What is next for health care?

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Change – the constant in today’s world

➢ Technology is the driver of change
  • Computational power & size
  • World Wide Web and Internet
  • Smart phones and mobile devices
  • Internet of things
  • Process and work flow
  • People/consumers
  • Policy
  • Artificial Intelligence & machine learning
  • Virtual reality and augmented reality
  • 3D printing
The faster time moves, the faster time moves.
The changing present

- Hospital dominated
- Higher revenues with sicker people
- Most care delivered in hospitals and clinics
- Reimbursement drives everything.
- Clinical data largely unstructured, poor quality, incomplete and inconsistent.
- Local terminologies dominant.
The wrong approach

- We deal with each problem as a single, isolated problem rather than looking at the broader setting.
- We spend most of our time in a work-around rather than solving the problem.
- We address problems with solutions that are already out of date.
- We start with what we know and have, rather than looking for the best solution.
- We ignore the hard problems.
- We accept “You can’t do that” or “it’s impossible.”
HEALTH INDICATORS


[Pie chart showing the distribution of health indicators: Behavioral (40%), Genetic (30%), Socioeconomic (15%), Environmental (10%), and Clinical (5%).]
From sick care to health

• Reimbursement focus shifts from fee-for-service to accountable care.
• Healthier patients bring highest returns.
• Hospitalization cost money. Keep people out of hospital.
• Focus on behavioral health – good health habits - nutrition, exercise, no smoking, responsible drinking, safe driving, etc.
Consequences

• It will cost more to be sick.
• Patients will seek care outside of hospital and clinics.
• Technology will enable interactions with persons in their home.
• Except for a few major academic health centers, most hospitals will become much smaller or disappear. They will be replaced by small Emergency Centers.
Patients become empowered

- Patients have access to their data.
- Patients are more sophisticated.
- Patients better understand their diseases and want to play a role in their treatment.
- Life is lived outside the healthcare environment.
- Data collected and analyzed in real time becomes more responsive.
- Patients want to push this data back into their EHR.
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.
CHANGING TO 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
As movement to ubiquitous EHRs becomes the norm, data sharing became the 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?
Data Sharing becomes the norm

- Federal grants require plan for data sharing.
- Patient-Centric EHRs
- Creation of Big Data
- Creation of national and global data registries

- 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.
- Success depends on interoperability.
Value Proposition

• More complete data about a patient
• Pragmatic clinical trials with millions of patients and less cost
• Rare diseases become less rare.
• Better understanding of outcomes

• Requires common data element set
• Requires high quality data
• Requires interoperability
NEW VOICES ...

- Patients, consumers, citizens or whatever we wish to call them are having an influence in health and health care.
- "Googling" 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 do Pharmaceutical Companies spend so much money on TV commercials for drugs that still must be prescribed by a physician?
THE AGE OF THE PATIENT

- Patient reported outcome
- Wearable sensors
- Mobile devices
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.
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.

21st Century Cures Act is about the development of iApps.
Collecting data with high quality and consistency is one of the biggest challenges we face.

- Solution – automate the process
- Initial steps – wearable sensors

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.”
Big Data and Its Impact

- Big Data is defined by volume, velocity, variety and value.
- For a single patient, we are talking about petabytes of data.
- For federated databases, we are talking about millions and billions of patient. We can find thousands of similar patients who have gone through the full disease cycle enabling us to understand sub-diseases and discover the most effective treatment.
- NonSQL databases making their appearances to provide higher speed necessary for analyses.
  - Hadoop, mongoDB, others
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.
- Humans repeat errors
The volume of data, the variety of data types, the increasing wealth of knowledge, and the ability to track disease and comorbidities from start to finish will overpower the ability of humans to make informed decisions 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.

Humans will be replaced.
THE SECOND MACHINE AGE

- Machine Learning
- Deep Learning
- Artificial Intelligence
- Cognitive Computing

- Everybody's doing it
  - Google IBM
  - Apple Microsoft
  - Amazon Many Others
• The future deserves the best of health and healthcare that we, technology, policy, innovation, and disruption can provide. That is our goal, and that is our strategy.
• Whatever 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.
• The world is changing and we must change with it.
• Resistance is futile.
THANK YOU!

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