

Improving Vaccine-Preventable Disease Reporting through Health Information Exchange

Brian E. Dixon, MPA, PhD, FHIMSS

UK Research Seminar

October 16, 2015

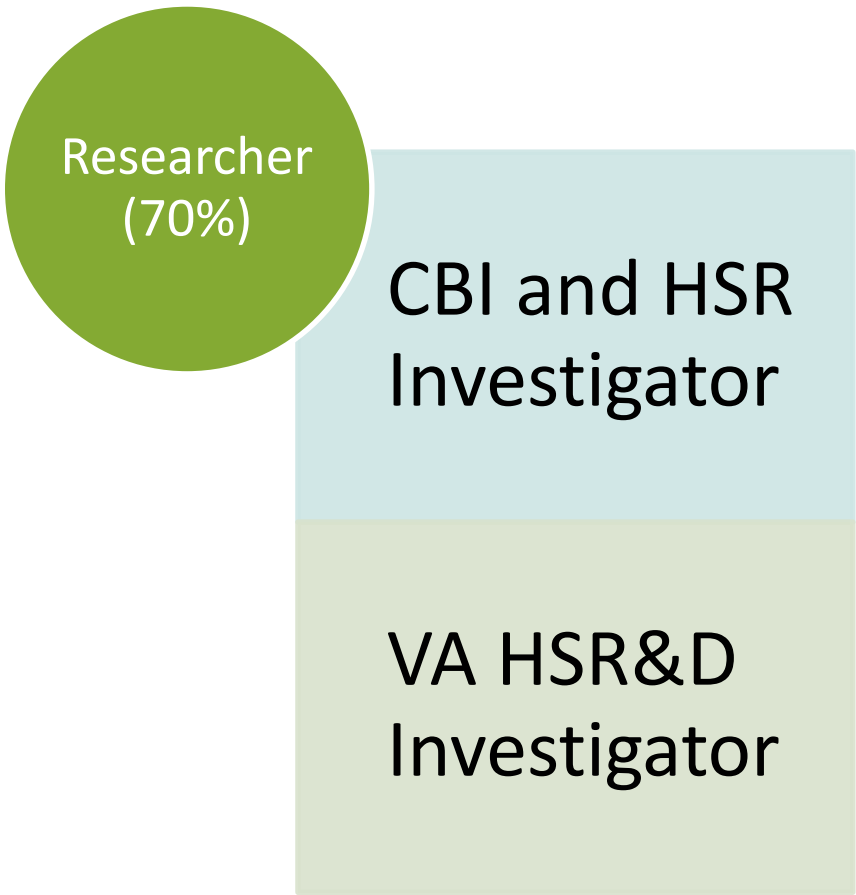
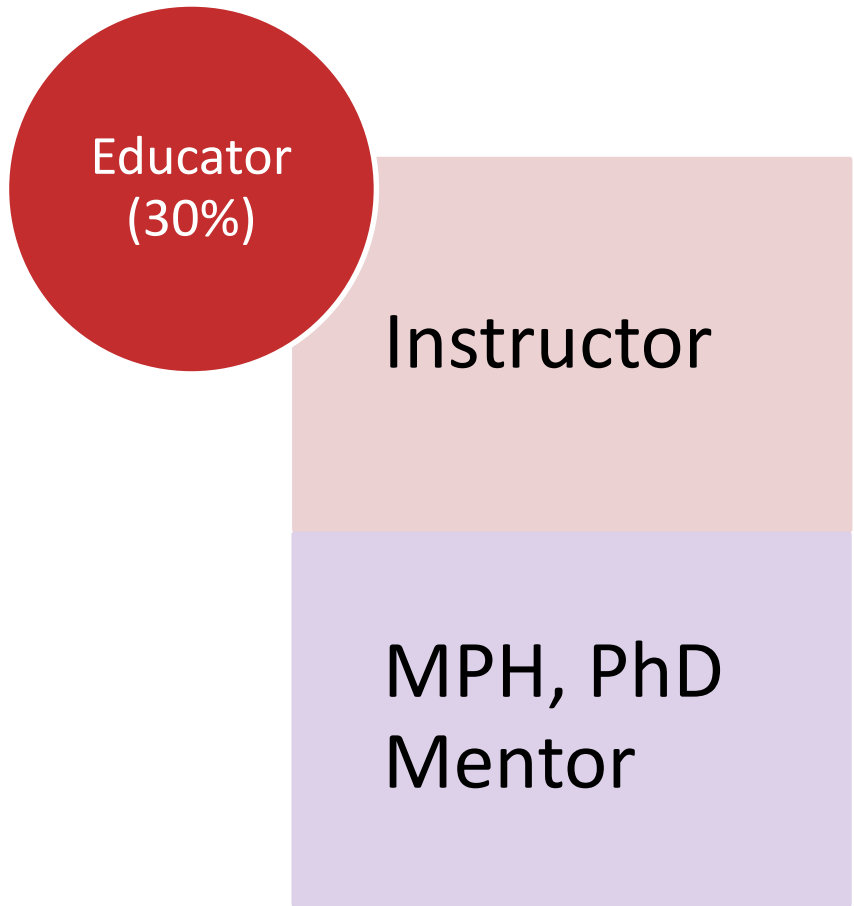


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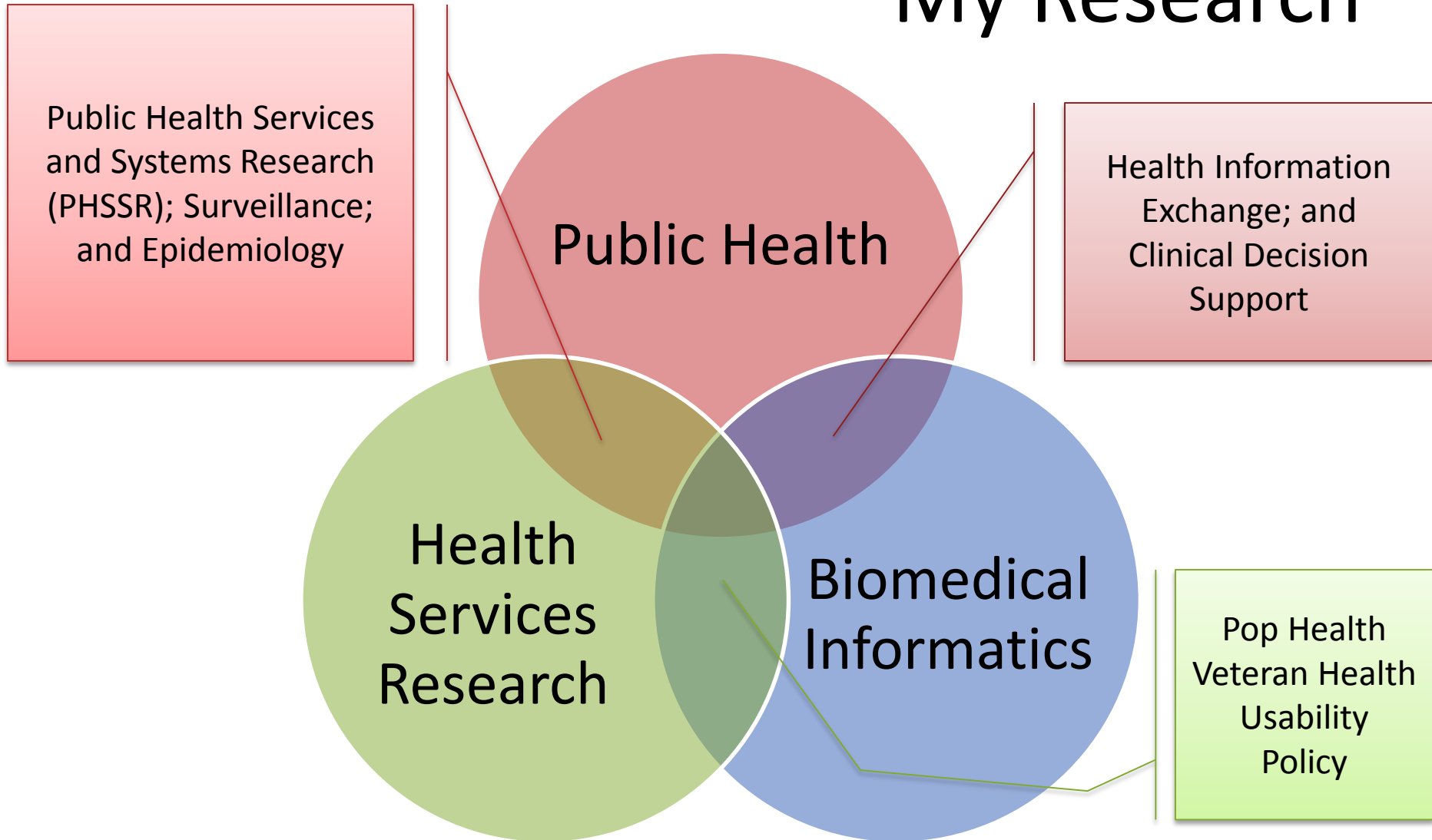


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IU, Regenstrief, and VA...Oh, My!



My Research



Agenda

- Population Health Decision Support
- Case Reporting Then and Now
- A Pop Health Decision Support Intervention
- Preliminary Findings and Policy Recommendations

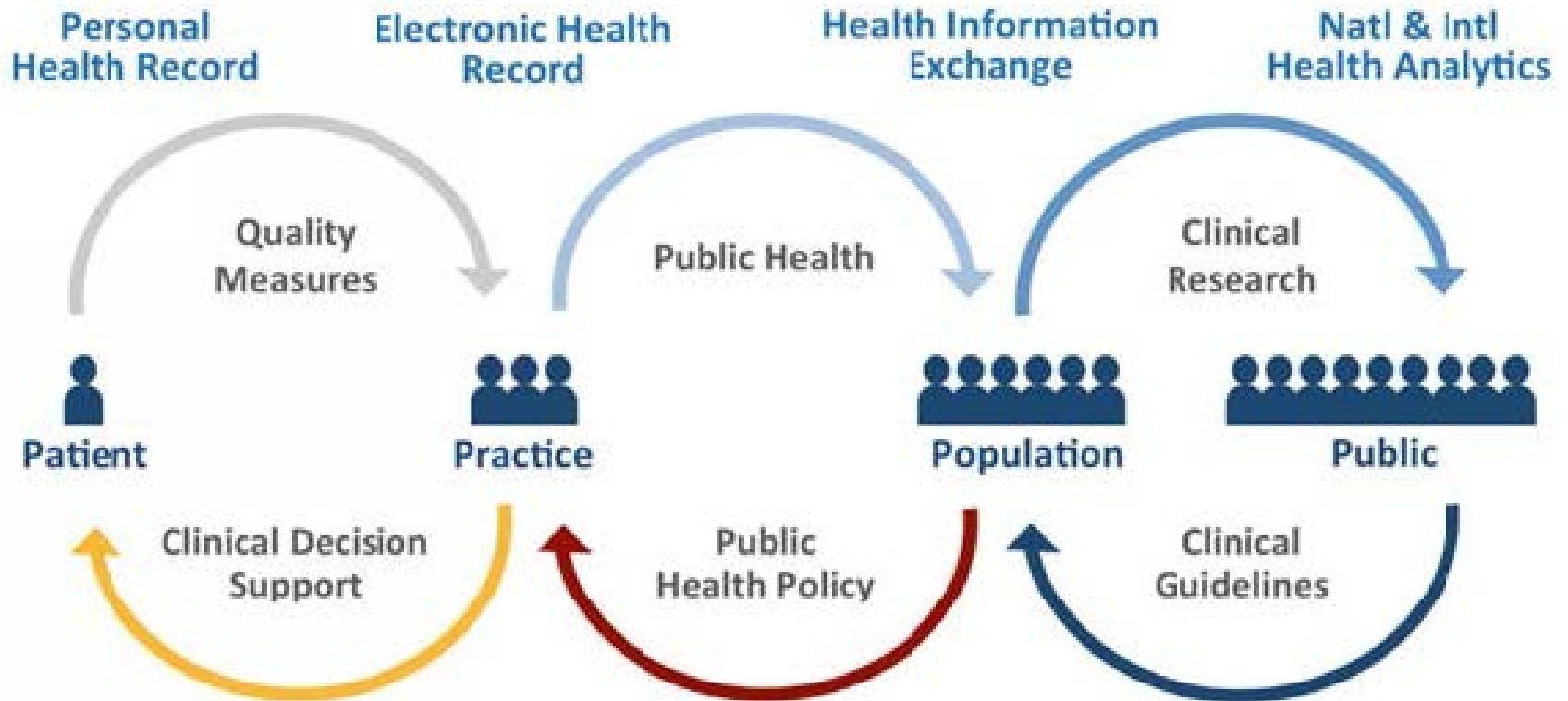
Clinical Decision Support

- 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



Friedman, JAMIA, 2008

How Does CDS 'Fit' into Public Health?

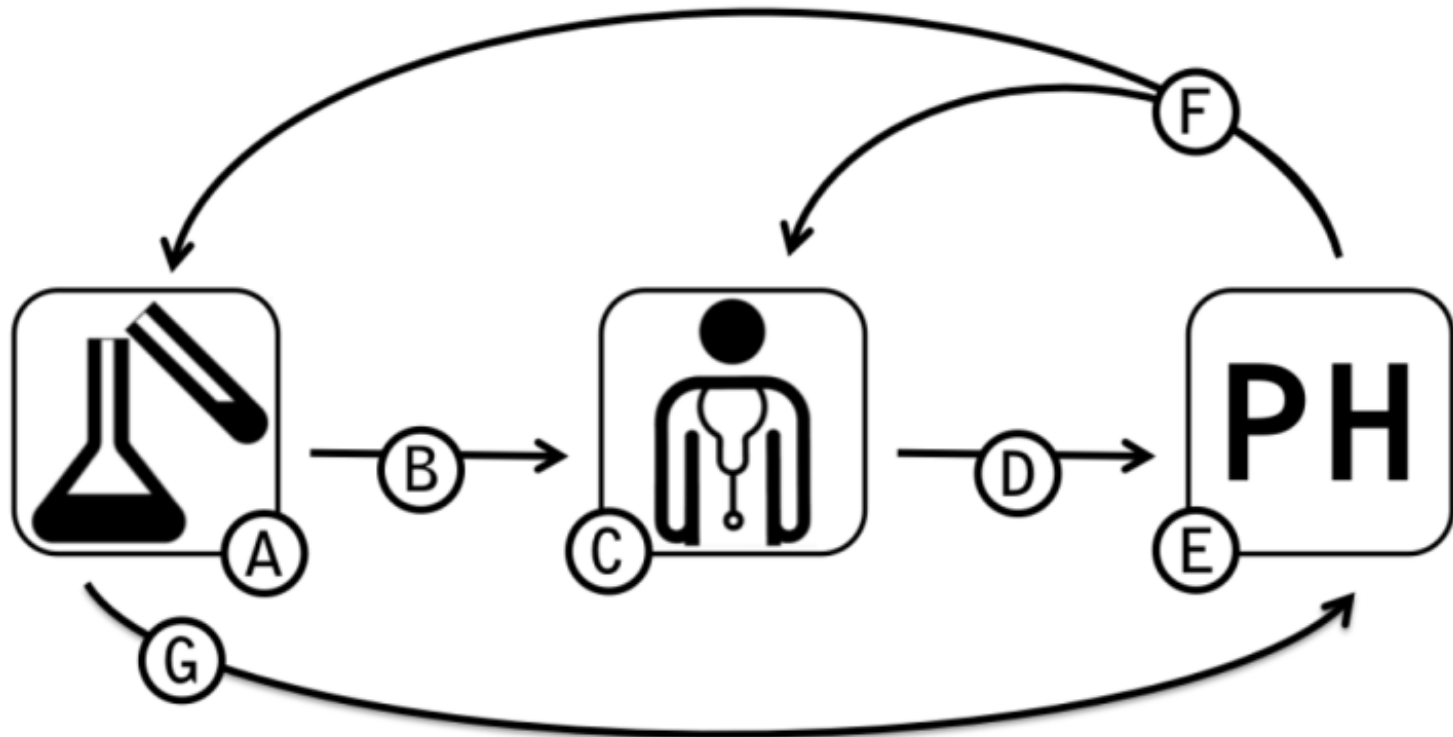


Office of the National Coordinator for Health IT, 2014


PH Decision Support

- Public health decision support (PHDS) can be defined as the use of the computer to bring *relevant knowledge* to bear on the *health and well-being* of a *population*.
 - Dixon, Gamache, Grannis, 2013
- Examples:
 - Vaccine forecasting report
 - Suggestion for ordering stool culture

Traditional Case Reporting Workflow



Official State CDR Form

 **CONFIDENTIAL REPORT OF COMMUNICABLE DISEASES**
 State Form 43823 (R2 / 11-96)
 THIS FORM CONTAINS CONFIDENTIAL INFORMATION PER 410 IAC 3.1-2-18.

DISEASE

patient Information

Name (last, first, m.i.)

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

Address (number and street) Telephone number ()

City, ZIP code

County

(Not Required For STD's) Check all that apply:

Health Care Worker

Food Service

School (student / staff)

Day Care (attendant / staff)

Date of birth (month, day, year) Age

SEX **RACE** **ETHNICITY**

Male White Hispanic

Female Black Non-Hispanic

Pregnant? Unknown Unknown

Yes No Other _____

Unknown Multi-Racial

Name of school / day care?

Part of an outbreak? Yes No Unknown

Etiologic agent Site of infection

Date of diagnosis (month, day, year) Stage (syphilis only)

Symptoms associated with infection? Yes No Unknown

IF YES (Not Required for STD's) Onset date (month, day, year) Died? Yes No

Pertinent symptoms, signs:

Lab test(s) and result(s) Date(s)

Treatment (name of antibiotic) Dosage Date initiated

Antibiotic resistance Yes No NOT DONE If Yes, what antibiotic?

Reporting Facility Code (see other side for codes) If hospital, name of hospital

Name of physician and address Record number

Telephone number () Person reporting (other than physician)

Date of report Telephone number ()

Check here if you need more cards

LOCAL HEALTH DEPARTMENT USE ONLY

Date received (month, day, year) Follow-up initiated? Yes No

Name of investigator

patient Information

Name
 Address
 Phone#
 DOB
 Gender
 Race/ethnicity

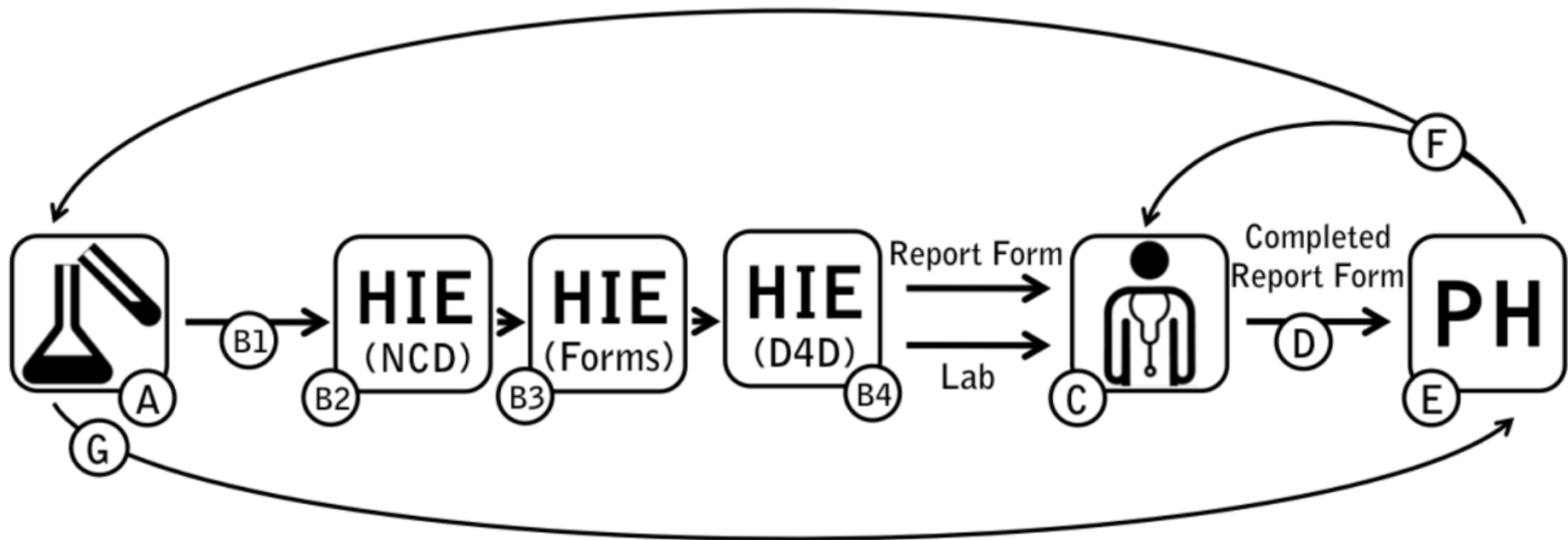
lab Information

Etiologic agent
 Test name
 Test date
 Treatment initiation date
 Treatment (drugs)

provider Information

Physician name
 Physician address
 Phone#
 Reported by
 Report date

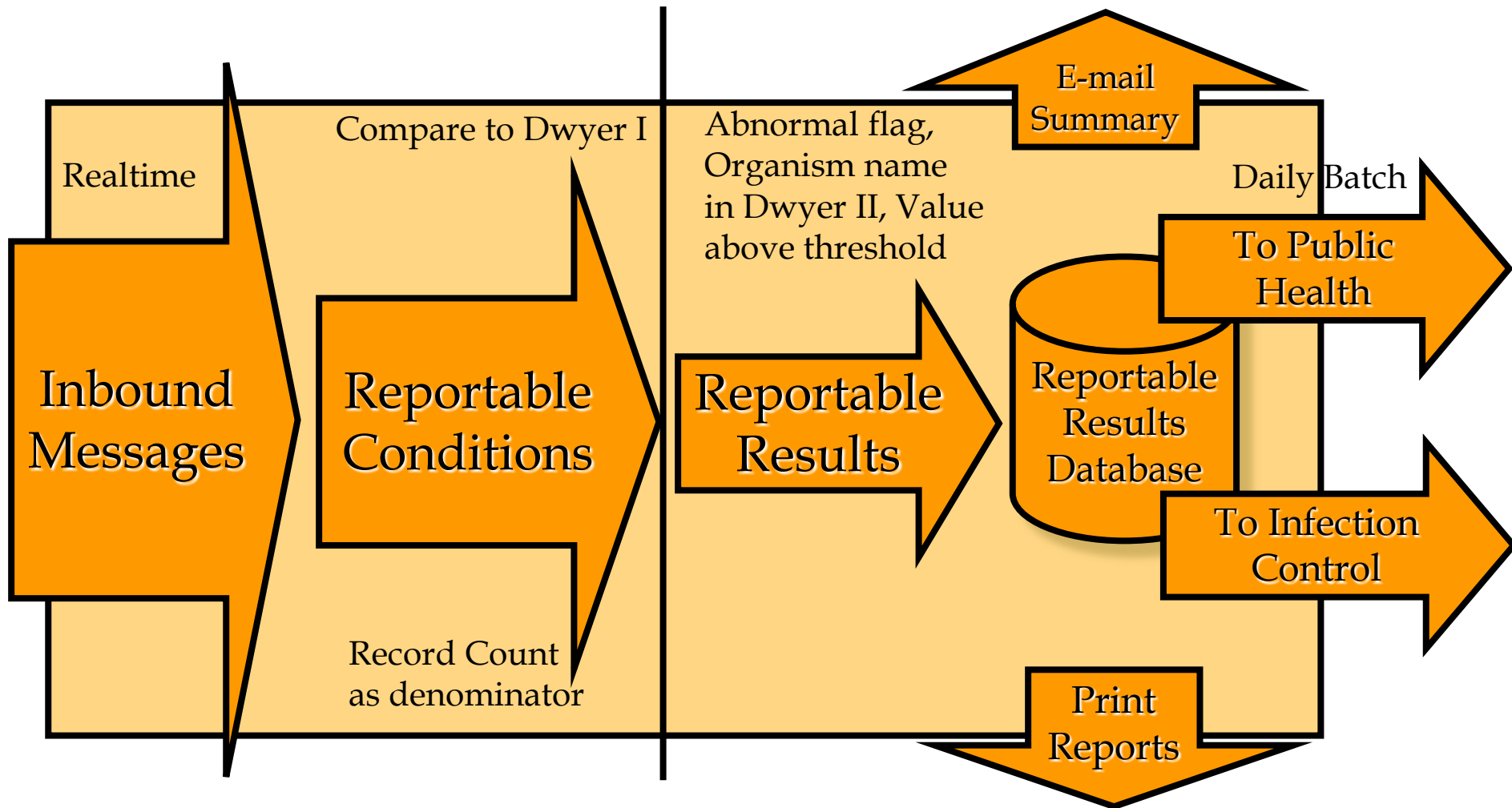
Enhanced Case Reporting Workflow



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



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

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Indiana Health Information Exchange portal

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Dixon, Brian
 A to Z Family Practice

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Filters:

Actions:

<input type="checkbox"/>	Provider	MRN	Patient Name	Arrival	VT	Doc Type	Doc Details
<input type="checkbox"/>	Benton, Peter	000000	AUSTIN, SAM	2007 10/04 01:27 AM		Lab (St. Francis)	Basic Metabolic Panel
<input type="checkbox"/>	Benton, Peter	000000	BENTON, BRIAN	2007 10/04 01:27 AM		Microbiology (St. Francis)	TRICHOMONAS WET PREP EXAM
<input type="checkbox"/>	Benton, Peter	003768	BRADY, VICTOR	2007 10/04 01:27 AM		Transcription (Morgan)	CONSULTATION REPORT
<input type="checkbox"/>	Benton, Peter	10709	BRADY, VICTOR	2007 10/04 01:27 AM	!	Lab (St Vincents)	HEMATOCRIT POC
<input type="checkbox"/>	Benton, Peter	200072	BROWN, JAMES	2007 10/04 01:27 AM		Radiology (St Vincents Mercy)	BONE SCAN
<input type="checkbox"/>	Benton, Peter	90004	BROWN, JAMES	2007 10/04 01:27 AM		Radiology (SERH)	CR TIBIA FIBULA 2 VW RT 73590 [prelim]
<input type="checkbox"/>	Benton, Peter	60000	BRADY, VICTOR	2007 10/04 01:27 AM		Radiology (St Clare)	CT PELVIS W 72193
<input type="checkbox"/>	Benton, Peter	90008	BROWN, JAMES	2007 10/04 01:27 AM		Radiology (St Vincents Mercy)	CHEST-PA & LATERAL
<input type="checkbox"/>	Benton, Peter	000000	BROWN, JAMES	2007 10/04 01:27 AM		Radiology (St Clare)	CR WRIST MIN 3 VW RT 73110
<input type="checkbox"/>	Benton, Peter	16000	BROWN, JAMES	2007 10/04 01:27 AM	!	Lab (St. Francis)	STAT CBC w/DIFF
<input type="checkbox"/>	Benton, Peter	07200	BROWN, JAMES	2007 10/04 01:27 AM	!	Lab (St Vincents)	STAT TOTAL PROTEIN PE
<input type="checkbox"/>	Benton, Peter	000000	BROWN, JAMES	2007 10/04 01:27 AM		Transcription (Morgan)	HISTORY
<input type="checkbox"/>	Benton, Peter	000000	BROWN, JAMES	2007 10/04 01:27 AM		Lab (St Vincents)	Allocated Unit
<input type="checkbox"/>	Benton, Peter	70000	BROWN, JAMES	2007 10/04 01:27 AM		Radiology (St Francis)	US PELVIS + TRANSVAGINAL [prelim]
<input type="checkbox"/>	Benton, Peter	70000	BROWN, JAMES	2007 10/04 01:27 AM		Face Sheet (St Vincents)	Patient Registration
<input type="checkbox"/>	Benton, Peter	48000	GIORDANO, JAMES	2007 10/04 01:27 AM		Radiology (St Clare)	RF UGI W/SMALL BOWEL 74245
<input type="checkbox"/>	Benton, Peter	10008	GIORDANO, JAMES	2007 10/04 01:27 AM	!	Lab (St Vincents)	STAT CBC
<input type="checkbox"/>	Benton, Peter	90000	GIORDANO, JAMES	2007 10/04 01:27 AM	!	Lab (GLHS)	CBC/AUTO DIFF
<input type="checkbox"/>	Benton, Peter	45000	GIORDANO, JAMES	2007 10/04 01:27 AM	!	Lab (Morgan)	COMPREHENSIVE PROFILE
<input type="checkbox"/>	Benton, Peter	45000	GIORDANO, JAMES	2007 10/04 01:27 AM		Lab (Morgan)	AMYLASE LEVEL
<input type="checkbox"/>	Benton, Peter	45000	GIORDANO, JAMES	2007 10/04 01:27 AM		Lab (Morgan)	CREATINE PHOSPHOKINASE
<input type="checkbox"/>	Benton, Peter	88000	GIORDANO, JAMES	2007 10/04 01:27 AM		Radiology (St Clare)	CR CHEST PA/LAT 71020
<input type="checkbox"/>	Benton, Peter	90000	GRACE, MARIE	2007 10/04 01:27 AM	!	Lab (St Vincents)	STAT TOTAL PROTEIN PE
<input type="checkbox"/>	Benton, Peter	50000	GRACE, MARIE	2007 10/04 01:27 AM	!	Lab (St Vincents)	GLUCOSE POC
<input type="checkbox"/>	Benton, Peter	000000	GRACE, MARIE	2007 10/04 01:27 AM		Radiology (St Clare)	MRI BRAIN W/WO CONTRAST 70553
<input type="checkbox"/>	Benton, Peter	000000	GRACE, MARIE	2007 10/04 01:27 AM	!	Lab (St Vincents)	TOTAL PROTEIN PE
<input type="checkbox"/>	Benton, Peter	60000	HANCOCK, JEFFREY	2007 10/04 01:27 AM		Transcription (Morgan)	EEG AWAKE AND DROWSY AMBULATE
<input type="checkbox"/>	Benton, Peter	000000	HANCOCK, JEFFREY	2007 10/04 01:27 AM		Microbiology (St. Anthony CP)	Urine Culture [prelim]
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<input type="checkbox"/>	Benton, Peter	000000	HANCOCK, JEFFREY	2007 10/04 01:27 AM	!	Lab (St Vincents)	STAT CHLAM GC DNA SDA
<input type="checkbox"/>	Benton, Peter	50000	HANCOCK, JEFFREY	2007 10/04 01:27 AM		Lab (Morgan)	VALPROIC ACID (DEPAKENE) LEVEL
<input type="checkbox"/>	Benton, Peter	60000	HANCOCK, JEFFREY	2007 10/04 01:27 AM		Lab (St. Francis)	Basic Metabolic Panel
<input type="checkbox"/>	Benton, Peter	28000	JANSEN, JAYL	2007 10/04 01:27 AM		Radiology (St Clare)	CT CHEST WO 71250

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INBOX Review

Navigation:

Actions:

Copy for: Benton, Peter Pt: _____



St. Clare
MEDICAL CENTER

Sisters of St. Francis Health Services

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

Pt: D	MR#:	DOB: 1 / / 19	Sex: M
Acct: 30 01	Location: SCEDE		
Accession#: 32	Pt Class: E	Admit Date:	Primary Care:
Order#:			
Ordered by: CARTER, JOHN			
Attending:			

Final Report

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

ADMITTING DIAGNOSIS: EXTREMITY PN

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

IMPRESSION: 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
 d: Sep 10 2007 12:07A

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<input type="checkbox"/>	UNKNOWN (NPI_ALL_PP_MASTER: 000000001)			2012 09/24 04:46 PM			Disease Reporting (Indiana Dept Health)	Public health notifiable condition
<input type="checkbox"/>	UNKNOWN (NPI_ALL_PP_MASTER: 000000001)			2012 09/24 04:46 PM			Disease Reporting (Indiana Dept Health)	Public health notifiable condition
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 THIS FORM CONTAINS CONFIDENTIAL
 INFORMATION PER 410 IAC 3.1-2-18.

DISEASE
HEPATITIS C

Name (last, first, m.i.)			<p>(Not Required For STD's) Check all that apply:</p> <input type="checkbox"/> Health Care Worker <input type="checkbox"/> Food Service <input type="checkbox"/> School (student / staff) <input type="checkbox"/> Day Care (attendee / staff)
If child, name of parent (last, first, m.i.)			
Address (number and street)		Telephone number	
City, ZIP code		Name of school / day care?	
County			
Date of birth (month, day, year)	Age		
SEX	RACE	ETHNICITY	
<input checked="" type="checkbox"/> Male	<input checked="" type="checkbox"/> White	<input type="checkbox"/> Hispanic	
<input type="checkbox"/> Female	<input type="checkbox"/> Black	<input type="checkbox"/> Non-Hispanic	
Pregnant?	<input type="checkbox"/> Unknown	<input type="checkbox"/> Unknown	

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

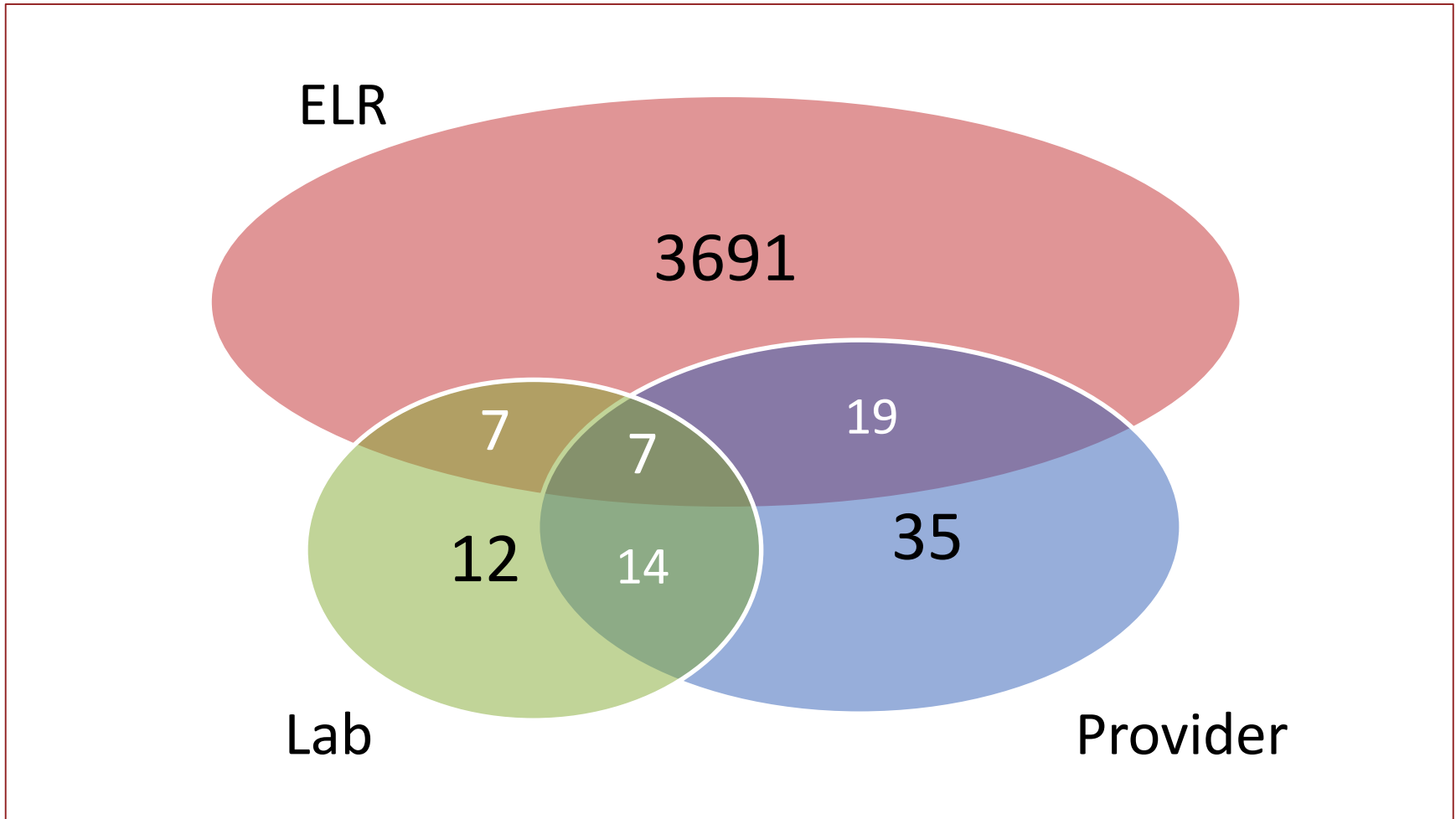
Project Status

- 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)

Reporting Overlap



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

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Research Scientist, Regenstrief Institute;
Health Research Scientist, Department of Veterans Affairs

<http://tinyurl.com/fsphbed>

Twitter: @dpugrad01

References

- Dixon BE, Grannis SJ, Revere D. Measuring the impact of a health information exchange intervention on provider-based notifiable disease reporting using mixed methods: a study protocol. *BMC Medical Informatics and Decision Making* 2013; 13:121.
- Revere D, Hills RA, Williams J, Grannis SJ, Dixon BE. Leveraging health information exchange to improve population health reporting processes: Lessons in using a collaborative-participatory design process. *eGEMs (Generating Evidence & Methods to improve patient outcomes)*. 2014; 2(3):12.
doi: 10.13063/2327-9214.1082