Enhanced Public Health Reporting Using an HIE Network

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Brian E. Dixon, PhD, FACMI, FHIMSS, Director of Public Health Informatics, Regenstrief Institute, Inc. and Associate Professor, Indiana University Richard M. Fairbanks School of Public Health
Conflict of Interest

Brian E. Dixon, PhD, FACMI, FHIMSS
Twitter: @dpugrad01

Has no real or apparent conflicts of interest to report.

NOTE:
Dr. Dixon is part-time VA employee. Comments are personal and should not be attributed to the Department of Veterans Affairs or the Federal Government.
Agenda

• Case Reporting for Notifiable Disease
  – Historical perspective
  – Significance for clinical and public health practice

• Controlled Before-and-after Trial of HIE-based Intervention
  – Indiana Health Information Exchange
  – Study Design and Methods
  – Results
  – Discussion

• Conclusions
Learning Objectives

• Describe the barriers to timely, complete reporting of notifiable diseases to public health authorities

• Discuss the policies and requirements for reporting information to public health agencies

• Define the concept of electronic case reporting in support of public health

• Explain how a health information exchange network can facilitate electronic case reporting
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

\[
\left( \text{Brain} + \text{Computer} \right) \quad > \quad \text{Brain}
\]

Friedman, JAMIA, 2008
Public Health Decision Support

• Public health decision support (PHDS) can be defined as the use of the computer to bring relevant knowledge to bear on the health and well-being of a population.
  – Dixon, Gamache & Grannis, 2013
  – doi.org/10.1136/amiajnl-2012-001514

• Examples:
  – Vaccine forecasting report
  – Suggestion for ordering stool culture
Public Health Case Reporting
Notifiable Diseases

• “for which regular, frequent, and timely information regarding individual cases is considered necessary for the prevention and control of the disease” McNabb, et al., 2008

• Examples of notifiable diseases
  – HIV / AIDS
  – Sexually transmitted infections (e.g., Chlamydia)
  – Enteric diseases, including *E. coli*, Salmonella
  – Lead poisoning
  – Zika virus
  – Lyme disease
Notifiable Disease Case Reporting

• Most states require reporting of notifiable diseases
  – State law varies with respect to disease, requirements

• Notifiable disease reporting often uses manual, spontaneous reporting processes
  – Paper, Phone, Fax
  – Relies on providers, labs to Identify and Report

• Varied workflow at health department based on disease
  – Routine (e.g., chlamydia)
  – Intense (e.g., HIV)
  – Dixon et al. 2014, 10.5210/ojphi.v5i3.4939
Traditional Case Reporting Workflow
Problem: Provider Underreporting

• Between 9% and 99% cases reported (high variance)
  – Most diseases less than 20% cases
  – Doyle et al., 2012, Am J Epidemiol

• Why care about disease reporting to public health?
  – Accurate reporting of disease burden (epidemiology)
  – Timely control and response
  – Cost of care for rising incidence ($$$)
  – Antibiotic resistance
PH Reporting: Provider’s View

• In pre-intervention survey, 60.7% of clinic staff (N=29) said they had previously reported to PH

• I need to report that to public health?
  – Lack of awareness (28%)

• I don’t know to whom or how to report that…
  – Lack of understanding of process (21%)

• No one’s fined me for not reporting that…
  – Lack of sufficient rewards/penalties
How can we improve provider reporting rates?

• Leverage health information technology (IT) components available in our ecosystem

• Implement a solution that minimizes burden on clinics while maximizes yield for public health organizations

• Utilizes available standards in support of interoperability
Official State Case Report Form

<table>
<thead>
<tr>
<th>Patient Information</th>
<th>Lab Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Etiologic agent</td>
</tr>
<tr>
<td>Address</td>
<td>Test name</td>
</tr>
<tr>
<td>Phone#</td>
<td>Test date</td>
</tr>
<tr>
<td>DOB</td>
<td>Treatment initiation date</td>
</tr>
<tr>
<td>Gender</td>
<td>Treatment (drugs)</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Provider Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physician name</td>
</tr>
<tr>
<td>Physician address</td>
</tr>
<tr>
<td>Phone#</td>
</tr>
<tr>
<td>Reported by</td>
</tr>
<tr>
<td>Report date</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disease Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name (last, first, middle)</td>
</tr>
<tr>
<td>Address</td>
</tr>
<tr>
<td>Phone#</td>
</tr>
<tr>
<td>DOB</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Race/ethnicity</td>
</tr>
<tr>
<td>Etiologic agent</td>
</tr>
<tr>
<td>Test name</td>
</tr>
<tr>
<td>Test date</td>
</tr>
<tr>
<td>Treatment initiation date</td>
</tr>
<tr>
<td>Provider (name of antibiotic)</td>
</tr>
<tr>
<td>Antibiotic resistance</td>
</tr>
<tr>
<td>Report date</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local Health Department Use Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date received (month, day, year)</td>
</tr>
<tr>
<td>Follow-up initiated? Yes No</td>
</tr>
<tr>
<td>Name of investigator</td>
</tr>
</tbody>
</table>

DISTRIBUTION: White - Indiana Department of Health; Canary - Local Health Office; Pink - Reporter
The Indiana Network for Patient Care
Quick Stats on the INPC

• 117 hospitals, representing 38 health systems

• Over 16,000 practices with over 45,000 providers

• Over 14 million patients

• Nearing 12 billion pieces of clinical data
  – Doubled in the past 2 years!
The Notifiable Condition Detector

Leveraging Robust Infrastructure

• Existing HIE communication pathways
  – Electronic laboratory reporting (ELR)

• Automated case detection
  – Identification of cases that should be reported to PH
  – Classification of disease using LOINC / SNOMED CT

• Clinical messaging (aka DOCS4DOCS @IHIE)
  – Getting information to its recipient in a way that is integrated into workflow
Enhanced Case Reporting Workflow
Pre-Populated Notifiable Report

Confidential Report of Communicable Diseases

State Form 43823 (R2/11-96)
This form contains confidential information under 410 IAC 3.1-2.18.

Disease: 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
- White
- Hispanic

- Female
- Black
- Non-Hispanic

Pregnant?
- Unknown
- Unknown

Telephone number
(Not Required For STD's)
- Health Care Worker
- Food Service
- School (student/staff)
- Day Care (attendee/staff)

Name of school/day care?
Study Design and Methodology

• Controlled Before-and-After Study
  – Intervention clinics (N=7) were not randomized, but there were concurrent controls (N=312)
  – All clinics were connected to INPC via D4D

• Timeframe: 2013-2016; Setting: Indianapolis, Indiana

• Difference-in-difference analysis to detect $\Delta$
  – Focus is $\Delta$ between intervention and control sites
  – Binomial GLM with logit link function and NLEstimate macro
Data and Sources

• Source of Data: Case files from the Marion County Public Health Department
  – All cases for 7 representative diseases: CT, GC, HBV, HCV, Histoplasmosis, Salmonella, Syphilis
  – Case records include lab, HIE, and provider reports

• A report is a fax, paper report, or e-report
  – We looked at reports as well as the fields within the report, such as patient name, address, lab test, etc.

• Goal: Comprehensive review of all reports for each case as well as the information in each report
Outcome Measures

• Primary Outcome
  – Provider Reporting Rate: the proportion of cases where there is at least one report from a provider (clinic or hospital)
  – Remember that the lab can also submit reports

• Secondary Outcomes
  – Completeness of key fields used by disease investigators: the proportion of non-null values received by MCPHD
  – Timeliness of reports: Difference in # days between lab result and when report submitted to MCPHD
Results of Evaluation
Provider Reporting Rates

Before

After

Control Clinics
12.40% 10%

Intervention Clinics
20.20%

p < .001

50%
Reporting Rates Over Time

RR in Each Quarter stratified by pilot and control clinic

![Graph showing reporting rates over time for pilot and control clinic.](image-url)
Provider Reporting Rates (Chlamydia)

Control Clinics
- 28.80%

Intervention Clinics
- 56.90%
- 66.40%

p < .001
Provider Reporting Rates (Gonorrhea)

Control Clinics: 27.50%

Intervention Clinics: 55.60%
Provider Reporting Rates (Hepatitis C)

Control Clinics

- Before: 6.40%
- After: 2.00%

Intervention Clinics

- Before: 6.50%
- After: 7.30%
Completeness of Data in Reports

- 4 of 15 Fields Significantly Improved (p<0.001)
  - Physician First Name, Last Name
  - Physician Address, Zip Code

- 9 of 11 Remaining Fields Improved**
  - Patient Information, Lab Test Performed
  - Completeness from control clinics also improved

- Patient First and Last Name Remained 100%
Timeliness of Provider Reporting

Days

Control Clinic

Intervention Clinics

Before

After

11.25

7.96

10.13

9.67
Alerting clinics to new cases of notifiable disease is feasible and effective at improving reporting rates
  - Clinics responded to alerts with submissions to the LHD and provided more complete reports*

The intervention effects were not uniform
  - Timeliness of reporting did NOT change
  - Chlamydia benefited the most
  - Other diseases did not improve significantly**
Lessons and Discussion

• Leverage existing standards and pathways where possible
  – Use of LOINC and SNOMED CT in ELR messages
  – Utilize eCR C-CDAs and FHIR APIs where they exist

• Public health services part of an HIE network are not always revenue generating
  – Policy or other drivers might be necessary to drive adoption

• Solutions should fit into clinic workflow
  – Current solutions for “outside” information not optimal
  – EHR systems should assume coordination with external entities such as public health departments
Implications of Trial

- Electronic case reporting (eCR) is a public health option specified in Stage 3 meaningful use
  - Also MIPS Public Health Reporting criterion

- If we can alert providers to cases that should be reported and enabled electronic submission of reports, we should see reporting rates increase across diseases
  - PH Decision Support combined with MU functions

- Do not focus solely on MDs / physicians
  - Clinic “reporters” are nurses, MAs, others
  - Revere et al., 2017. doi.org/10.1186/s12889-017-4156-4
Implications of Trial

Digital Bridge is a forum for discussing the challenges of interoperability and collaboration on solving them.

Our Vision

The vision of the Digital Bridge is to ensure our nation’s health through a bidirectional information flow between health care and public health.

Digital Bridge is currently piloting electronic case reporting (eCR) as its first use case.

https://digitalbridge.us/infoex/about/
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Public Health Informatics Program @Regenstrief Institute

Support and Improve the Business of Public Health
• Automating reporting of cases (ELR, ECR) to PH agencies
• Leveraging EHR data for chronic disease prevalence

Assess and Improve the Health of Populations
• Improving vaccination rates and population immunity
• Reduce the proportion of children who are overweight

Educate and Train the Next Generation
• Provide high quality informatics education to MPH, MD, etc.
• Train the future leaders of public health informatics
Questions and Discussion

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

Twitter: @dpugrad01
Email: bedixon@regenstrief.org