The Future of Healthcare: Where Artificial Intelligence meets Predictive Analytics

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Conflict of Interest Disclosure for Workshop

Joel Robertson does not have any real or apparent conflict(s) of interests or vested interest(s) that may have a direct bearing on the subject matter of the continuing education activity.
Learning Objectives

This presentation will enable participants to:

• Understand the impact AI and Predictive Medicine can have on healthcare
• Understand that present systems cannot manage the variables of data that must be used
• Understand precision based behavioral medicine can have significant impact on effectiveness, safety and costs of chronic diseases
• Understand the difficulties of adoption of systems that disrupt the present system
Conflict of Interest Disclosure for US Healthcare

Joel Robertson does have real and apparent conflicts of interests and vested interests that have a direct bearing on the subject matter of the delivery of healthcare in the US.

“Robertson Health’s goal is to change the way medicine is practiced, operating in non-profit and profit combinations of companies to support R&D and delivery of healthcare solutions, while remaining politically independent of systems that resist change.

Robertson Health has more than $30M invested in the process and has been the recipient of Microsoft’s most innovative technology and the “top 5 best solutions” in the world.”
Philosophical Approach to “Changing Healthcare”

• Robin Hood Theory of Medicine
  – Not about money, rather change

• Challenge of “more and better” medicine and “less” politics

• Some of the processes described have been available for 5 years in the US….
  – Why will they not be adopted in US, but accepted Worldwide?

• Not here to “sell” anything, rather to “sell” the need to change the way we do healthcare to becoming “patient centered not business centered”
Who Are We and Why Are We Here?

• Background and history in Behavioral Medicine
  – National Treatment Protocols for Behavioral Medicine for EMS
  – Books and articles
  – Fortune 200 Companies
    • Red Wings, DOD, Fuji Photo, Dow Corning, J&J, GlaxoSmith, GM, NASCAR, etc.

• Transition to include Diagnostics
  – “Diagnoses error and friend”
  – 1.8 Billion people will never see a doctor
Challenges of Predictive and Precision Medicine

• Knowledge and Understanding
  – High knowledge individuals in very specific areas
  – Knowledge gap between research and application

• Data Platforms and Structures
  – No general platform able to contain sophisticated data
  – Data is not linear, rather “J” or “Bell” shaped
    • Data must be stored in three dimensional databases (healthcare data is unique)
  – Information is stored in disparate systems

• Usability
  – Poor ability to transfer knowledge to patient
  – Connected devices provide data, but often don’t have ability to interact with person and various disease states
  – Making precision medicine precise and simple for the patient
The Challenges Can be Overcome with AI and Technology

- Empowering consumers is empowering people that are likely ignorant in health, yet they MUST be empowered to create real change.
- Peer review is essential for research, but can create avoidance of inclusion of new knowledge or different knowledge, yet we MUST have legitimate research available.
- Present EHR systems aren’t granular and/or able to store data for AI systems.
- Middleware that allow patient’s to authorize data from all EHR systems allows data sharing.
- Technology must eliminate patient collection and entry of data to be used.
Software is only as “smart” as the user:

UNLESS

AI allows software to be “smart enough” to ask the user a question when the user does not know to ask a question
The Fourth Paradigm of Data Intensive Science

- First Paradigm: Observe
- Second Paradigm: Add theory
- Third Paradigm: Collect data, learn and teach
- Fourth Paradigm: Disrupt a decision in real time to create or ensure a better decision
The Adoption Gap: Can we Overcome?

“Treatment failure is actually our failure to provide the right treatment for the patient.”

“The failure of healthcare is not knowledge of diseases as much as knowledge of people and why they do what they do.”

“Good and bad medicine is differentiated by knowledge of what will as well as what won’t work”

“Good and bad healthcare is differentiated by knowledge of what is best for the patient versus what is best for the business”

“Is not patient care....the business?”
Making Patient Care....the Business

- **Diagnosis:** Determine what is broken or is likely to break
  - Diagnostics (presently 8-20% error)
  - Predictive and Preventative Medicine
- **Precision Treatment:** Determine what is the “best” treatment based upon multiple variables that makes the treatment PRECISE
  - Knowing about a disease is different than knowing about MY disease
  - I.E. Diabetes may have up to 19 population groups that require different treatments
- **Compliance:**
  - PRESCRIBE BEHAVIORAL TREATMENT INSTEAD OF ALLOWING A PATIENT TO CHOOSE WHAT FEELS BEST
  - Use “Fourth paradigm” of behavioral medicine
  - Physical health, emotional health, spiritual health.....Brain health
- **Follow Up:** Intervene consistently to provide “real time” feedback
  - Reverse diagnosis
  - Connected devices
  - Follow up and interactive programs
Functional Requirements for AI to Work

- Clinical Weighted Prevalence (CWP) of event, side effect, or diagnosis
  - How often is this event likely to occur
- Clinical Predictive Value (CPV)
  - How likely is this “fact” going to increase or decrease the likelihood of the event to be true
- Predictive Risk Factors (PRF)
  - Concomitant “cards you are dealt”
    - Body, Brain, Reward Center, Environment, Belief System
- CWP + CPV + PRF = Population Group
  - Population Groups are highly specific and each have a precise Predictive Response
- Predictive Response (PR)
  - Accurate and precise
  - Most statistical evidence based treatment for that population group
Functional Requirements for Users

• Scalable across all communication platforms (wireless, Bluetooth, cellular, internet, etc.)
• Device agnostic (Apple, Microsoft)
• Software agnostic (Epic, Cerner)
• Dynamic (changes quickly with events)
• Interactive
• Intuitive
• Determine what information the person needs
• Offer options
• Multi cultural, multi language (Publish Sets)
Precision Medicine and Diagnostics Requirements

• Accurate
  – Probability factors: “Likely the disease”
  – Possible factors: “Could be the disease”
  – Tested in India with MPHA’s vs. Physicians

• Regionalized

• Precise

• Increase clinical supervision with lesser skilled individuals

• Platform agnostic

• User skill driven
Labs and Tests
Serum Hemoglobin
The amount of oxygen carrying pigment known as Hemoglobin in the blood.
- **High:** > 17.5 g/dL
- **Normal:** 11.2 - 17.5 g/dL
- **Low:** > 11.2 g/dL

Medical History
Exposure: Mosquito Bite
Bite on the skin caused by a mosquito as it feeds on the blood of a person or animal.
- Typically Associated

Disease History
Renal Failure
A decline in kidney function
- Personal: Occasionally Associated
- Family: Not Associated

Symptoms
Fever
Above normal body temperature
- Consistently Associated

Patient Facts
Non-medical information about the patient including age, gender, race, geography, occupation, and substance abuse

Medical History
Medical information including surgery, trauma, treatments, parity, diet, allergies, exposures and more.

Disease History
History of disease found in patient or the patient’s family.

Symptoms
Evidence that is reported by the patient or observed on physical exam.

Labs and Tests
Laboratory tests including blood work, urinalysis, microbiology and analysis of other bodily fluids. Interpretive tests including x-rays, CT scans, MRIs, and more.

Patient Facts
Region
Geography the patient is currently living
- United States
- South Africa
- India

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Global Prevalence:
Very Common

Malaria
Aliases: Malarial Fever; Swamp Fever; Jungle Fever
- Parasitic infection that may affect the entire body
- Symptoms may include fever, night sweats and chills which commonly occurs in cycles
- Commonly spread through a bite of an infected mosquito

Referrals:
Referrals are provided...
1.) if the user is not able to safely treat the condition on their own
2.) if the case needs further evaluation from a physician or specialist

Regional Data Values
Regional Prevalence Data
Final Diagnosis & Follow Up
Regional Prevalence Data
- South Africa: Extremely Common
- India: Extremely Common
- United States: Very Rare

Regional Data Values (based on patient facts)
- United States
- South Africa
- India

The region determines what dataset the engine will use

Global Prevalence:
Very Common
Example of Diagnostics

• Cell Phone Emulator (acts as iPhone) connecting to South Africa Database “Live”

• RHealth Advisor
Precision Medicine and Chronic Disease Management or Behavioral Medicine

**BRAIN**
- Emotional and Biochemical Characteristics
  - Compulsive/Impulsive
  - Natural Tendencies
  - ADHD

**BODY**
- Physical characteristics and disease history
  - Health
  - Family History of Diabetes
  - Body Type

**BELIEFS**
- Belief system, including expectations and beliefs of self and others
  - Team Player
  - Inclusion
  - Expectations
  - Value for others

**ENVIRONMENTAL**
- Past and present environmental, social, emotional, and financial factors
  - Conflict resolution
  - Confidence
  - Upbringing
  - Relationships

**REWARD CENTER**
- Brain reward/pleasure center
  - Arousal
  - Satiation
  - Combination

The Cards You’ve Been Dealt
Clinically Weighted Prevalence (CWP)

Determines how prevalent an event or condition is within a certain population. Determined by gender, age, geographic location, pre-existing diseases, genetic factors or markers, environment, lifestyle, and various other factors.

Predictive Risk Factors (PRF)

Correlates risk factors associated with a certain disease, events or condition.

Predictive Responses (PR)

Predicts what recommendations will yield the best responses for that individual.

Individuals

Program Plan

Diet Plan X
Activity Plan Y
Nutritional Plan Z

RW Analytics
Evidence-based Research
NIH, ADA, AHA, etc. Guidelines

Low Glycemic
Modify protein intake
Short but high-intensity Exercise
Low tyrosine, tyramine, and taurine products with sodium restriction

BMI: 31
Apple-Shape
Tobacco Use
Taurine, tyrosine, tyramine, salt

Disease Predictive Response + Brain Chemistry Predictive Response + Nutritional Predictive Response = Individualized Program Plan
Precision Medicine and AI can TAILOR activity, diet, exercise, music, and more...
There are over 3,500 different diet plans and over 2,200 exercise programs needed to address population groups for weight loss.

A = Mod protein/low fat/low glycemic/mod carbohydrate
B = High protein/low fat/low glycemic/low carbohydrate
C = Mod protein/low fat/mod carbohydrate
D = Mod protein/low fat/low glycemic/low carbohydrate
E = Mod protein/low fat/mod carbohydrate
F = Vegetarian, low fat/mod protein/mod glycemic
S = Serotonin enhancing version
D = Dopamine reducing version
C = Serotonin enhancing and dopamine reducing version
What does this all mean?

• Precision based medicine that can tailor the right treatment for the right person at the right time AND dynamically change as conditions and events occur is the future of safe and effective medicine.

• The technology and content exist NOW!

However!

• The system doesn’t support a cost savings, more efficient and accurate approach.
What do we do?

• Partner with each other and creative healthcare systems that believe the business of healthcare is about:
  – Patients
  – Better care
  – Less expensive care
  – More efficient care
  – Understanding what patients WANT and NEED

“Patient Centered versus Political Centered Healthcare”
We can change healthcare if we learn to cooperate and put the patient first.
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Questions?
Thank you!

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