Bridging Health and Health Care
Wednesday, March 4, 2015  12:00-1:00pm ET

Leveraging Electronic Health Records for Public Health: From Automated Disease Reporting to Developing Population Health Indicators

Conference Phone: 877-394-0659
Conference Code: 775 483 8037#
Please remember to mute your phone and computer speakers during the presentation.
Agenda

Welcome: Angie Carman, DrPH, PHSSR National Coordinating Center, Assistant Professor, U. of Kentucky College of Public Health

Presenter:
“Leveraging Electronic Health Records for Public Health: From Automated Disease Reporting to Developing Population Health Indicators”
Brian Dixon, MPA, PhD, FHIMSS, Assistant Professor, Richard M. Fairbanks School of Public Health, Indiana University

Commentary:
Shaun J. Grannis, MD, MS, Associate Director, Regenstrief Institute Center for Biomedical Informatics
Joseph Gibson, MPH, PhD, Director of Epidemiology, Marion County Public Health Department, Indianapolis

Questions and Discussion
Future Webinar Announcements
PHSSR Mentored Researcher Development Awards

- 2-year awards providing protected time to complete PHSSR project, with research mentor and practice mentor (2013-2015)
- Four award recipients will present over six weeks

<table>
<thead>
<tr>
<th>Title</th>
<th>Presenter</th>
<th>Institution</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifying &amp; Learning from Positive Deviant Local Public Health Departments in Maternal and Child Health</td>
<td>Tamar A. Klaiman, PhD, MPH, U. of Sciences, Philadelphia</td>
<td>(February 19)</td>
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Brian Dixon, MPA, PhD, FHIMSS
Assistant Professor
Department of Epidemiology
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Indiana University

Research Scientist, Regenstrief Institute Center for Biomedical Informatics
Investigator in Residence, Center on Health Information and Communication, Department of Veterans Affairs

bedixon@regenstrief.org
Leveraging Electronic Health Records for Public Health: From Automated Disease Reporting to Developing Population Health Indicators

Brian E. Dixon, MPA, PhD, FHIMSS

March 4, 2015
Agenda

• The Neolithic Revolution in Public Health
  – A change in how PH accesses data

• Leveraging the Digital Health Infrastructure
  – Challenges for PH agencies
  – RWJF-funded projects to address the challenges

• Questions and Discussion
A Neolithic Revolution in Population Health

Photo from *El mono obeso* by JE Campillo; Accessed via http://www.uv.es/jgpausas/he.htm
The Revolution is in Data and Information Acquisition
Where Health Care Used to Be (and in some places still is)
*Fictitious patient record*
User

Specialist

Hospital

PCP

Other EHRs

Your EHR

Public Health

Bio Repositories

Yours and Others’ EHRs

Device and Patient Reported Data

User

Today

10+ Years

5-10 Years
Fueling the Revolution

• Meaningful Use
  – Incentive program from CMS to encourage adoption and use of EHR systems
  – $21.6 billion paid to 355,000 EHs/EPs thru 2014

• Stage 2 MU requires HIE
  – Summary of care provided at least 10% of time
  – Laboratory reporting to public health
Meaningful Use

Eligible Hospitals and CAHs

Report on all 16 Core Objectives:

1. Use computerized provider order entry (CPOE) for medication, laboratory and radiology orders
2. Record demographic information
3. Record and chart changes in vital signs
4. Record smoking status for patients 13 years old or older
5. Use clinical decision support to improve performance on high-priority health conditions
6. Provide patients the ability to view online, download and transmit their health information within 36 hours after discharge.
7. Protect electronic health information created or maintained by the Certified EHR Technology
8. Incorporate clinical lab-test results into Certified EHR Technology
9. Generate lists of patients by specific conditions to use for quality improvement, reduction of disparities, research, or outreach
10. Use certified EHR technology to identify patient-specific education resources and provide those resources to the patient if appropriate
11. Perform medication reconciliation
12. Provide summary of care record for each transition of care or referral
13. Submit electronic data to immunization registries
14. Submit electronic data on reportable lab results to public health agencies
15. Submit electronic syndromic surveillance data to public health agencies
16. Automatically track medications with an electronic medication administration record (eMAR)
The Learning Health System

• Learning Health System (LHS), a concept introduced by the Institute of Medicine

• Emphasizes health systems should leverage their data to continuously improve; and practice should inform research objectives

• EHR and HIE Systems lay the foundation for the LHS
LEVERAGING THE DIGITAL INFRASTRUCTURE FOR PUBLIC HEALTH
## Results from 2010 NACCHO Survey

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Percent of LHDs</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Individual</td>
<td>Syndromic</td>
<td>Outbreak</td>
<td>Laboratory</td>
</tr>
<tr>
<td><strong>Restaurant Inspections</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n=210)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Water Wells</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(Licensing and/or Testing) (n=179)</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Lead Testing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(n=175)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Environmental Health Tracking</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n=190)</td>
<td></td>
<td></td>
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<th>Percent of LHDs</th>
<th></th>
<th></th>
<th></th>
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<tr>
<td></td>
<td>Immunization Records</td>
<td>Vital Records</td>
<td>Home Visits by Public Health Nurses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(n=244)</td>
<td>(n=171)</td>
<td>(n=199)</td>
<td></td>
</tr>
<tr>
<td><strong>Paper Records</strong></td>
<td>62%</td>
<td>56%</td>
<td>72%</td>
<td></td>
</tr>
<tr>
<td><strong>Standalone Spreadsheet or Database</strong></td>
<td>14%</td>
<td>13%</td>
<td>17%</td>
<td></td>
</tr>
<tr>
<td><strong>Local Data Warehouse</strong></td>
<td>13%</td>
<td>11%</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td><strong>In a Web-Based Database</strong></td>
<td>65%</td>
<td>59%</td>
<td>28%</td>
<td></td>
</tr>
<tr>
<td><strong>A Shared Database (Other than Web)</strong></td>
<td>22%</td>
<td>23%</td>
<td>16%</td>
<td></td>
</tr>
</tbody>
</table>
Challenges for PH Agencies

• PH Organizations Lag Behind Medicine
  – Aging infrastructure
  – Workforce unprepared for Brave New World

• Old Paradigms Won’t Work
  – 2010s an era of instant gratification
  – Data must be open and usable

• Capacity to Evolve Limited
  – Limited $ available for investment
  – Limited workforce to advance systems
Two Projects

• Examining a provider intervention to automate reporting of vaccine-preventable diseases
  – Mentored Research Scientist Development Award No. 71596

• Population EHR Data for Assessment at the Local level (PEDAL)
  – PHSSR No. 71271
Domesticating Clinical Data

Raw EHR Data

Domesticate Data (Normalize, Clean, NLP)

Do Something Useful (Identify Vaccine-Preventable Results)

Public Health

Hospital

Regenstrief Center for Biomedical Informatics
Traditional PH Reporting Workflow
Study Objective

• Most reports to PH originate from labs

• We aim to increase reporting rates for providers using an automated process where CDR fields are pre-populated using EHRs
Enhanced PH Reporting Workflow
Pre-populated Reporting Forms

<table>
<thead>
<tr>
<th>Name (last, first, m.i.)</th>
<th>LABTESTING, HARRY M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth Date (month, day, year)</td>
<td>11 12 2005</td>
</tr>
<tr>
<td>Telephone number</td>
<td>765-555-1212</td>
</tr>
<tr>
<td>City, ZIP code</td>
<td>MAYBERRY, 46299</td>
</tr>
<tr>
<td>County</td>
<td>Marion</td>
</tr>
<tr>
<td>Age</td>
<td>3</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
</tr>
<tr>
<td>Race</td>
<td>Hispanic</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Unknown</td>
</tr>
<tr>
<td>Date of diagnosis</td>
<td>11 05 2008</td>
</tr>
<tr>
<td>Etiologic agent</td>
<td>CHLAMYDIA BY RIA - POSITIVE</td>
</tr>
<tr>
<td>Symptoms associated with infection?</td>
<td>Yes</td>
</tr>
<tr>
<td>IF YES</td>
<td>Onset date (month, day, year)</td>
</tr>
<tr>
<td>Pertinent symptoms, signs:</td>
<td></td>
</tr>
<tr>
<td>Lab test(s) and result(s)</td>
<td>CHLAMYDIA BY RIA - POSITIVE</td>
</tr>
<tr>
<td>Treatment (name of antibiotic)</td>
<td></td>
</tr>
<tr>
<td>Dosage</td>
<td></td>
</tr>
<tr>
<td>Date initiated</td>
<td></td>
</tr>
<tr>
<td>Antibiotic resistance?</td>
<td>Yes</td>
</tr>
<tr>
<td>Reporting Facility Code (see other side for codes)</td>
<td>ST01W</td>
</tr>
<tr>
<td>Name of physician and address</td>
<td>FLINTSTONE, FRED</td>
</tr>
<tr>
<td>1001 W. 10th STREET, INDIANAPOLIS, IN 46205</td>
<td></td>
</tr>
<tr>
<td>Date of report</td>
<td></td>
</tr>
<tr>
<td>Date received (month, day, year)</td>
<td></td>
</tr>
<tr>
<td>Follow-up initiated?</td>
<td>Yes</td>
</tr>
<tr>
<td>Name of investigator</td>
<td></td>
</tr>
<tr>
<td>DISTRIBUTION: White - Indiana Department of Health; Canary - Local Health Office; Pink - Reporter</td>
<td></td>
</tr>
</tbody>
</table>
Research Design

• Controlled implementation
  – Clinics will receive pre-populated physician reporting forms in addition to standard D4D clinical messages
  – Baseline info collected before clinic goes live
  – Future sites are controls for early adopters

• Mixed methods approach
  – Quantitative metrics
  – Qualitative interviews
What are we measuring?

• Quantitative
  – Data completeness
  – Time from report to disease investigation
  – Reporting rates by clinic, disease

• Qualitative
  – Perceived completeness, timeliness
  – Perceived workload
  – Satisfaction with prepopulated forms
Project Status

• Baseline data collection completed
  – Existing counts of disease cases, data quality, and processes within public health department
  – Analyzing baseline numbers

• Intervention went live Sept 2014
  – Collecting post-intervention data
  – Beginning analysis of post-intervention data
Issue / Lesson Learned

• Natural language processing of microbiology results is difficult
  – Labs serve multiple “customers” and PH is not at the top of their priority list
  – Standard outputs from LIS/LIMS hard to decipher using clear, standardized rules

• Although the codes for Rubella and Varicella IgG results are in the CDC RCMT, it does not mean that one should use them
  – Many false positive results
Premature death

http://www.countyhealthrankings.org/app/indiana/2014/overview
PEDAL Project Aims

1. Develop neighborhood-level indicators of population health using EHR integrated with a community information system;

2. Evaluate neighborhood-level indicators with respect to reliability, validity, feasibility, and perceived usefulness; and

3. Generate an integrated view of neighborhood-level indicators of health within a local health department jurisdiction, enabling review of information for planning and policy.
Can we get to neighborhood level?

• Sub-county: anything smaller than a county
  – LHD Planning Area (~40,000-50,000)
  – Zip code (~8,000)
  – Census tract (~4,000)
  – Census block group (~1,500)
  – Neighborhood

• What is a neighborhood?
SAVI is a free resource to help you make data-informed decisions. It provides data about Central Indiana communities, tools to analyze and visualize the data, and training to build your capacity to use it effectively.

www.savi.org
Measures

• Prevalence of diabetes; asthma and COPD; depression; STIs; and hypertension as well as other cardiovascular diseases
• Chlamydia screening
• HbA1c Testing for Patients with Diabetes
• HbA1c Controlled at <8% for Patients with Diabetes
• LDL-C Screening for Patients with CVD
• LDL-C Levels < 100 mg/dL for Patients with CVD
• Emergency Room Utilization for People With Asthma
Choosing Measures

• Participatory design and process
  – Engage range of public health stakeholders
  – Coordination with CTSI CHEP, ISDH

• Cast broad net, then narrow list
  – What is feasible given population incidence?
  – What is feasible given EHRs?
  – What is feasible given INPC?
  – What is feasible given geography?
# Measure Selection - Feasibility

<table>
<thead>
<tr>
<th>Measure or Indicator</th>
<th>Likelihood of Electronic Capture in an EHR or PH System</th>
<th>Availability within a RHIO or IT Systems Accessible to Public Health</th>
<th>Prevalence of Disease or Occurrence per 1000 Population</th>
<th>Percentage of Health Care Market / Providers Contributing Data</th>
<th>Geographic Granularity, Enabling Use at Small Scales</th>
<th>Use for PEDAL?</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV screening</td>
<td>10 - very likely; captured in structured format</td>
<td>10 - definitely available and likely all institutions</td>
<td>Varies by Disease; Marion County, Indiana</td>
<td>~95% of Marion County</td>
<td>YES for PEDAL since data available at high quality (X,Y) coordinates</td>
<td>Yes</td>
</tr>
<tr>
<td>HPV vaccination coverage (single dose &amp; completed series)</td>
<td>7 - likely</td>
<td>3 - unlikely to be available</td>
<td>97.2 (male) 384.3 (female)</td>
<td>10%</td>
<td>90% can definitely scale down to the smallest levels</td>
<td>No - Very challenging to representative data in small area</td>
</tr>
<tr>
<td>Emergency Room Utilization by People With Dental Pain/Infections</td>
<td>7 - likely</td>
<td>7 - available but may not for all institutions</td>
<td>10 - can definitely scale down to the smallest levels</td>
<td>95%</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Prevalence of viral hepatitis – HBV and (especially) HCV</td>
<td>10 - very likely; captured in structured format</td>
<td>3 - unlikely to be captured electronically or captured in free</td>
<td>Varies by Disease; Marion County, Indiana</td>
<td>~95% of Marion County</td>
<td>10% can definitely scale down to the smallest levels</td>
<td>Yes</td>
</tr>
<tr>
<td>Evidence of violence/trauma (e.g., domestic violence)</td>
<td>3 - unlikely to be captured electronically or captured in free</td>
<td>3 - unlikely to be available</td>
<td>Varies by Disease; Marion County, Indiana</td>
<td>~95% of Marion County</td>
<td>10% can definitely scale down to the smallest levels</td>
<td>No - Difficult to determine if EHR data is available</td>
</tr>
</tbody>
</table>
**Measure Definition**

### DIABETIC CARE: Comprehensive Diabetic Care (CDC)

#### DESCRIPTION
Percentage of patients 18–75 years of age with type 1 or type 2 diabetes who had the following completed during the respective measurement period. Each is a separate measure.

- (DC1) Hemoglobin A1c (HbA1c) testing
- (DC8) HbA1c good control (<7.0%)
- (DC2) HbA1c control (<9.0%)
- (DC3) LDL-C screening performed
- (DC5) LDL-C controlled (<100 mg/dL)
- (DC6) Kidney disease (nepropathy) monitored
- (DC7) Retinal eye exam performed

#### MEASURE-SPECIFIC DATA RETURNED

<table>
<thead>
<tr>
<th>No.</th>
<th>Criteria</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age</td>
<td>18–75 years</td>
</tr>
<tr>
<td>2</td>
<td>Denominator Period</td>
<td>24 months</td>
</tr>
<tr>
<td>3</td>
<td>Measurement Period</td>
<td>12–24 months</td>
</tr>
</tbody>
</table>

**No. 1** Identify patients whose date of birth is 18–75 years from the current month

#### DATA RETURNED

<table>
<thead>
<tr>
<th>No.</th>
<th>Field Name</th>
<th>Description</th>
<th>Data Type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DiabetesEncounterDate</td>
<td>Date of diabetes diagnosis</td>
<td>Date</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>DiabetesMedicationDate</td>
<td>Date insulin or oral hypoglycemic dispensed</td>
<td>Date</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>VisitType</td>
<td>Visit Type</td>
<td>String</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>HbA1cTestDate</td>
<td>Date of HbA1c test</td>
<td>Date</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>HbA1cTestResult</td>
<td>Result of HbA1c test</td>
<td>String</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>LDL-CtestDate</td>
<td>Date of LDL-C test</td>
<td>Date</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>LDL-CtestResult</td>
<td>Result of LDL-C test</td>
<td>String</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>UrineMicroalbuminTestDate</td>
<td>Date of urine microalbumin</td>
<td>Date</td>
<td></td>
</tr>
</tbody>
</table>
Data Analysis

• Internal Validation
  – Statistical techniques to optimize the variance over the geographic regions of interest
  – Factor analysis in conjunction with self organizing maps (SOMs)

• External Validation
  – Compare with MCPHD surveys, BRFSS
  – Explore quality of INPC data
Status of PEDAL

• Selected broad set of measures
  – Initially bit off a bit more than we can digest

• Defined nearly all measures
  – Numerator, denominator

• Internal validation with data from the INPC and SAVI
  – Optimizing prevalence models; adj for population

• External validation with MCPHD and other PH stakeholders
  – Creating maps, analysis sets for review
Diabetes Rates
2011-2013

Percent of INPC Patient Population Diagnosed with Diabetes by Neighborhood:

- 1.5% - 3.32%
- 3.33% - 4.99%
- 5% - 6.54%
- 6.55% - 8.8%
- 8.81% - 16.07%

The Polis Center

Source: Indiana Network for Patient Care

Map created 11/7/2014 by The Polis Center at IUPUI
Successful Strategies for Innovation in PH Informatics

• Innovation = Feasible + Advance
  – Look at what is feasible given the digital infrastructure in your community

• Identify the biggest pain points
  – Ask providers what irks them
  – Ask PH system leaders what they need

• Don’t boil the ocean
  – Start small then incrementally expand
Successful Strategies for Innovation in PH Informatics

• Standards are preferable
  – Select and utilize available, mature standards
  – Avoid creating new ones unless necessary

• Think critically about winners and losers
  – Where there is change, there is cost

• Don’t let perfect be the enemy of the good
  – 80% complete can often be good enough
Acknowledgements

• Thank you to my mentors
  – Shaun Grannis, MD
  – Joe Gibson, PhD

• These organizations fund my work
  – U.S. Agency for Healthcare Research and Quality
  – Robert Wood Johnson Foundation
  – U.S. Centers for Disease Control and Prevention
  – Merck-Regenstrief Program
  – Indiana State Department of Health
  – U.S. Department of Veterans Affairs
Questions?

Brian E. Dixon, MPA, PhD, FHIMSS
Assistant Professor, IU Fairbanks School of Public Health;
Research Scientist, Regenstrief Institute;
Health Research Scientist, Department of Veterans Affairs

http://tinyurl.com/fsphbed
Twitter: @dpugrad01
Commentary

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Associate Professor of Family Medicine
Indiana University School of Medicine
sgrannis@regenstrief.org

Joseph Gibson, MPH, PhD
Director of Epidemiology
Marion County Public Health Department, Indianapolis
JGibson@marionhealth.org

Questions and Discussion
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| Wednesday, March 11 | 12-1pm ET     | Evaluating the Quality, Usability, and Fitness of Open Data for Public Health Research | Erika G. Martin, PhD, State University of New York-Albany  
**2013 PHSSR MRDA Award** |
| Thursday, March 19  | 1-2pm ET      | Cross-sector Collaboration Between Local Public Health & Health Care for Obesity Prevention | Eduardo J. Simoes, MD, University of Missouri and  
Katherine A. Stamatakis, PhD, MPH, St. Louis University |
<table>
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<td>Restructuring a State Nutrition Education and Obesity Prevention Program: Implications of a Local Health Department Model</td>
<td>Helen W. Wu, PhD, U. California Davis</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>– 2013 PHSSR MRDA Award</td>
</tr>
<tr>
<td>Wednesday, April 8</td>
<td>12-1pm ET</td>
<td>Public Health Services Cost Studies: Tobacco Prevention, Mandated Public Health Services</td>
<td>Pauline Thomas, MD, New Jersey Medical School &amp; NJ Public Health PBRN Nancy Winterbauer, PhD, East Carolina University &amp; NC Public Health PBRN</td>
</tr>
<tr>
<td>Tuesday and Wednesday</td>
<td>April 21-22</td>
<td>2015 PHSSR KEENELAND CONFERENCE, Lexington, KY</td>
<td></td>
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</tbody>
</table>
For more information contact:

Ann V. Kelly, Project Manager
Ann.Kelly@uky.edu

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Lexington, KY 40536
859.218.2317

www.publichealthsystems.org