

# ESP

*Electronic medical record  
Support for  
Public health*

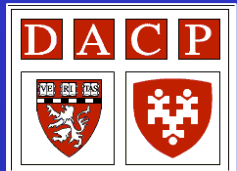
PHIN Conference - September 25, 2006

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CDC Center of Excellence in Public Health Informatics  
Boston, MA



# CDC Center of Excellence in Public Health Informatics (Boston)



- Harvard Medical School / Harvard Pilgrim Health Care Department of Ambulatory Care and Prevention
- Children's Hospital Informatics Program
- Massachusetts Department of Public Health
- Harvard Vanguard Medical Associates
- Brigham and Women's Hospital Channing Laboratory



# Background

- Disease surveillance is a core function of public health
- Extensive efforts over the past decade to digitize reporting
  - Electronic Laboratory Reporting systems
  - National Electronic Disease Surveillance System
- Reporting of clinician diagnoses and patient treatments, however, still done manually and dependent upon clinician initiative
  - Incomplete, delayed, details often missing
  - Web-based case reporting in some states

# Goals

- Complement NEDSS state level electronic disease surveillance with provider level electronic data
- Complement electronic laboratory reporting systems with provider-derived data
- Improve completeness, accuracy, and timeliness of reporting of notifiable diseases
- Reduce clinician reporting workload



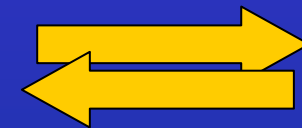
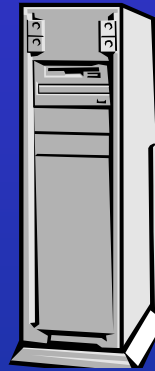
# ESP: Automated detection and reporting of notifiable conditions

Practice EMR



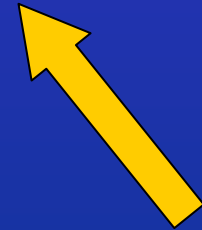
 ICD9  
 LOINC  
 NDC  
Demographics

ESP



HL7  
reports of  
notifiable  
conditions

Health Department



# Principles of ESP

- **Provider controlled**
  - Data under practice's physical and logical control
  - Able to review and approve cases prior to reporting
- **Automatic**
  - Shifts reporting initiative from clinicians to electronic systems.
- **Secure**
  - Stringent, industry standard security measures
- **Flexible**
  - Easily accommodates disease definition modifications
- **Universal**
  - Designed to work with any EMR capable of exporting data
  - Open-source software
- **Unobtrusive**
  - Invisible to clinicians during routine clinical care
  - Transfers analytical work away from EMR to avoid disrupting clinical computing

# Architecture

- ESP server distinct from practice EMR
  - ESP server resides inside practice firewall
  - not visible or accessible outside the practice
- Practice EMR exports complete encounter data on all patients seen each day to ESP server nightly
  - Text files
  - Include demographics, encounter information, diagnostic codes, lab results, and drug prescriptions

# Architecture

- ESP analyzes each encounter for evidence of reportable conditions
- Cases electronically reported to the MA Department of Public Health
  - HL7 message sent using CDC secure messaging protocol (PHIN-MS)
- Data erased from ESP server after 90 days



# Report to Health Department

- Patient demographics
- Responsible clinician, site, contact info
- Basis for condition being detected
- Treatment given
- Symptoms (ICD9 code & temperature)
- Pregnancy status (if pertinent)

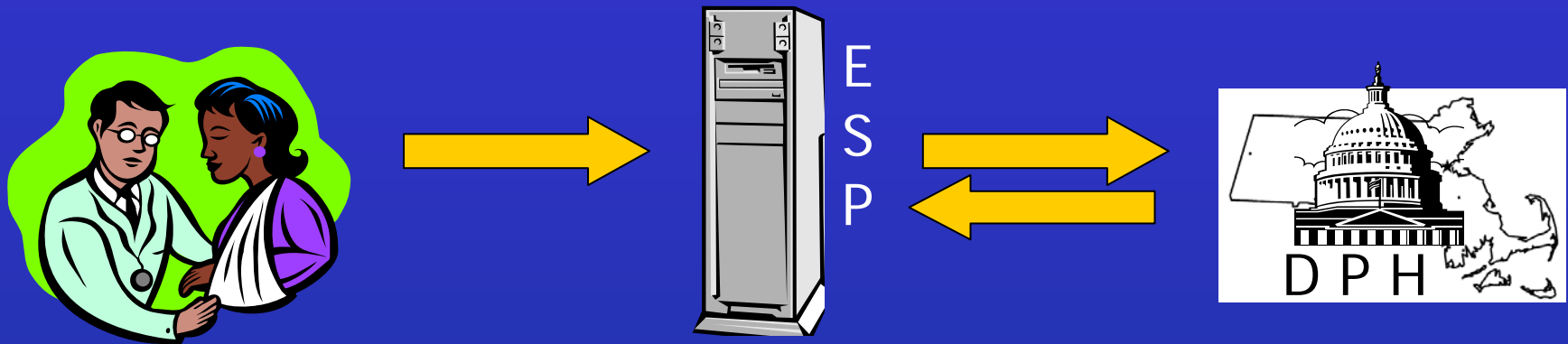


# Architecture

- Health department can query ESP for selected clinical data on patients with positive laboratory tests associated with notifiable conditions
  - Massachusetts has an independent Electronic Laboratory Reporting (ELR) system
  - e.g. ELR reports positive Chlamydia DNA probe
    - was patient treated?
    - is patient pregnant?
  - Clinicians can control reply



# ESP: an intermediary between clinicians and health departments



## ESP Functions:

1. Temporary copy of selected clinical data
2. Data analysis for notifiable conditions
3. Bidirectional communications

# Case Identification

- Simple lab based definitions:
  - e.g. Gonorrhea and Chlamydia
- Complex laboratory based definitions
  - e.g. acute hepatitis C
- Clinical diagnoses +/- lab data
  - e.g. pelvic inflammatory disease, lyme disease



# Case Identification Logic: Chlamydia

*Positive test for any of the following (partial list):*

LOINC Number	Component	System	Method Type
14463-4	Chlamydia trachomatis	Cervix	Culture.Organism specific
14470-9	Chlamydia trachomatis Ag	Cervix	Enzyme immunoassay
14509-4	Chlamydia trachomatis Ag	Cervix	Immune fluorescence
14474-1	Chlamydia trachomatis Ag	Urine sed	Enzyme immunoassay
14513-6	Chlamydia trachomatis Ag	Urine sed	Immune fluorescence
21190-4	Chlamydia trachomatis DNA	Cervix	Probe.Amplification.Target
23838-6	Chlamydia trachomatis DNA	Fluid.Genital	Probe
16600-9	Chlamydia trachomatis DNA	Genital	Probe
6356-0	Chlamydia trachomatis DNA	Genital	Probe.Amplification.Target
21191-2	Chlamydia trachomatis DNA	Urethra	Probe.Amplification.Target
21192-0	Chlamydia trachomatis DNA	Urethra	Probe
16602-5	Chlamydia trachomatis rRNA	Urine	Probe



# Case Identification Logic: Acute Hepatitis C

- Complex combination of laboratory data
  - Markedly elevated liver enzymes AND positive Hep C specific test AND negative tests for Hep A & Hep B
  - or*
  - Elevated Hep C viral load AND negative HCV ELISA within 30 day period
  - or*
  - Sequential negative then positive HCV ELISA's over 90 day period



# Case Identification Logic: Pelvic Inflammatory Disease

- Clinical evaluation with supporting laboratory data
  - ICD9 code consistent with PID
  - and*
  - positive laboratory test for *Chlamydia* or *Gonorrhea* within 30 days



# Compatibility

- Designed to be used with any EMR able to export plain text summaries of encounter information
- Open-source software built with “off-the-shelf” tools
- Uses industry standard nomenclature to detect notifiable conditions
  - ICD9 diagnostic codes
  - Logical Object Identifier Names and Codes (LOINC) for labs
  - National Drug Code (NDC) for medications
  - Systematized Nomenclature of Medicine (SNOMED) vocabulary
- Includes a user-configurable tool to translate proprietary local codes into universal nomenclature



# CPT to LOINC Mapping

## *Harvard Vanguard Medical Associates*

<b>Test Name</b>	<b>CPT</b>	<b>COMPONENT</b>	<b>LOINC</b>
CHLAMYDIA PCR, URINE (MALES)	86631	835	16601-7
CHLAMYDIA GENPROBE DNA	LA0219	1312	16600-9
CHLAMYDIA GENPROBE DNA	87178		16600-9
CHLAMYDIA GENPROBE DNA	87491	1312	16600-9
CHLAMYDIA LCR, URINE	87492	2026	16601-7
CHLAMYDIA GENPROBE DNA	87800	1312	16600-9
CHLAMYDIA GENPROBE DNA	87800	2178	16600-9
PEDIATRIC URINE CHLAMYDIA	87591	2487	16601-7



# CPT to LOINC Map - Challenges

Proprietary code

Test Name	CPT	COMPONENT	LOINC
CHLAMYDIA PCR, URINE (MALES)	86631	835	16601-7
CHLAMYDIA GENPROBE DNA	LA0219	1312	16600-9
CHLAMYDIA GENPROBE DNA	87178		16600-9
CHLAMYDIA GENPROBE DNA	87491	1312	16600-9
CHLAMYDIA LCR, URINE	87492	2026	16601-7
CHLAMYDIA GENPROBE DNA	87800	1312	16600-9
CHLAMYDIA GENPROBE DNA	87800	2178	16600-9
PEDIATRIC URINE CHLAMYDIA	87591	2487	16601-7

Multiple codes  
for same test

Incorrect code

Obsolete code



# Validation

- All case identification algorithms validated using historical electronic encounter data
  - Apply rule to all patients seen at Harvard Vanguard Medical Associates over 5 year period



# Electronic versus Manual Reporting

Harvard Vanguard Medical Associates, 2000-2004

	Manual Reports*	ESP Logic
Chlamydia	1629	1824
Gonorrhea	502	531

\*generated by dedicated reporting staff



# Accuracy and Concordance

- Random sample of 50 patients found to have Chlamydia using electronic criteria
    - 100% of cases laboratory confirmed
    - 91% had been reported to health dept
- But...
- Range of 6-60 day reporting lag
  - 24% had incomplete information on lab test or treatment regimen



# Pelvic Inflammatory Disease

Harvard Vanguard Medical Associates, 2000-2004

Manual  
Reports

ESP  
Logic

	Manual Reports	ESP Logic
Pelvic Inflammatory Disease	1	74



# Case Management Interface

- Optional interface for providers wishing to review suspected cases prior to transmission to health department
- Displays recent patient encounters with condition triggers highlighted
- Clinician can approve the case, designate as false positive, or queue for further review





**CDC Center of Excellence in Public Health Informatics**  
**Electronic Support For Public Health**

- ESP Home
- Administration
- ALL Cases
- Cases Awaiting Review
- Cases Under Review
- Cases Queued
- Cases Sent
- Cases: DO NOT send
- Help, documentation
- Anonymous User

Search Cases		
Patient Name	Patient MRN	
* <input style="width: 90%;" type="text"/>	* <input style="width: 90%;" type="text"/>	<input type="button" value="Search Cases"/>

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**26 Cases Found**

(click on a case Identifier to see the case details)

Case ID		Suspected Condition	Workflow State	Name	MRN	Patient Address
<a href="#">9: Full View</a>	<a href="#">Restrict View</a>	Chlamydia	AWAITING REVIEW	ADT, BOB	HVMA-70375003	200 BOB B WAY SUITE 100 BOSTON, MA, 02115
<a href="#">10: Full View</a>	<a href="#">Restrict View</a>	Chlamydia	AWAITING REVIEW	ADT, ELLEN	HVMA-70375005	999 ELLEN DEGENERIS BOULV 1 BOLLYWOOD HIL BEVERLY HILLS, CA, 90210
<a href="#">11: Full View</a>	<a href="#">Restrict View</a>	Chlamydia	AWAITING REVIEW	PETTIGREW, SCOTT	SSMC-99999999	6015 DRIFTWOOD NEWTONVILLE, MA, 02460
<a href="#">12: Full View</a>	<a href="#">Restrict View</a>	Chlamydia	AWAITING REVIEW	XBIALIDOCIAOS, FIVE	HVMA-70374707	275 GROVE STREET NEWTON, MA, 02466
<a href="#">13: Full View</a>	<a href="#">Restrict View</a>	Chlamydia	AWAITING REVIEW	XBIALIDOCIAOS, ELEVEN	SSMC-100000041	275 GROVE STREET NEWTON, MA, 02460
<a href="#">14: Full View</a>	<a href="#">Restrict View</a>	Chlamydia	AWAITING REVIEW	XBI, BETTY	HVMA-70375112	275 GROVE STREET AUBURNDALE, MA, 02466
<a href="#">15: Full View</a>	<a href="#">Restrict View</a>	Chlamydia	AWAITING REVIEW	Wongwright, Donna Patricia	329763717	
<a href="#">16: Full View</a>	<a href="#">Restrict View</a>	Chlamydia	AWAITING REVIEW	Wongngyin, Jim Bazza	592049427	
<a href="#">17: Full View</a>	<a href="#">Restrict View</a>	Chlamydia	AWAITING REVIEW	Wright, Deena Donna	511071056	
<a href="#">18: Full View</a>	<a href="#">Restrict View</a>	Chlamydia	AWAITING REVIEW	Jones, Shane Patricia	869154558	

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## Administration

ALL Cases

Cases  
Awaiting  
ReviewCases Under  
Review

Cases Queued

Cases Sent

Cases: DO  
NOT sendHelp,  
documentationAnonymous  
User

## Suspected Condition: Chlamydia

CaseID	Patient Name, MRN	Workflow State	Comments	Last Updated	Created Date	Case Definition	Query ID
12	XBIALIDOCIAOS FIVE: HVMA-70374707	AWAITING REVIEW		2006-08-15 13:00:13	2006-08-15 13:00:13	Chlamydia	None

## Encounter data

Pertinent to Condition	Date	ICD9 Codes	Site	Pregnancy	Temperature	Clinician
	20060609	002.9=Paratyphoid fever nos	Somerville Urgent Care, Weekend/Holiday, Adult			SMITH, HEDY
	20060614	V70.0=Routine medical exam				PACKER, MARVIN
	20060614	002.0=Typhoid fever	Somerville Urgent Care, Weekend/Holiday, Adult			SMITH, HEDY
	20060620	784.0=Headache	Dedham Ear, Nose and Throat			CURTIN, NANCY
	20060626	001.9=Cholera nos	Somerville Urgent Care, Weekend/Holiday, Adult			SMITH, HEDY
	20060627	002.0=Typhoid fever	Somerville Urgent Care, Weekend/Holiday, Adult			SMITH, HEDY
	20060630	708.9=Urticaria nos	Kenmore Obstetrics and Gynecology			PACKER, MARVIN
	20060712	789.06=Abdom pain epigastric oct94	Quincy Internal Medicine			DOWD, LINDSAY
	20060712	780.2=Syncope and collapse	Quincy Internal Medicine			DOWD, LINDSAY
	20060713	780.2=Syncope and collapse	Quincy Internal Medicine			DOWD, LINDSAY
	20060726	427.31=Atrial fibrillation	Quincy Internal Medicine			DOWD, LINDSAY
	20060727	845.00=Sprain of ankle nos	Quincy Internal Medicine			DOWD, LINDSAY
	20060731	780.2=Syncope and collapse	Quincy Internal Medicine			DOWD, LINDSAY

## Laboratory Results

Pertinent to Condition	Date Ordered	CPT	Test Results	Abnormal Flag	Normal Range	Comment	Clinician
	20060609	86318=Immunoassay for infectious agent antibody, qualitative or semiquantitative, single step method (eg, reagent strip)	NEGATIVE		-	Referenc...	SMITH, HEDY
	20060614	<b>87491 - Chlamydia Genprobe DNA</b>	DETECTED		-	Reference ...	SMITH, HEDY
	20060614	CPT code=87491C: not found			-		PACKER.



# Current Status

- Currently being installed and piloted at Harvard Vanguard Medical Associates
  - Multi-specialty medical practice based in Eastern Massachusetts
    - EpicCare EMR
    - 16 office sites
    - 500 physicians
    - 350,000 patients



# Current Status

- Pilot phase going live October 2006
  - Chlamydia
  - Gonorrhea
  - Pelvic inflammatory disease



# Next steps

- Expand reporting to ~80 reportable conditions
- Prospective concurrent evaluation of ESP vs traditional reporting
- Modify ESP to work in smaller practices



# Future Applications

- Data rich repository with bidirectional communication between providers and health departments
  - Syndromic surveillance
  - Vaccine registries
  - Clinical decision support
  - Public health quality of care indicators



# ESP Team

- Harvard Medical School / Harvard Pilgrim Health Care  
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  - Gillian Haney
  - James Daniel
- Channing Laboratory of Brigham and Women's Hospital
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