Keeping up with the times – Tensions between workflow, status quo, and technology

OMG Healthcare and Business Process Modeling Workshop

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Nothing to disclose

The faster time moves,
the faster time moves.

It is not the strongest of the species that survive, nor the most intelligent, but the one most responsive to change.

Charles Darwin

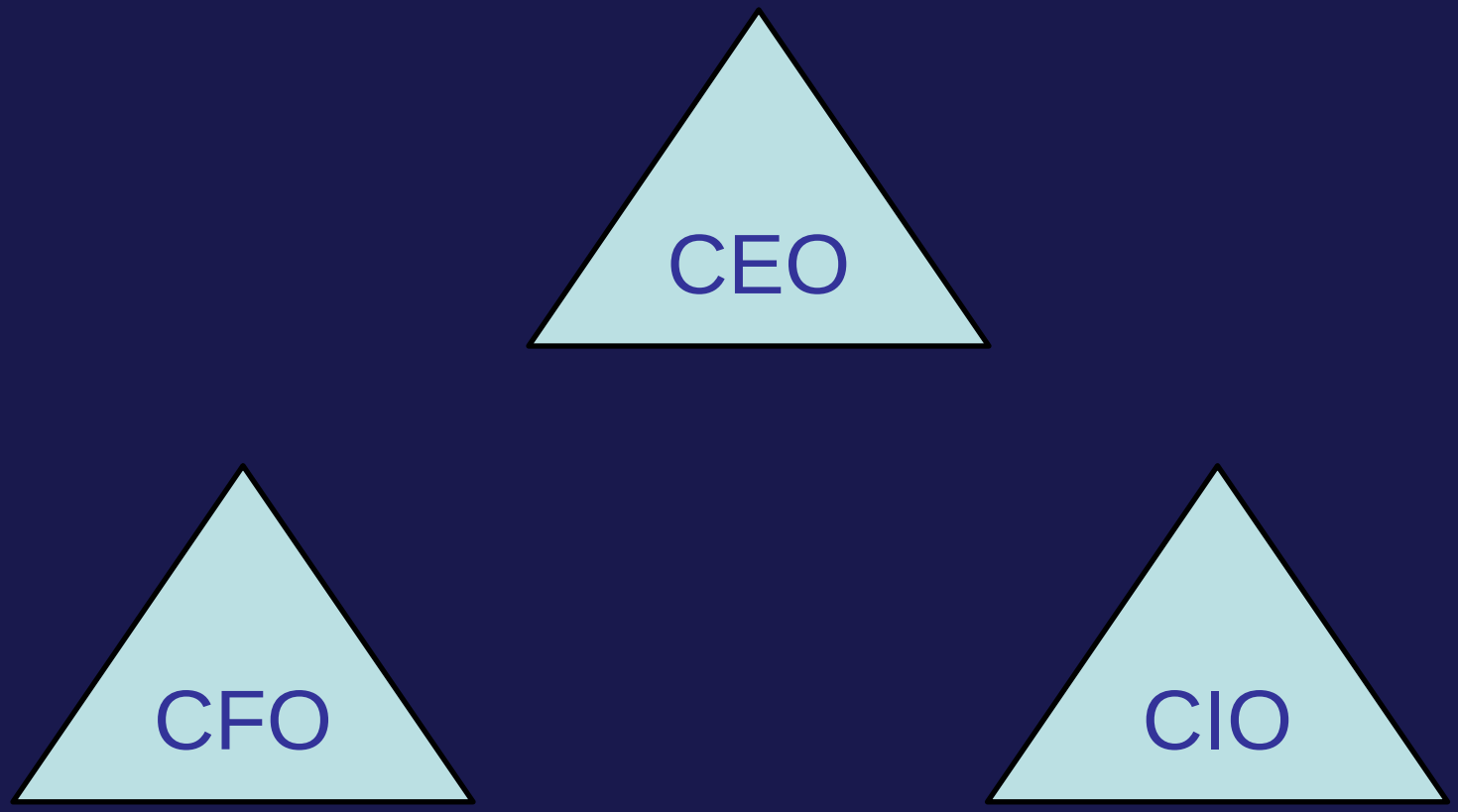
The Immediate Past

- Inpatient care was totally dominant
  - Hospital Information Systems (HIS) rather than Electronic Health Records (EHR)
  - Work flows were defined by in-patient service
  - The sicker the patient, the more the revenues
  - Fee-for-service meant more tests, more money
  - Paper dominated; independent domains
  - Patients had little to no influence on their care.
- Most HISs (and EHRs) were home grown and existed mostly in academic medical centers

Status Quo

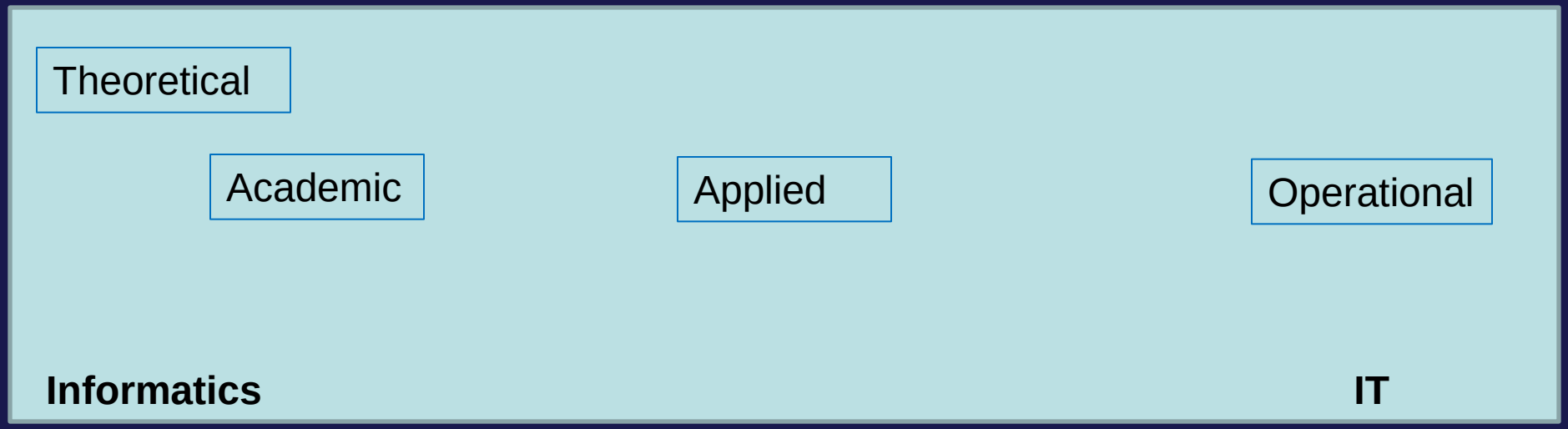
- Reimbursement is the driver in HIT. It influences what is collected and how it is coded. Billing records are most important. Clinical records are difficult to access for analyses.
- Clinical data is largely unstructured, available in narrative mode, poor quality, and inconsistent. Cut and paste issues.
- Most data representation is local.

Decision Makers



Who dominates ?

The spectrum of informatics



Where is the ideal perspective?

What is the order of importance?

- Reduce cost of care
- Better care
- Build new processes into current workflow or
- Change current workflow to incorporate new processes
- Protect status quo or
- Embrace change

Out with the old

- Current EHR systems are built on technologies that date 40 years ago
  - Epic – 1976
  - Cerner – 1983
- Large, expensive mainframes dominated
  - Transitioning to Personal Computers, Portals, Servers
- Clinicians mostly unhappy with commercial EHR systems
- EHR data difficult to access for secondary use
- Personalization impossible

In with the new

- How do we keep up with changing technology?
  - New concept and role for the EHR
    - EHR's sole function is data in, data out
    - EHR data structure optimized to find the value of any data element as well as to know immediately if that data element has never been collected.
    - All other functionality is external to the EHR but must be interoperable with content
  - Functionality supports a changing technology and accommodates domain preferences.
  - Access to data, as appropriate, is enhanced.
  - Movement to the cloud

What's happening today?

- Transition to value-based care
- Switch from illness-driven to health-driven
  - Healthy patients bring more revenue
  - Motivation to reduce number of redundant testing
  - Hospitalization is viewed as a last resort, not first line of care.
- Ambulatory patient care is now the dominant health model.

The scope changes

- As movement to ubiquitous EHRs becomes the norm, data sharing became goal.
  - Interoperability became the Holy Grail
    - Data interchange standards
    - Common data representation
  - Patient-centric EHRs
  - Health Information Exchanges
- Predictive analytics should guide business decisions
- Major impact on workflow
  - Making decisions on data from elsewhere?

New Initiatives

- Cancer Moon Shot Initiative
- Precision Medicine
- Population Health
- Big Data To Knowledge (BD2K)

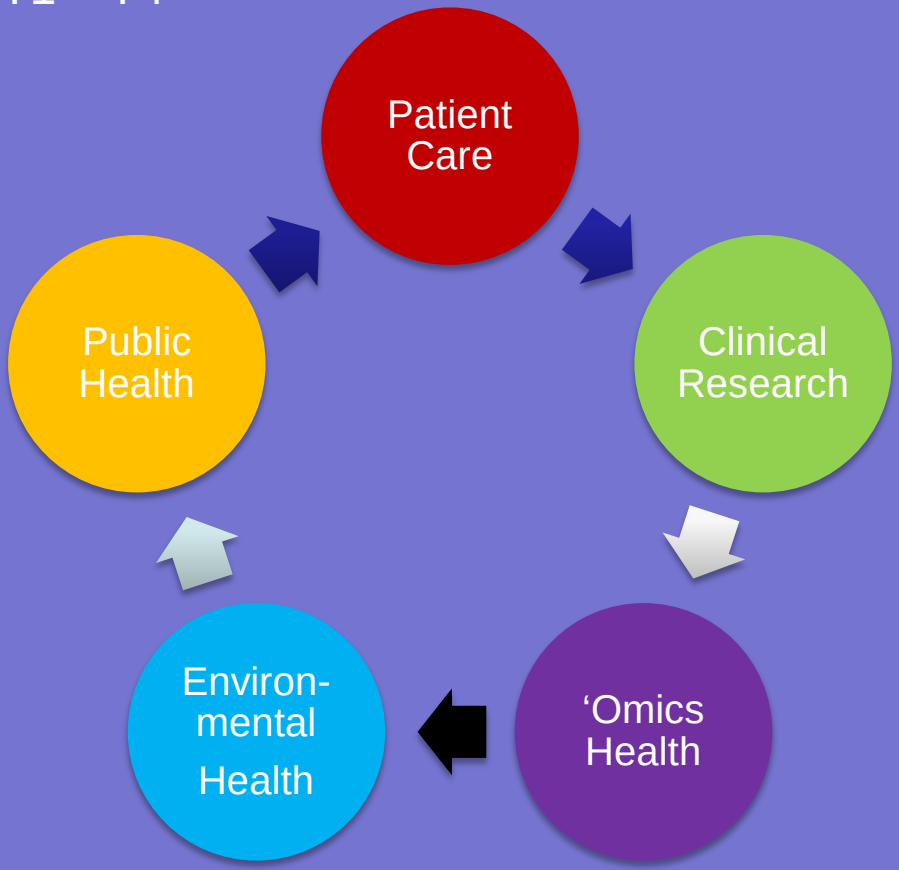
All of these initiatives require data sharing across all sources. The result is huge increases in data that we must accommodate and use effectively. Further, predictive analytics using such tools as machine learning, natural language processing, and cognitive computing are becoming increasingly into play.

Impact of initiatives

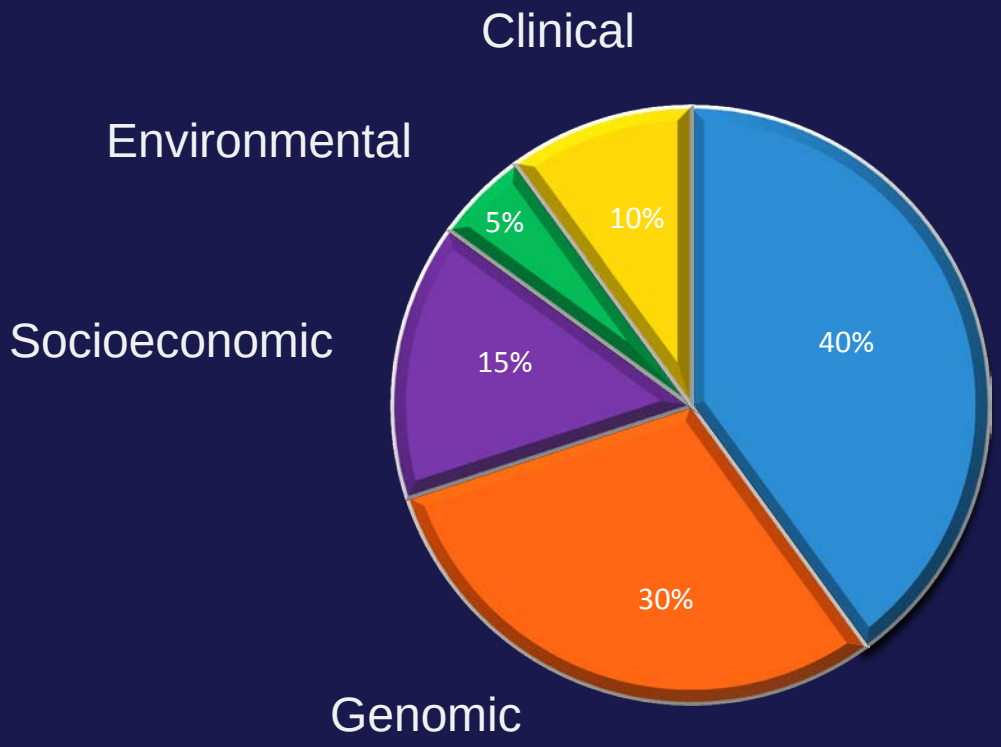
- Interoperability is key to the success of population health efforts that support the transition to value-based healthcare.
- Organizations unable to share patient data will find it very difficult to improve quality and avoid financial penalties under value-based care.
- Unique and universal patient identity becomes mandatory for error-free aggregation of data.

POPULATION HEALTH

Translational Medicine :T1 – T4



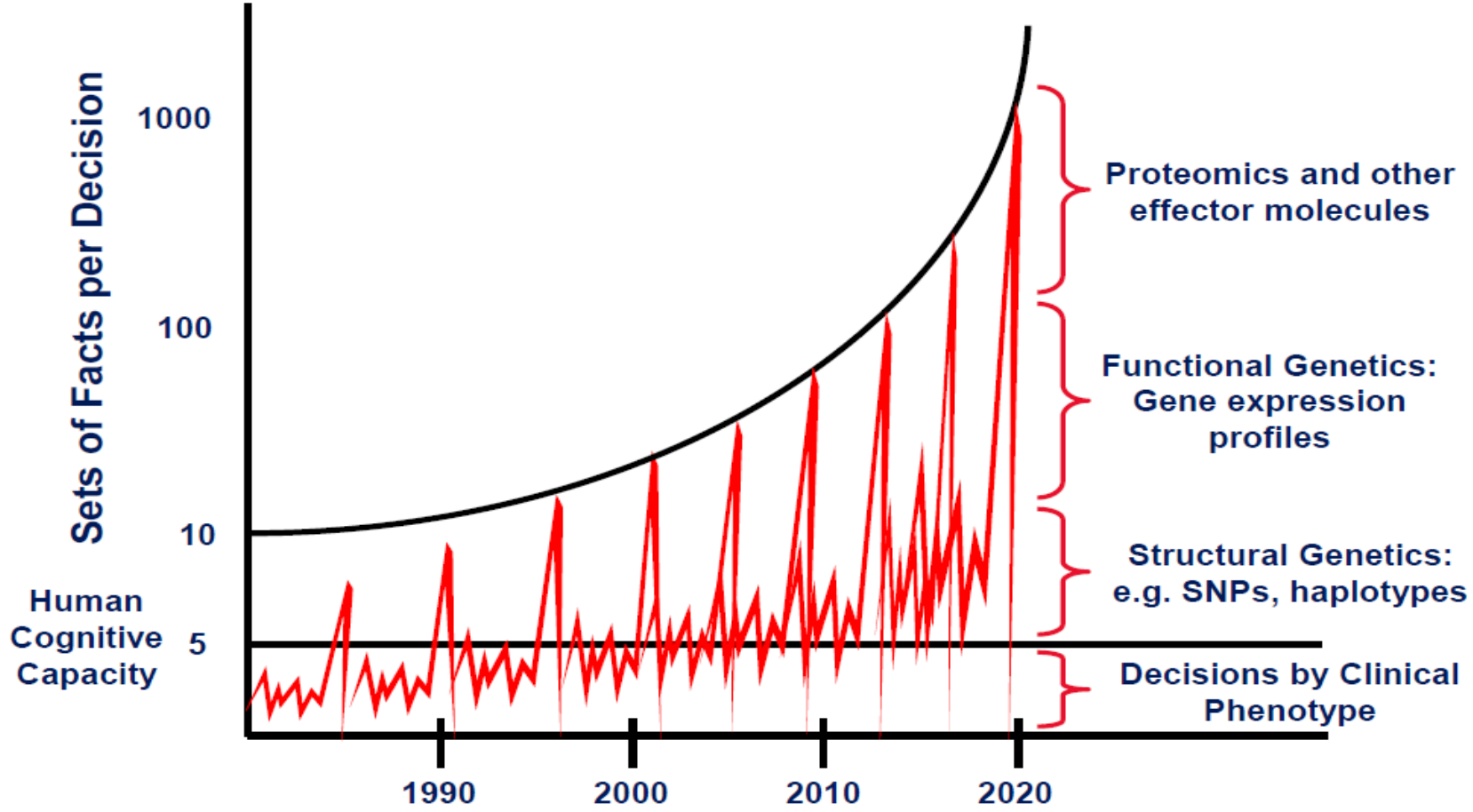
Health Indicators



How do we introduce these new kinds of data into the workflow?

Source: McGinnis JM, Williams-Russo P, Knickman JR. The case for more active policy attention to health promotion. Health Aff. (Millwood) 2002;21: 78-93

Burning Platform: Overwhelming Complexity



Stead WW. Beyond expert-based practice. IOM (Institute of Medicine). Evidence-based medicine and the changing nature of health care: 2007 IOM annual meeting summary,(Introduction and Overview, p. 19). Washington, DC: The National Academies Press 2008.

New Voices …

- Patients, consumers, citizens or what ever we wish to call them are having influence in health and health care.
- “Googling” it has opened the knowledge and understanding of disease for the non-professional to change the communication between physician and patient.
- Social media and such groups as “Patients like me” have the power to change the system.
- Why does the Pharmaceutical Companies spend so much money on TV commercials for drugs that still must be prescribed by a physician?

Overwhelmed?

- Clinicians make informed decisions about 10% of the time. Missing data, dirty data, confusing knowledge, changing knowledge, conflicting literature, past teachings, personal experiences all contribute.
- The amount of data now available for decision making far exceed the ability of a human to make those informed decisions.
- Cognitive Computing and Artificial Intelligence is now beginning to assuming that role.

Mobile Devices

- The ubiquity of smart phones has changed communications between and among groups. A virtual visit is becoming competitive with an office visit.
- Smart phone apps can be used for data collection by text, check boxes, and photographs with sufficient resolution to make clinical diagnoses in many areas such as dermatology.
- Smart phones can be used for education.
- Smart phones can be used for behavior modification.

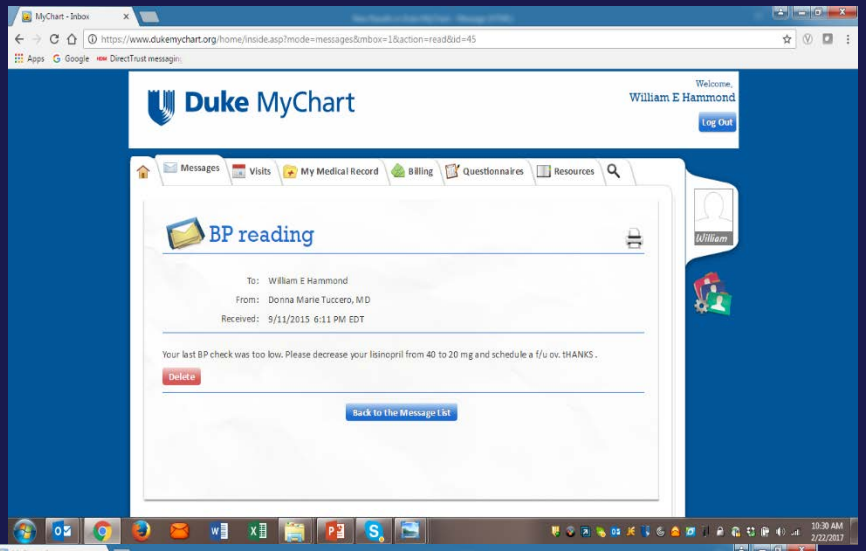
Mobile Health

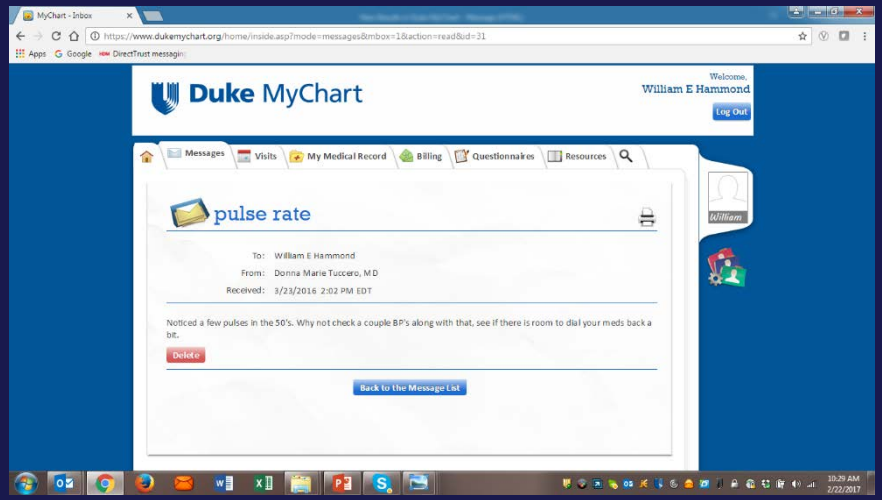
- The increasing motivation for consumer engagement and service-oriented applications is giving rise to new initiatives carrying the label of iApps.
- SMART on FHIR is providing the standards, the publicity, and the examples.
- Apple, Google, and Microsoft along with many others are entering this field and are creating both a market and repository for iApps.

Wearable devices

- Collecting data with high quality and consistency is one of the biggest challenges we face.
  - Solution – automate the process
  - Initial steps – wearable sensors
- Observation – My Duke EHR has data about me only once or twice a year. But I generate data constantly outside the system. First indications of change in my health status will happen in and on my body. Rather than “Give Me My Data” – I want “Take My Data and Intervene When Appropriate.”

Personal Experiences





Apple watch to iPhone to Epic EHR.
PCP looks about once per week.
Scalability?

Workflows will follow patient

- Patient engagement will completely change the workflow.
- Patient encounters will increasing occur remotely.
- Clinical intervention will be frequently driven by patient reported data.
- Multiple specialties may engage at a single encounter.
- Patient care protocols will be the driving force.

Big Data and Its Impact

- For a single patient, we are talking about petabytes of data.
- For a aggregated database of multiple patients we are talking about yottabytes or even brontobytes.
  - 1000 Terabytes = 1 Petabyte. · 1000 Petabytes = 1 Exabyte. · 1000 Exabytes = 1 Zettabyte. · 1000 Zettabytes = 1 Yottabyte. · 1000 Yottabytes = 1 **Brontobyte**.
- NonSQL databases making their appearances to provide higher speed necessary for analyses.
  - Hadoop, mongoDB, others

Patient generated data and genomic data will be top health care data sources.

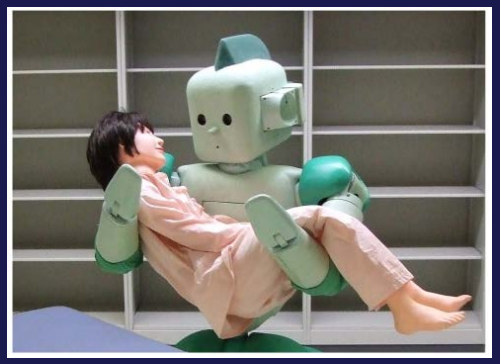
Forty percent of health care executives and clinicians said that in five years, patient-generated data will become a top health data source and genomic data will be one of the most useful sources of data, according to a survey from NEJM Catalyst.

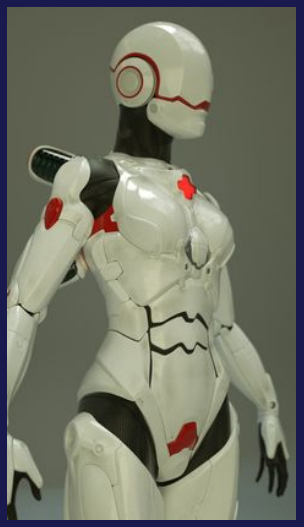
Are self-aware computers the doctors of tomorrow?

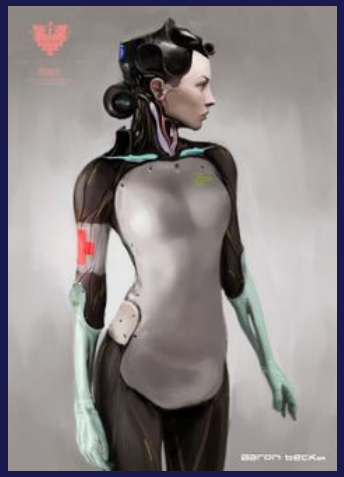
Computers will be the decision makers of tomorrow and tomorrow is almost here.

Is IBM's Watson the new Marcus Welby?

Robotics







SMART on FHIR®© – Open Platform Architecture

SOA Orchestration

mHealth

SMART™ Web Apps

Trusted App Registry

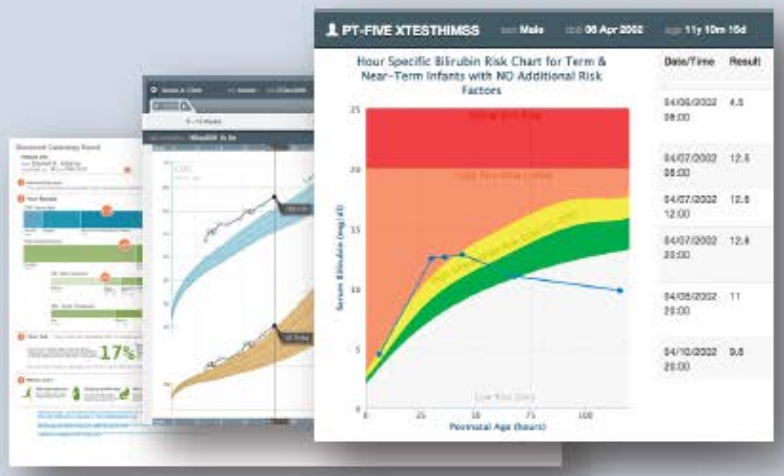
Children's Hospital Boston

Intermountain Healthcare

visualdx

"polyglot"

HARVARD MEDICAL SCHOOL



OAuth

FHIR® REST API

FHIR Profiles from CIMI Models (using standard terminology)

http://smartplatforms.org/smart-on-fhir/

Heterogeneous Systems

Commercial EHR

Home Grown System

System Integrator

Others…

Source: Stan Huff

The art of the future possible

- The volume of data, the variety of data types, the increasing wealth of knowledge, and the ability to track disease and co-morbidities from start to finish will overpower the ability of humans to make informed decision about health and health care.
- Computers will not only become the decision makers but will carry out the decisions directly.
- The role of the human clinician will change to being an interface between computers and patients, and that may only be a temporary step.

The future deserves the best of health and health care that we, technology, policy, innovation, and disruption can provide. That is our goal, and that is our strategy.

- What ever the future, it is constantly changing. We must change as well.
- The future is closer than ever before, and we must plan accordingly.
- Modularity, technology neutrality, and sharing thoughts and ideas may be keys to survival.