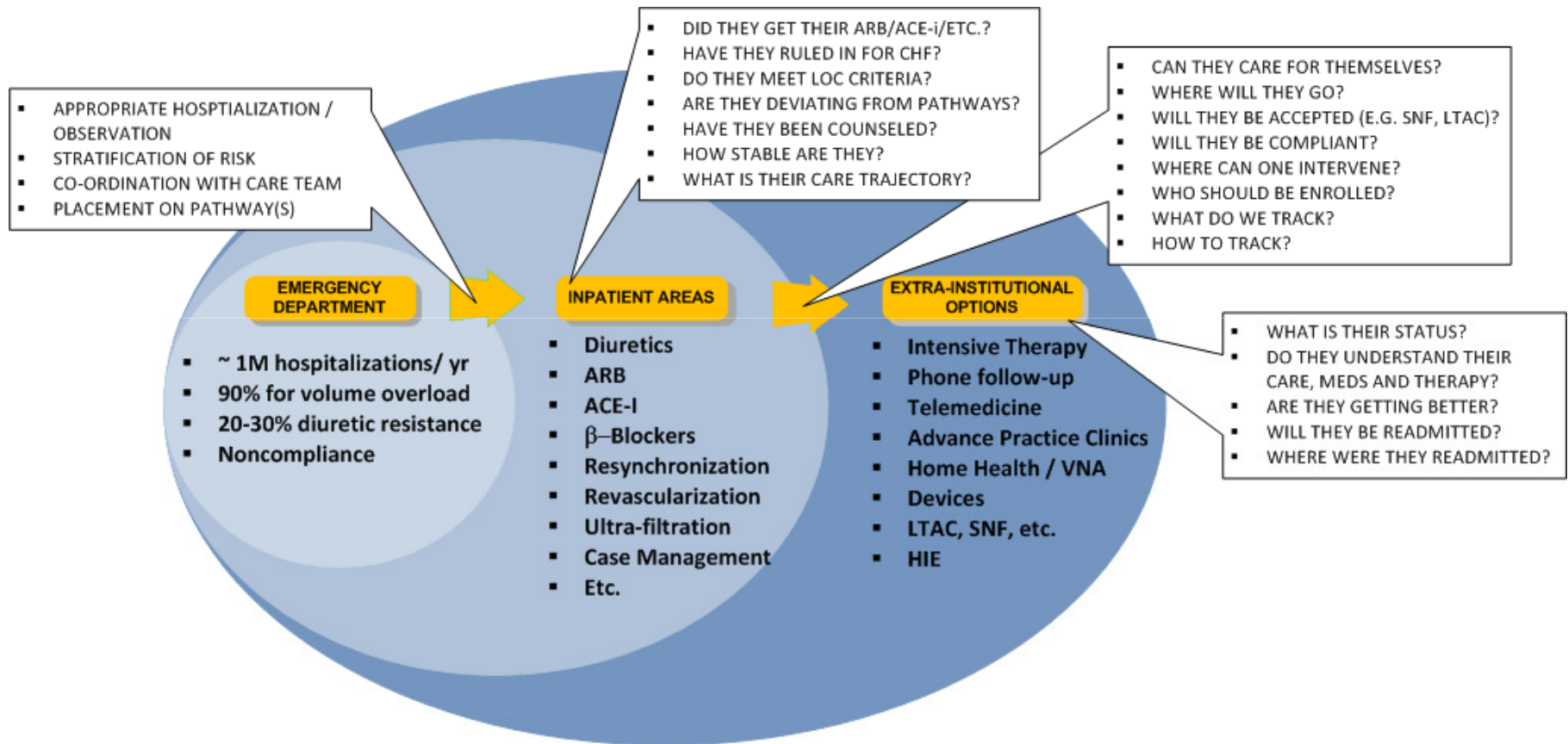


CHART REVIEW REQUIRED

Analytics: 360Fresh, Inc.

Computational chart review for assessing and predicting risk

Projects

- UT Southwestern Medical (Dallas)
- Large Hospital in New York (Pediatrics)
- Hospitals in California and Chicago
- Joint studies with university medical centers
- Ongoing NCI/NIH Project



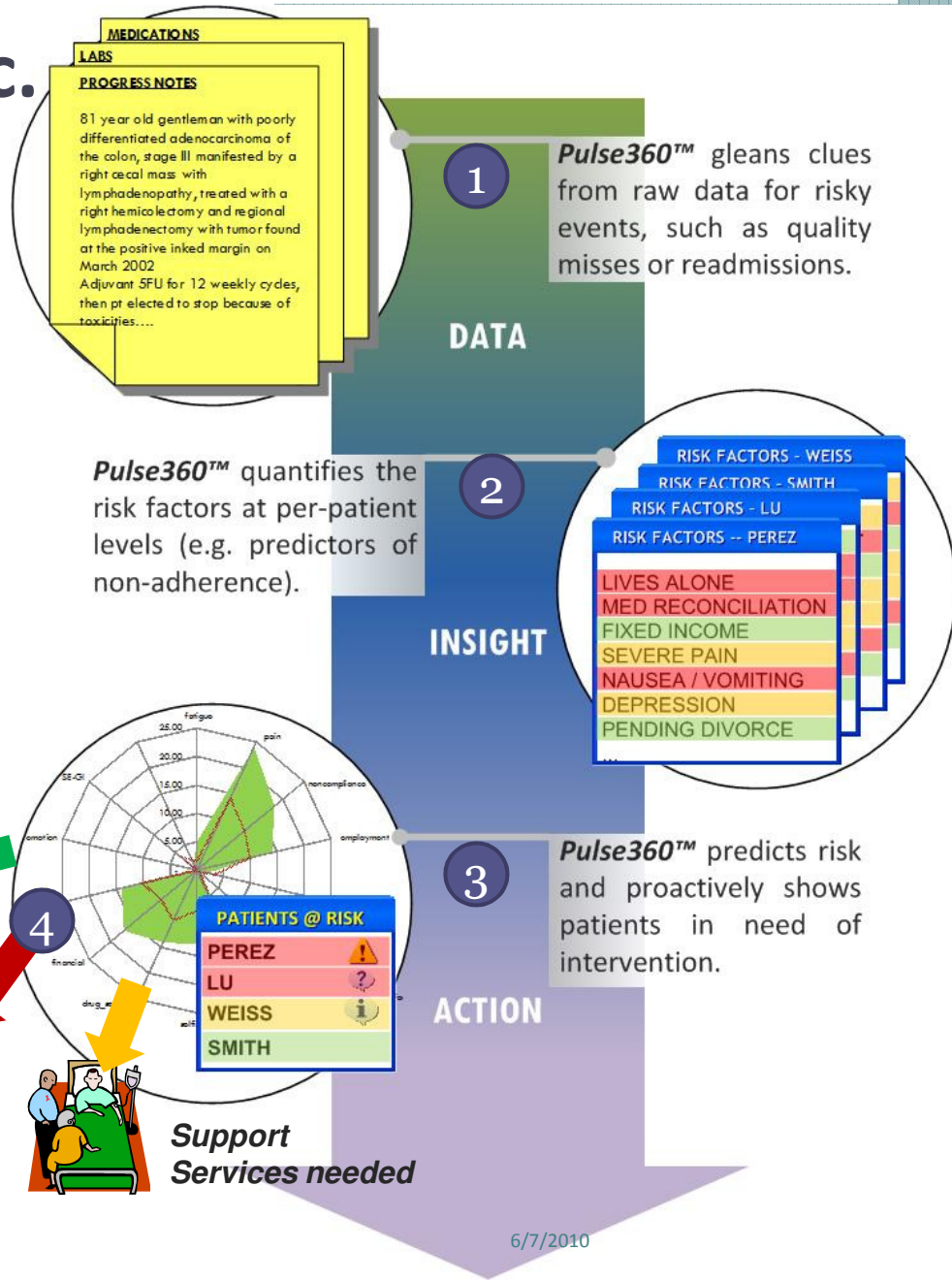
Weight management



Nutrition Services needed



Support Services needed



MEDICATIONS

LABS

PROGRESS NOTES

81 year old gentleman with poorly differentiated adenocarcinoma of the colon, stage III manifested by a right cecal mass with lymphadenopathy, treated with a right hemicolectomy and regional lymphadenectomy with tumor found at the positive inked margin on March 2002. Adjuvant 5FU for 12 weekly cycles, then pt elected to stop because of toxicities....

RISK FACTORS - WEISS

RISK FACTORS - SMITH

RISK FACTORS - LU

RISK FACTORS -- PEREZ

LIVES ALONE

MED RECONCILIATION

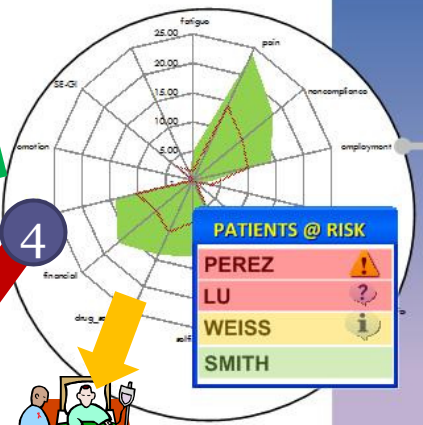
FIXED INCOME

SEVERE PAIN

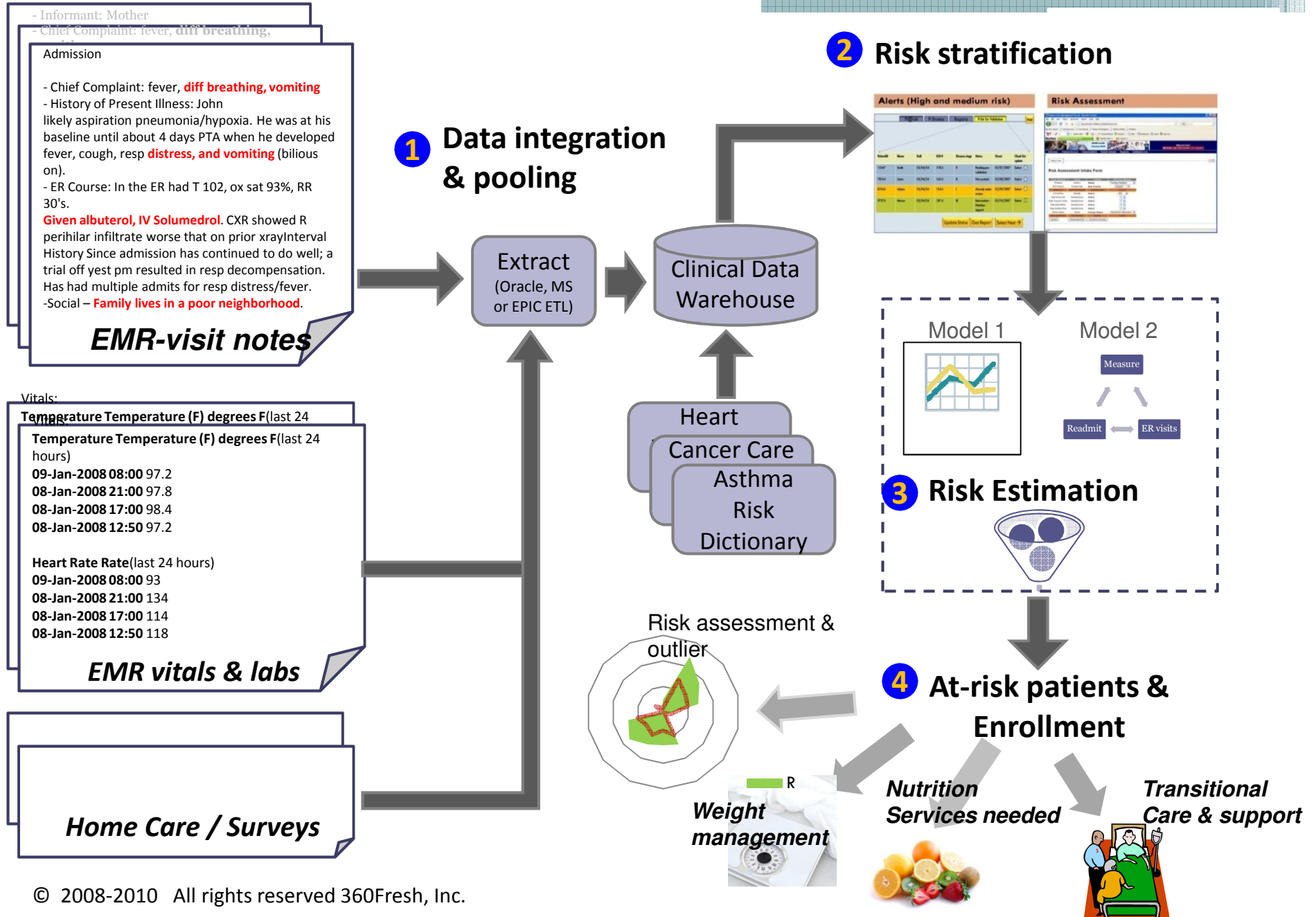
NAUSEA / VOMITING

DEPRESSION

PENDING DIVORCE

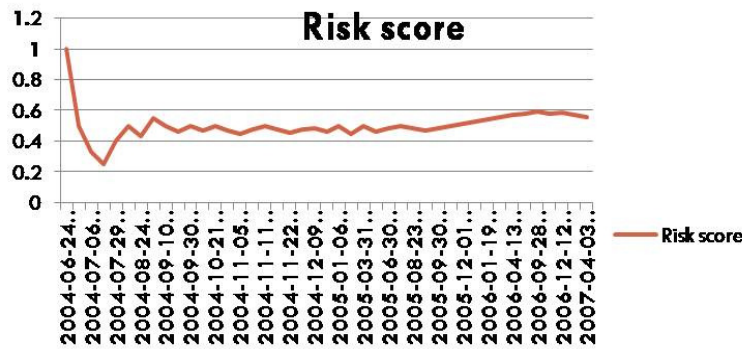


Case study: Asthma readmission



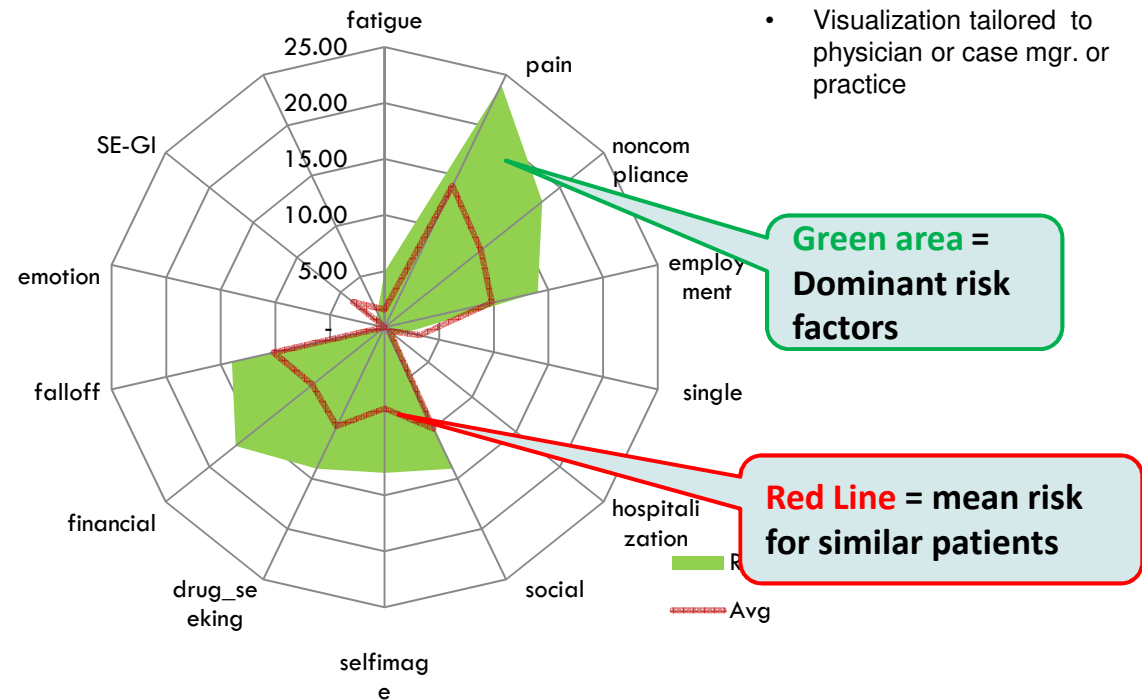
Case study: 360Fresh identified Cancer patients at risk of non-adherence prior to each visit

Risk estimation over multiple visits



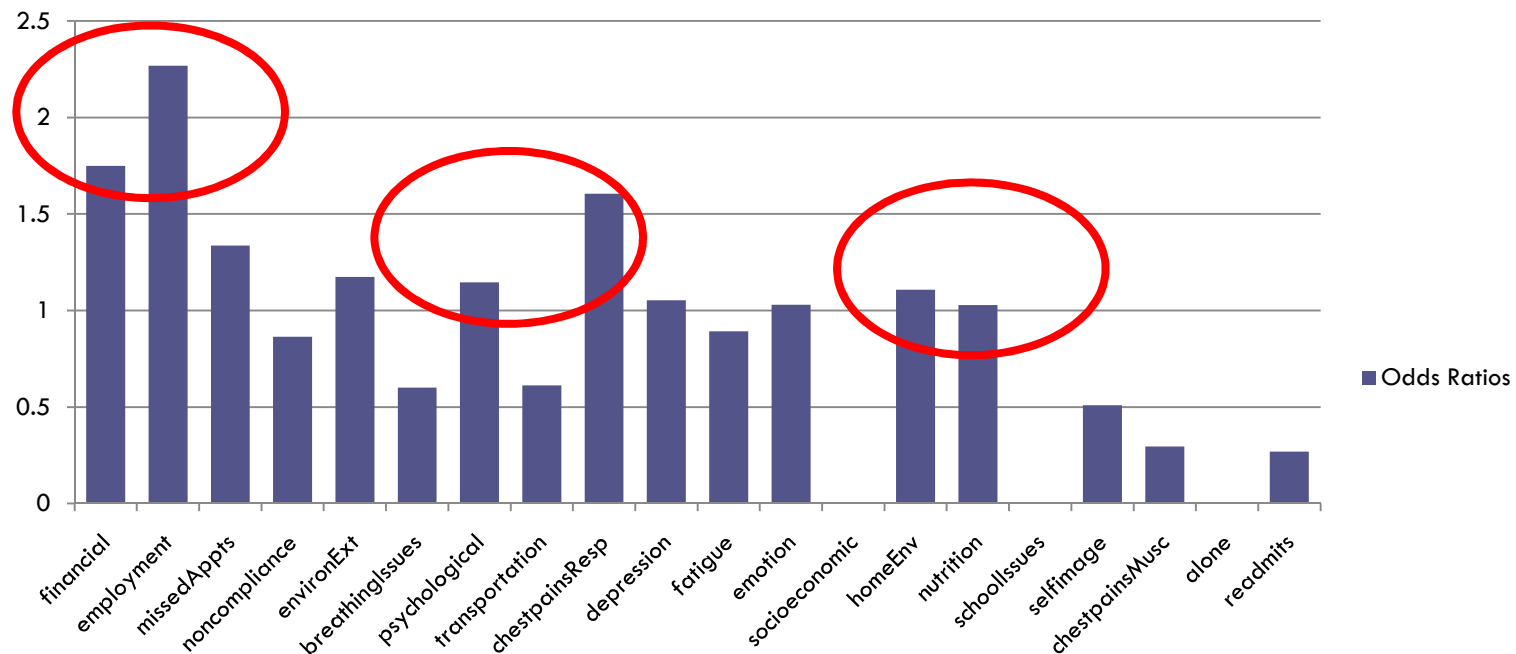
— Risk-algorithm predicted risk of non-adherence
 — Identified likely dominant risk factors
 — Individual patients, many sources of data analyzed.

Dominant Risk-factor Analysis for Non-adherence



Case Study: Risk Factors and likely predictors of Readmission

Odds and likely predictors



Outcome predictors: social, financial and living conditions

What case managers see

Patients @Risk Alerts

Patients at Risk of Non-Adherence

Selection	Patient Id	Risk Score	Risk Factors
<input type="radio"/>	18285	0.52	financial,med-sideeffects,fatigue,
<input type="radio"/>	21430	0.27	noncompliance,med-sideeffects,fatigue,financial,socioeconomic,
<input type="radio"/>	06375	0.18	missedAppts,financial,sideeffects,noncompliance,fatigue,emotional,selfimage,er
<input type="radio"/>	23067	0.17	missedAppts,financial,socioecon sideeffects,fatigue,selfimage,nond

RISK FACTORS DETECTED

RETURNING PATIENT

NEW PATIENT

Strength of specific risks (multiple formats)

Patient risk calculated from existing data

Patient Profile

Initials	B340
Name	John Smith
Date of Birth	1936-05-05 00:00:00.0
ICD_9 Code	174.5
Stage	N/A
Onset Date	2004-06-10 00:00:00.0
Clinician Id	bdntf
Treatment Type	Not Available
Symptoms	Medication sideeffects
Non-Conformance	Medium-to-High
Risk	Medium-to-High Risk
Smoking Status	Not Available
Tx Cycle	1
Dx Description	Malignant neoplasm of lower-outer quadrant of female breast

Patient Score Trend

Pareto Chart (Histogram) of Dominant Risk Factors

Weighted frequency of occurrence [on Y Axis]

Risk Factor	Weighted Frequency of Occurrence
sideeffects	24.0
employment	15.0
noncompliance	12.0
transportation	13.0
selfimage	17.0
social	21.0
financial	11.0

Risk Factors [on X Axis]

Services & the Business of Health Care

- Measurement (QI)
- Publicity (QR) → Brand
- Value-based payment → CMS
- New Business Relationships & Models
 - Warranties, Telecare, ACOs, gainsharing

ANALYTICS = New Basis of Competition & Operation

Geisinger Medical Center: Where a Warranty on Coronary Artery Bypass Surgery Signals a Commitment to Excellence

This story originally appeared in IHI's 2008 Annual Progress Report.

John Podgursky, 62, did not know there was a warranty on the bypass surgery he had in the summer of 2007 at Geisinger Medical Center in Danville, Pennsylvania. But even if he had, he would not have needed it. His surgery and recovery went just fine.

It all started when he was mowing his lawn in Elysburg, Pennsylvania, a quiet community about an hour southwest of Scranton, in the heart of the anthracite coal region. Semi-retired from a lifelong career in the Bureau of Mines, Podgursky says he felt some tightness in his chest. He felt it off and on for the next few days.

A series of examinations and tests revealed that Podgursky needed triple bypass surgery. "One artery was 100 percent blocked, and two others were pretty blocked up as well," he recalls. The surgery was booked for the very next day.

Podgursky was twice lucky. First, to get on the surgical schedule so quickly, and second to be at Geisinger, where the warranty itself is far less important than what it symbolizes.

the terms of the warranty, which Geisinger calls ProvenCareSM, Geisinger charges insurers a flat fee for a bypass that includes 90 days of routine follow-up care. If a patient suffers complications, Geisinger pays for the treatment at its facilities.

ld about our values,"
nt, Division of Clinical
We have identified 40
s surgery, and it is our
nd every time." Under

calls ProvenCareSM,
bypass that includes
nt suffers

complications, Geisinger pays for the treatment at its facilities.

For further Information:

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“New” tools and methods for influencing behavior

nytimes.com



July 13, 2008

Warning: Habits May Be Good for You

By CHARLES DUHIGG

A FEW years ago, a self-described “militant liberal” named Val Curtis decided that it was time to save millions of children from death and disease. So Dr. Curtis, an anthropologist then living in the African nation of Burkina Faso, contacted some of the largest multinational corporations and asked them, in effect, to teach her how to manipulate

contacted some of the largest multinational corporations and asked them, in effect, to teach her how to manipulate consumer habits worldwide.

about half those deaths could be prevented with the regular use of soap, studies indicate.

But getting people into a soap habit, it turns out, is surprisingly hard.

To overcome this hurdle, Dr. Curtis called on three top consumer goods companies to find out how to sell hand-washing the same way they sell Speed Stick deodorant and Pringles potato chips.

She knew that over the past decade, many companies had perfected the art of creating automatic behaviors — habits — among consumers. These habits have helped companies earn billions of dollars when customers eat snacks, apply lotions and wipe counters almost without thinking, often in response to a carefully designed set of daily cues.

“There are fundamental public health problems, like hand washing with soap, that remain killers only because we can’t figure out how to change people’s habits,” Dr. Curtis said. “We wanted to learn from private industry how to create new behaviors that happen automatically.”

The companies that Dr. Curtis turned to — Procter & Gamble, Colgate-Palmolive and Unilever — had invested hundreds of millions of dollars finding the subtle cues in consumers’ lives that corporations could use to introduce

The companies that Dr. Curtis turned to — Procter & Gamble, Colgate-Palmolive and Unilever — had invested hundreds of millions of dollars finding the subtle cues in consumers’ lives that corporations could use to introduce new routines.

- Use marketing and knowledge mobilization tools and methods to improve health literacy, **self-efficacy**, prevention.
- Haskell WL, et al. *Circulation* 89:975-990, 1994
- **Advertising techniques** for patient safety, quality of care, adverse events, infection control, etc.
- Maibach et al *Prev Chronic Dis* 2006 Jul