Improving Vaccine-Preventable Disease Reporting through Health Information Exchange

Brian E. Dixon, MPA, PhD, FHIMSS

UK Research Seminar

October 16, 2015
IU, Regenstrief, and VA...Oh, My!

Educator (30%)
Instructor
MPH, PhD
Mentor

Researcher (70%)
CBI and HSR Investigator
VA HSR&D Investigator
My Research

Public Health Services and Systems Research (PHSSR); Surveillance; and Epidemiology

Health Information Exchange; and Clinical Decision Support

Public Health

Health Services Research

Biomedical Informatics

Pop Health Veteran Health Usability Policy
Agenda

• Population Health Decision Support

• Case Reporting Then and Now

• A Pop Health Decision Support Intervention

• Preliminary Findings and Policy Recommendations
Clinical Decision Support

- Computer-based clinical decision support (CDS) can be defined as the use of the computer to bring relevant knowledge to bear on the health care and well being of a patient.
  – Greenes, 2007

\[(\text{brain} + \text{computer}) \geq \text{brain}\]

Friedman, JAMIA, 2008
How Does CDS ‘Fit’ into Public Health?

Office of the National Coordinator for Health IT, 2014
PH Decision Support

• Public health decision support (PHDS) can be defined as the use of the computer to bring \textit{relevant knowledge} to bear on the \textit{health} and \textit{well-being} of a \textit{population}.
  
  – Dixon, Gamache, Grannis, 2013

• Examples:
  
  – Vaccine forecasting report
  
  – Suggestion for ordering stool culture
Traditional Case Reporting Workflow
# Official State CDR Form

## Patient Information
- Name
- Address
- Phone#
- DOB
- Gender
- Race/ethnicity

## Lab Information
- Etiologic agent
- Test name
- Test date
- Treatment initiation date
- Treatment (drugs)

## Provider Information
- Physician name
- Physician address
- Phone#
- Reported by
- Report date
Enhanced Case Reporting Workflow
Enhancement Builds Upon Core Infrastructure

• Automated case detection
  – Identification of cases that must be reported

• Clinical messaging**
  – Getting information to its recipient in a way that is integrated into workflow

• Public health communication pathways
  – Electronic laboratory reporting**
  – Fax communications
The Notifiable Condition Detector

Inbound Messages

Reportable Conditions

Compare to Dwyer I

Abnormal flag, Organism name in Dwyer II, Value above threshold

Reportable Results

Abnormal flag, Organism name in Dwyer II, Value above threshold

E-mail Summary

Database

Abnormal flag, Organism name in Dwyer II, Value above threshold

Realtime

Record Count as denominator

Daily Batch

Print Reports

To Public Health

To Infection Control

Reportable Results Database

Report Count as denominator

Print Reports

To Public Health

To Infection Control

E-mail Summary
Triggers for Case Detection

• ICD-9 / ICD-10 / SNOMED CT
  – Clear signal of clinical or lab confirmed diagnosis

• LOINC
  – Clear signal of test that examines PH condition
  – Yet the “result” can be hard to confirm

• Natural Language Processing
  – Hard but necessary as labs “dump” results into standard messages
Clinical Messaging/Public Health Communication
Login Screen

Welcome

Please enter your username and password, then press "Log in".

Username: [input field]
Password: [input field]

Log in
Forgot your password?

helpdesk@ihie.org
317.644.1752
<table>
<thead>
<tr>
<th>Provider</th>
<th>MRN</th>
<th>Patient Name</th>
<th>Arrival</th>
<th>VT</th>
<th>Doc Type</th>
<th>Doc Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benton, Peter</td>
<td>1234</td>
<td>John Smith</td>
<td>2007/10/04 01:27 AM</td>
<td>Lab (St. Francis)</td>
<td>Basic Metabolic Panel</td>
<td>TRICOMONAS WET PREP EXAM</td>
</tr>
<tr>
<td>Benton, Peter</td>
<td>5678</td>
<td>Jane Doe</td>
<td>2007/10/04 01:27 AM</td>
<td>Microbiology (St. Francis)</td>
<td>Consultation Report</td>
<td>HEMATOCRIT RBC</td>
</tr>
<tr>
<td>Benton, Peter</td>
<td>9012</td>
<td>Margaret Lee</td>
<td>2007/10/04 01:27 AM</td>
<td>Transcription (Morgan)</td>
<td>Radiation Report</td>
<td>BONE SCAN</td>
</tr>
<tr>
<td>Benton, Peter</td>
<td>7890</td>
<td>Sarah Brown</td>
<td>2007/10/04 01:27 AM</td>
<td>Radiology (St Vincent's Mercy)</td>
<td>CT PELVIS W 72155</td>
<td>CHEST PA LATERAL</td>
</tr>
<tr>
<td>Benton, Peter</td>
<td>5678</td>
<td>David Williams</td>
<td>2007/10/04 01:27 AM</td>
<td>Radiology (St Clares)</td>
<td>CT PELVIS W 72155</td>
<td>CHEST PA LATERAL</td>
</tr>
<tr>
<td>Benton, Peter</td>
<td>9012</td>
<td>Emma Davis</td>
<td>2007/10/04 01:27 AM</td>
<td>Lab (St. Francis)</td>
<td>Basic Metabolic Panel</td>
<td>CHLAMYD GC DNA EPA</td>
</tr>
<tr>
<td>Benton, Peter</td>
<td>3456</td>
<td>Michael Lee</td>
<td>2007/10/04 01:27 AM</td>
<td>Lab (St. Vincent's)</td>
<td>Basic Metabolic Panel</td>
<td>VAPROIC ACID (DEPAREN) LEVEL</td>
</tr>
<tr>
<td>Benton, Peter</td>
<td>7890</td>
<td>William Smith</td>
<td>2007/10/04 01:27 AM</td>
<td>Radiology (St Clares)</td>
<td>Basic Metabolic Panel</td>
<td>CT CHEST WO 71250</td>
</tr>
<tr>
<td>Benton, Peter</td>
<td>5678</td>
<td>Margaret Lee</td>
<td>2007/10/04 01:27 AM</td>
<td>Lab (St. Vincent's)</td>
<td>Basic Metabolic Panel</td>
<td></td>
</tr>
</tbody>
</table>
St. Clare
MEDICAL CENTER
Sisters of St. Francis Health Services

Pt: Beaton, Peter
Acct: 36
Accession#: 3291227
Order#: CARTER, JOHN
Pt Class: E
Admit Date: P

St. Clare Medical Center
1710 Lafayette Road
Crawfordsville, IN 47933
(765) 362-2800

DOB: 1/19/19
Sex: M

***Final Report***

EXAM: CR WRIST MIN 3 VV RT 73110
EXAM DATE: Sep 10 2007 11:17AM ACESSION#: 3291227

ADMITTING DIAGNOSIS: EXTREMITY PW

CLINICAL HISTORY: Recent trauma. The patient presents with pain in wrist.

IMPRESS: No evidence of an acute or healing fracture.

RESULT: Three views of the right wrist show no evidence of an acute or healing fracture. The distal radius and ulnar are intact. The carpals are normal in appearance, position and alignment. Incidental note is made of metallic plates and screws in the fourth and fifth metacarpals, consistent with open reduction of prior fractures.

Read by: JAMES PEARCE MD
Reviewed and Electronically signed by: JAMES PEARCE MD
<table>
<thead>
<tr>
<th>Provider</th>
<th>MRN</th>
<th>Patient Name</th>
<th>Arrival</th>
<th>VT</th>
<th>Doc Type</th>
<th>Doc Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNKNOWN (NPI_ALL_PP_MASTER: 0000000001)</td>
<td></td>
<td></td>
<td>2012-09-24 04:46 PM</td>
<td></td>
<td>Disease Reporting (Indiana Dept Health)</td>
<td>Public health, notifiable condition</td>
</tr>
<tr>
<td>UNKNOWN (NPI_ALL_PP_MASTER: 0000000001)</td>
<td></td>
<td></td>
<td>2012-09-24 04:46 PM</td>
<td></td>
<td>Disease Reporting (Indiana Dept Health)</td>
<td>Public health, notifiable condition</td>
</tr>
<tr>
<td>UNKNOWN (NPI_ALL_PP_MASTER: 0000000001)</td>
<td></td>
<td></td>
<td>2012-09-24 04:46 PM</td>
<td></td>
<td>Disease Reporting (Indiana Dept Health)</td>
<td>Public health, notifiable condition</td>
</tr>
<tr>
<td>UNKNOWN (NPI_ALL_PP_MASTER: 0000000001)</td>
<td></td>
<td></td>
<td>2012-09-24 04:46 PM</td>
<td></td>
<td>Disease Reporting (Indiana Dept Health)</td>
<td>Public health, notifiable condition</td>
</tr>
<tr>
<td>UNKNOWN (NPI_ALL_PP_MASTER: 0000000001)</td>
<td></td>
<td></td>
<td>2012-09-24 04:46 PM</td>
<td></td>
<td>Disease Reporting (Indiana Dept Health)</td>
<td>Public health, notifiable condition</td>
</tr>
<tr>
<td>UNKNOWN (NPI_ALL_PP_MASTER: 0000000001)</td>
<td></td>
<td></td>
<td>2012-09-24 04:46 PM</td>
<td></td>
<td>Disease Reporting (Indiana Dept Health)</td>
<td>Public health, notifiable condition</td>
</tr>
<tr>
<td>UNKNOWN (NPI_ALL_PP_MASTER: 0000000001)</td>
<td></td>
<td></td>
<td>2012-09-24 04:46 PM</td>
<td></td>
<td>Disease Reporting (Indiana Dept Health)</td>
<td>Public health, notifiable condition</td>
</tr>
<tr>
<td>UNKNOWN (NPI_ALL_PP_MASTER: 0000000001)</td>
<td></td>
<td></td>
<td>2012-09-24 04:46 PM</td>
<td></td>
<td>Disease Reporting (Indiana Dept Health)</td>
<td>Public health, notifiable condition</td>
</tr>
</tbody>
</table>
CONFIDENTIAL REPORT OF COMMUNICABLE DISEASES

HEPATITIS C

Name (last, first, m.i.)

If child, name of parent (last, first, m.i.)

Address (number and street)

City, ZIP code

County

Date of birth (month, day, year)

Age

SEX

RACE

ETHNICITY

□ Male
□ Female

□ White
□ Black
□ Hispanic
□ Non-Hispanic

Pregnant?

□ Unknown

Telephone number

(Not Required For STD's)

Check all that apply:

□ Health Care Worker
□ Food Service
□ School (student / staff)
□ Day Care (attendee / staff)

Name of school / day care?
So What Happens Next?

• Today clinics must print these forms, complete them manually, and submit them to local health departments using Fax
  – Some use electronic fax

• In the future, we hope to work with the SHA to deliver completed forms electronically directly into the state NEDSS system
Conditions Addressed*

Vaccine Preventable**
- Hepatitis B (Acute)
- Varicella zoster virus (Chickenpox)
- Rubella
- Measles
- Mumps

Others
- Chlamydia
- Gonorrhea
- Syphilis
- Hepatitis C
- Histoplasmosis
- Salmonella
Project Status

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

• Intervention Complete (Jun 2014 – Jun 2015)
  – Finishing entry of post-intervention data
  – Preliminary analysis of post-intervention data**
Baseline Reports

• 3,880 cases for 3,697 unique patients
  – Only the VPD conditions
  – 3,790 (97.7%) of these were HBV

• Reporting Rates
  – 24 of 3717 (.006%) of HBV inc. provider report
  – 66 of 68 (97%) of OTHER inc. provider report
  – Automated case detection provided an ELR for more than 100% of cases (duplicate results)
Baseline Completeness

• Data Completeness (Not NULL)
  – Provider: 78% mean (Range 45.3% - 100%)
  – Fax-based Lab: 76% mean (Range 42% - 100%)
  – ELR: 67% mean (Range 0.01% - 100%)
  – ELR completeness higher for just 3 of 15 fields
    • Test name, physician last name, sex

• Providers seem to provide a report for rarer events than for more common diseases*
Timeliness of VPD Reports

• Differences btw Report Date and Test Date

• ELR: Mean = 1.4 days; Median = 0 days
• Lab: Mean = 3.1 days; Median = 2 days
• Provider: Mean = 9.3 days; Median = 3 days

• For nearly all cases, ELR is the *first* signal
Next Steps

• Complete analysis and dissemination
  – Continue to finalize and analyze post-intervention
  – Synthesize qualitative data

• Publish findings
  – Planned submission to Frontiers in PHSSR
  – Planning submissions to AJPH and JAMIA
  – Presentations at the AMIA 2015 Symposium and the HIMSS16 Conference
Policy Discussion

• Utilize increasingly available e-infrastructures
  – Help identify when reporting is necessary
    • May be more advantageous for common diseases*
  – Provide direct EHR access for PH workers
  – Aligns with CMS Meaningful Use aims/goals

• Expand to other data not in ELRs
  – CPOE, eRx and Pharmacy systems
Challenges to Using EHRs

• Available infrastructure not equal*
  – Standard MU vs. HIE vs. NCD
  – Interoperability with Commercial EHRs

• HIPAA and State Legal Concerns
  – Many PO/ISOs over-interpret regulations

• Usability/Not Easy to Find Information
  – There is rarely a Google search bar
Challenges in This Project

• Aging infrastructure/legacy systems
  – Infrastructure needs hampered intervention start

• False positives for many VPDs
  – Distinguishing btw vaccine antibodies and positive can be challenging
  – Many inappropriate tests are on the CDC list of recommended codes for ELRs

• Very few VPDs making power an issue
Acknowledgements

• Key folks supporting my work
  – Shaun Grannis, MD (IUSM and Regenstrief)
  – Zuoyi Zhang, PhD (Regenstrief)
  – Jennifer Williams, MPH (Regenstrief)
  – P. Joe Gibson, PHD (Marion Co. Public Health Dept.)
  – Debra Revere and Becky Hills (U. Washington)
  – Patrick Lai, MPH (SOIC) and Uzay Kirbiyik (FSPH)

• The work presented was supported by grants from AHRQ (R01HS020209) and RWJF (71596) part of the PHSSR Portfolio.
Questions?

Answers

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
References
