Population Health Management: Innovations in Risk Adjustment & Predictive Modeling with EHRs and new HIT Sources

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Electronic health record use has reached a “tipping point.” The impact on predictive modeling (PM) and risk adjustment (RA) for population health management will be profound!

Source: USDHHS, CDC-National Center for Health Statistics - 2014
I WILL DISCUSS THE IMPACT OF THE FOLLOWING HEALTH IT (HIT) TRENDS ON FUTURE INNOVATIONS IN PREDICTIVE MODELING AND RISK ADJUSTMENT

• The evolving *digital health milieu*

• The *health data-economy* shift

• HIT mediated care - the new *e-patient / e-clinician*

• Opportunities -- and hype – of *BIG data*

• *e-Measures* of risk and health as a new focal point

• HIT as a new enabler for *population health*
THE DIE IS CAST

HEALTH IT AND E-HEALTH WILL SOON INTERMEDIATE AND DOCUMENT ALL ASPECTS OF HEALTH AND HEALTH CARE
The new “digital health milieu”

- EHRs
- Web-Portals
- PHRs
- Integrated Delivery System/ACO/Virtual Network
- Secure Messaging
- ICT / wireless & wired
- e-mail / internet/Social networks
- Practice Team
- Physician
- Patient
- Family
- M-health Apps
- Community/Population
- Claims/MIS/HIS
- CDS / POE
- PH/HR IT
- Biometric/Telemed
- ACO = Accountable Care Organization
- EHR = electronic health record
- PHR = personal health record
- CDS = clinical decision support IT systems
- MIS/HIS = Management/Health IT systems
- POE = provider order entry IT systems
- PH/HR = public health / human resource IT systems
- Telemed = telemedicine / remote patient monitoring-M-health = mobile health applications
- ICT = information / communication technology

Source: Weiner, 2012  [http://www.ijhpr.org/content/1/1/33]
HIT is the core of the Patient Centered Medical Home (PCMH)

- Integrate E-prescribing And COES
- EHR/HIE Connected
- Public Health Bio Surveillance Connected
- Advance Chronic Disease Mgmt
- Patient Registry Databases
- E-Clinical Decision Support
- Electronic Patient Access and Communication
- Electronic Eligibility System Interface
- Two way Quality Reporting

Source: US Medicare (CMS) Innovation Center
FOR 5 DECADES, GETTING PAID HAS BEEN THE MOTIVATION FOR MOST HIT AND THE MAIN SOURCE OF PM / RA DATA

FROM HERE ON, DATA WILL BE DERIVED FROM HIT INTENDED TO SUPPORTING THE CLINICAL CARE PROCESS
The shifting US “data economy” – the transition from claims to EHR systems

Estimated % of health care contact information captured primarily by claims vs. EHR systems, US 1980-2040

Source: Weiner and Salzberg JHU – Work in Progress
The Changing Axiom of the US Health Care “Data Economy”

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<th>CLAIMS/ ADMIN DATA</th>
<th>EHR/HIT/E-HEALTH</th>
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<td>• CARING FOR ONE PT</td>
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<td><strong>DISADVANTAGES</strong></td>
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<td>• POOR INTEROPERABILITY</td>
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<td>• INACCURACY RELATED TO $$</td>
<td>• ACCURACY INCENTIVES ?</td>
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Source: Weiner and Salzberg JHU – Work in Progress
AS THE HIT / E-HEALTH SUPPORTED INFRASTRUCTURE BECOMES THE NORM

REAL-TIME IN-PERSON PATIENT / DOCTOR INTERACTIONS WILL DECREASE SUBSTANTIALLY

PM WILL BECOME INTEGRATED INTO THIS PROCESS
15% or more of care will soon be real-time but “remote”, using telemedicine and “e-referrals”
Mobile health apps and biometric devices will increase exponentially as care alternative / adjunct
The new electronic EHR workflow will lead to profound changes in clinical practice.

NOTES: All trends were significant ($p < 0.05$). See the Table for the 17 Stage 2 Core Set objectives.
SOURCE: CDC/NCHS, National Ambulatory Medical Care Survey, Electronic Health Records Survey.
The new e-Health Mediated Patient / Clinician Interaction: A Conceptual Model

DATA...DATA EVERYWHERE...
BUT NOT A DROP TO DRINK

THE OPPORTUNITY AND HYPE OF “BIG DATA” AND “BIG ANALYTICS” IN HEALTH CARE PREDICTIVE MODELING
“BIG DATA” in Health Care

Source of Graphic – Nuance Inc
The Four “Vs” of Big Data in Health Care
Big Data, Big Analytics, Big Predictions???

Source: Dell
CHALLENGES AND HYPE OF BIG DATA: THIS WILL ALL IMPACT PREDICTIVE MODELING

- Some - though not all - data are unstructured and messy (e.g., clinicians notes and social networks)
- Some data streams (imaging, sensors, genomics) are huge, others are not (by today’s tech standards)
- Until interoperability is surmounted, much data will be missing and difficult to link
- Observational “machine learning” is only a small part of the equation. Logic, evidence and “domain experts” are essential for useful analytics
- Tools to share practical information with humans is key (e.g., decision support)
- The lines between big data / big analytics / predictive modeling are blurry
- Caveat emptor, everyone is hyping to sell something.
THE DIGITAL MEASUREMENT OF HEALTH STATUS AND RISK WILL BECOME CENTRAL TO MOST EVERYTHING

“E-ACG” RESEARCH FRONTIERS AT JOHNS HOPKINS

www.acg.jhsph.edu
Measuring and Understanding Risk Over Time is Central to Managing Care and Cost

Clinical Data & Socio-Demographic Data

Best Interventional Opportunity

Situational Risk
Early-Risk
High-Risk
Symptomatic Illness
Complex Active Illness

80% of costs

Longitudinal Health Status
Lifetime Health Costs

HIMSS14
EHR and other HIT data offer profound opportunities to measure risk beyond current claims based models.
The new electronic sources of risk factor / health status input data include:

- EHR “charting” (clinical findings, history, biometrics)
- EHR workflow (decision support-CDS, time stamps)
- “Order entry” (POE)” (e-prescribing, test-ordering)
- “Investigation “results” (lab, image, EKG/cardio)
- Home devices / sensors / m-health
- PHRs / Pt. portal / m-health (consumer preferences, actions and functions)
- Social networks / e-interactions (Dr/Pt, Pt/Pt, Dr/Dr)
- Community surveillance / public health networks
Electronic ambulatory lab results add significant risk prediction ability to claims-based information

Figures represent est. additional annual $ associated with “risk” information from lab data. Each bar represents pt. cohort stratified by lab value (H,M,L) for each test noted, for three claims-based morbidity levels (ACG RUBs).

Source: Preliminary JHU analysis based on approx 60,000 persons with claims data and in-scope digital lab results. Will likely be part of JHU ACG Version 12.0
Moving beyond cost and utilization: Some new targeted end-points / outcomes of EHR-based predictive modeling

- “Morbidity trajectories” over time
- Real time population health / community surveillance
- Real time clinical action for individual consumer
- Functional Status / Frailty
- Biometric attributes
- Cardiovascular and other physical function
- Social needs / challenges
- Consumer health related behaviors
- Mortality / Longevity
Consumer based “health risk appraisals” can be integrated into EHRs and the care workflow.
Consumer Social Network Data and Risk Prediction

Source: Yale Univ. Prof. Christakis
Physician “social networks” and risk prediction

A

1 Shared Patient

B

Doctor

C

2 Shared Patients

D

Doctor

Doctor
Constructing a “Care Density” Shared Care Network Measure

5 doctors represented by circles

3 patients represented by different lines

Total number of shared patients

total number of pairs of doctors

A new methodology now integrated into Johns Hopkins ACG System Version 11.0
Impact of Care Density on costs of for CHF Pts.

$0 represents the average costs for the patients in the low care density group. All models are adjusted for insurance plans, payer type, product type, age, gender, number of ADGs, having seen a PCP, and providers.

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3579968/
MAXIMIZING HEALTH (AND VALUE) FOR POPULATIONS

HIT AND RELATED “RISK” MEASUREMENT AND PREDICTIONS WILL MAKE COMMUNITY TARGETED POPULATION HEALTH MANAGEMENT FEASIBLE… AND INEVITABLE
Working Definitions

Population Health

“Population health comprises organized activities for assessing and improving the health and well-being of a defined population.”

Population Health Informatics (PHIT):

“Population health informatics is the systematic application of information technologies and electronic information to the improvement of the health and well-being of a defined community or other target population.”
HIT WILL ALLOW GREAT ADVANCES IN POPULATION HEALTH AND THESE WILL HAVE IMPACT ON FUTURE PM

• Ways to integrate disparate “numerators” & “denominators” to define true populations and communities.
• Ways to identify those “at-risk” both at the community and patient-panel level.
• Advanced tools for extracting and analyzing unstructured data from many sources.
• Models and tools to help medical care systems move towards “population value” perspectives.
• Integration of pop health analytics and decision support.
Hot-Spotting Baltimore Hospitalizations Using HIE Data

Source: CMS Innovation Planning Grant Received by the Maryland Department of Health
Conceptual model for the “Maryland Population Health Information Network” (M-PHIN) in Support of the new “All Payer” Population-Based Global Budget Hospital Payment System

- **Patient Experience Metrics**
- **Population Health Metrics**
- **Healthcare Cost**

**MD All-Payer Population Health Analytics Core**

**State-wide Population Health Data-warehouse**

- **Claims** (HSCRC, CMS)
- **National Data** (HCAHPS, CDC, QBR, PQI)
- **Local PH Metrics** (Md SHIP)

**New Data Sources?**

**EHRs**

1...n

**HIE (CRISP)**

**Informatics Unit at HSCRC/DHMH**
- A
- B
- C

**DHMH to Provider**
- DHMH to Provider

**Provider to DHMH**
- Provider to DHMH

**JHU Measurement Workgroup**
IN CONCLUSION

THE NEXT DECADE OR TWO WILL BE THE MOST DYNAMIC AND EXCITING TIME EVER IN THE FIELD OF PREDICTIVE MODELING IN HEALTH CARE
Likely future predictive modeling innovations for population health management

- Integration into the electronic health care workflow
- Be more finely tuned to specific individuals and populations
- Predict health outcomes beyond cost
- Target broader timeframes
- Be more accurate
- Involve more complex modeling
- Become more transparent and less hyped
- Be applied by a wider array of end-users
- Keep all of busy for the rest of our careers!!
But the journey may hold some surprises
Further Information?

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