The Center for Population Health IT (CPHIT):
Mission, Research Portfolio and Future Opportunities and Challenges

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Contacts: Jonathan Weiner, Director, (jweiner1@jhu.edu)
Hadi Kharrazi Assistant Director,
Elyse Lasser, Center Coordinator
Topics for Today

• Background on Pop HIT

• CPHIT Background
  • Mission, Team, Internal Partnerships, External Collaborators

• CPHIT R&D Projects
  • Research Priorities
  • Ongoing projects

• Data Sources To Share
  • OptumLabs (United Healthcare, Mayo, group practices)
  • MHCC-All Payer Claims Database
Recent US Growth in EHR Adoption Has Been Phenomenal

Office Based MDs

Source: USDHHS-ONC-2015
Recent US Growth in EHR Adoption Has Been Phenomenal

Acute Care Hospitals

Source: USDHHS-ONC-2015
Today’s Evolving HIT Framework Encompasses Delivery Systems, Consumers & Communities

- **EHRs**
- **Web-Portals**
- **PHRs**

**Integrated Delivery System/ACO/Virtual Network**

- **Physician**
- **Patient**
- **Practice Team**
- **Family**

**Secure Messaging**

- **ICT / wireless & wired**
- **e-mail / internet/Social networks**

**CDS / POE**

- **Claims/ MIS/HIS**

**Community/Population**

- **PH/HR IT**
- **Biometric/Telemed**
- **M-health Apps**

Source: Weiner, 2012. [http://www.ijhpr.org/content/1/1/33](http://www.ijhpr.org/content/1/1/33)
A Comparison of the Domains of Population Health, Public Health and Clinical Informatics

(a) Total population of a geographical boundary (e.g., a community surrounding a provider) regardless of their attribution to an individual entity (e.g., a healthcare provider, an employer).

(b) Target population attributed to an individual entity (e.g., a healthcare provider, an employer). In case of a healthcare provider, the target population will be the entire denominator of their patients or parts of it.

Source: JHU CPHIT = See Kharrazi et al 2016
Our Center’s 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.”
Population Health Informatics: An Integration of Three Disciplines

- Medical Care / Clinical Sciences
- Health Informatics / Info Sciences
- Population / Public Health Sciences
Mission: an innovative, multi-disciplinary R&D center to improve the health and well-being of populations by advancing the state-of-the-art of Health IT across public and private health organizations.

Focus: the application of electronic health records (EHRs), mobile health and other e-health and HIT tools targeted at communities and populations.

www.jhsph.edu/cphit
Core Team

Jonathan Weiner  
*Director*

Hadi Kharrazi  
*Research Director*

David Chin  
*Senior Advisor  
Industry Partners*

Elyse Lasser  
*Center Coordinator  
Research Associate*

Suchi Saria  
*Core Faculty*

Tom Richards  
*Technology Director*

Klaus Lemke  
*Senior Biostatistician*

David Bodycombe  
*Senior Project/R&D  
Manager*

Fardad Gharghabi  
*Senior Research  
Assistant*
Partnerships

JH Health System
JH Health Care

JHU Academic
Departments
and other R&D
centers

CPHIT
(Home of ACG
R&D)

External PH/IDS
Orgs.

JH Healthcare
Solutions,
LLC
(Now Managing
ACGs)

Business
Partners

Industry
Foundations
Government

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External Collaborators

• Veterans Health Administration (national)
• Maryland Department of Health
• Health Partners (MN)
• Atrius Health (MA)
• OptumLabs (MA)
• Baltimore City Health Department
• CMS
• Several Health Information Exchanges (MD, LA, HI, RI)
• Several National and Global Health care & IT companies
• Several Universities
R&D Priorities 1

• Development and testing of health status and quality measures created from EHRs and other HIT systems.

• Use and advancement of computing methodologies- including natural language processing (NLP) and pattern recognition tools.

• Initiation of effective approaches for linking provider-centric EHR systems with consumer-centric internet and mobile based e-health applications.

• Development of EHR-based tools and decision support applications to help manage high risk populations.

• Lead technical and strategic approaches for creating and demonstrating interoperability of EHR networks for public and private sectors.
R&D Priorities 2

• Creation of legal/ethical and policy frameworks around secondary use of EHR data for public health goals

• Development of innovative EHR-based tools and decision support for next generation quality/safety improvement

• Strategic integration of data from multiple sectors—health plans, health systems, physicians, agencies, etc. with EHR data to enhance population-based interventions and research

• Development of standardized tools and frameworks to support future R&D and evaluation in the fields of population health IT and informatics.
Ongoing projects- 1

• Developing an advanced set of EMR-Based population focused predictive modeling “e-ACG” tools

• Working with the US VA to develop a national population health measurement framework

• Developing a new geriatric/frailty “e-risk” score utilizing structured and unstructured EHR data

• Working with the JH health system and EPIC to develop state of the art population HIT Tools.

• Understanding how consumer/marketing data can be used to identify health outcomes
Ongoing projects - 2

• Working with the Maryland State Health Department, HIE and Hospital commission to build a statewide population HIT infrastructure

• Develop core analytics for regional collaboration to identify elder’s fall injuries in the community using social, medical, and public health data.

• Testing new “e-measures” of performance for health plans and IDSs.

• Working with the HIE, department of justice, and the Maryland State Health department to improve prescription drug monitoring programs.
EHRs and other HIT data offer profound opportunities to understand risk and need beyond current administrative data based models.

**Clinical Domain**
- Symptoms/Physical Status
- Diagnostics
- Therapeutics
- Medical History
- Genomics

**Consumer Domain**
- Socio-economic
- Behavioral/Lifestyle
- Family
- Preferences
- Insurance Status
- Knowledge/Attitudes
- Community Norms
- Access to Care
- Race/ethnicity
Moving beyond cost and utilization: Some new targeted end-points / outcomes of EHR-based “e-ACG” 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
Predicting High Utilization Events

Impact of Alternative Source of Input Data on Predictive Accuracy (AUC/ROC) of High Utilization Events

<table>
<thead>
<tr>
<th>AUC by outcome measures</th>
<th>Age &amp;Gender</th>
<th>Claims only</th>
<th>EHR only</th>
<th>Claims + EHR (either source)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ICD</td>
<td>ICD+Rx</td>
<td>ICD</td>
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<tr>
<td>Persons with any hospitalization</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Concurrent</td>
<td>0.658</td>
<td>0.983</td>
<td>0.983</td>
<td>0.804</td>
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<tr>
<td>Prospective</td>
<td>0.672</td>
<td>0.774</td>
<td>0.775</td>
<td>0.712</td>
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<tr>
<td>Persons with total cost at 95th percentile or above</td>
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<td></td>
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<tr>
<td>Concurrent</td>
<td>0.646</td>
<td>0.887</td>
<td>0.905</td>
<td>0.779</td>
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<tr>
<td>Prospective</td>
<td>0.647</td>
<td>0.817</td>
<td>0.828</td>
<td>0.725</td>
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<tr>
<td>Persons with costs at top 99th percentile or above</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Concurrent</td>
<td>0.685</td>
<td>0.945</td>
<td>0.947</td>
<td>0.817</td>
</tr>
<tr>
<td>Prospective</td>
<td>0.683</td>
<td>0.827</td>
<td>0.827</td>
<td>0.726</td>
</tr>
</tbody>
</table>
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 three lab value risk levels within three claims-based ACG morbidity levels (red, yellow, green).

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.
A pop based analytic/predictive model for obesity using EHR derived BMI & GIS Social Data

Electronic BMIs derived from EHRs of national care system
(Obesity levels based on 29,000 BMIs captured in one day in EHRs)

GIS Map of Low Income Areas by Small Area
(We are linked dozens of social factors based on pt. geo-codes)
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
A pop based predictive analytic / intervention of elders’ falls linking real time HIE & Social factors

Rates of falls by neighborhoods derived from real time health information exchange data in Baltimore City (draft results)

GIS map of housing types in Baltimore by census tract
CPHIT – Future Clearinghouse for Research Data?

Starting with two sources available now
OptumLabs

- Exploratory Access available
  - CPHIT can view and pull counts
  - Access to EHR and Claims data

- Logistics to using data
  - Preliminary and full applications for grant proposals and full access
  - Cost associated with access data for research
  - Statistical packages are limited
MHCC: Claims data

- CPHIT will house the MHCC (Md. Health Care Commission) all-payer claims database
- All commercial 2011-2014 (maybe Medicaid 2010-2011 but no Medicare.
- CPHIT will act as an agent for MHCC approving projects
- Applications and JHU IRB approval required

Data:
- All Claims
- Physician/provider information
- Zipcode, other location information
- Limited MCO data
These are exciting times: In the future, advances in population HIT will allow

• Ways to integrate disparate “numerators” & “denominators” to define true populations.

• Ways to identify those “at-risk” both at the community and patient-panel level.

• Advanced tools for extracting unstructured data from many sources using text mining (NLP).

• Integration of medical data, with a wide range of non-medical social and wellness data, at both individual and geographic levels.

• Real time signals and dynamic modeling.

• Models and tools to help medical care systems move away from Fee-For-Service towards “population value” perspectives.
The opportunities and challenges in this domain are huge, but a few details need to be worked out!
For further information or to explore Collaboration Please Contact

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