Challenges of Emergency Response Information Exchange

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How did we get here?

- National Electronic Disease Surveillance System (NEDSS) – describing and implementing the standards
- West Nile Virus – highlights need for rapid information sharing across functional and political boundaries
- 9/11 and Anthrax – public health assumes new responsibilities and partners
- SARS – emerging public health threats – global reach of infectious diseases
Where are we going?

Public Health Information Network (PHIN)

Vision – To transform public health by coordinating functions and organizations with infrastructure and information systems that enable:

- Real-time data flow
- Computer assisted analysis
- Decision support
- Professional collaboration
- Rapid dissemination of information to public health, clinical care and the public
Network of Partners

- **Food Safety**
  USDA, FDA

- **Law Enforcement**
  FBI, Local

- **Laboratory Response**
  USDA, FDA, DOD, Public Health Labs

- **Clinical Sector**
  Labs, Care delivery

- **Surveillance**
  CDC, State HD, Local HD

- **Response**
  CDC, State HD, Local HD, Federal Agencies

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PHIN
Challenges

- Provide public health officials with rapid access to information from a variety of sources
- Enable information sharing with multiple partners using common interface technologies and standards
- Support a broad spectrum of activities
- Enable information sharing across politically and functionally distinct organizations
- Ensure information semantics and context are retained across multiple transactions
- Minimize cost of implementation
Exposed individuals identified or local health dept. and CDC assistance

Federal response entities

Field Investigation Team

Centers For Disease Control and Prevention (CDC)

State and Local Public Health Departments

Public Health Lab

Clinical Site

Hospital Clinic

Law enforcement

Person

Patient presents with Anthrax symptoms at clinical site

Case data sent to State Health Dept. and forwarded to CDC with request for assistance

Federal response entities notified

Response teams identify source of exposure

Exposed individuals identified

Environmental specimens sent to lab with report back to field team and state or local health dept. and CDC

Field team reports findings back to state or local health dept. and CDC

Specimen sent to Laboratory Response Network lab for confirmation

Positive result returned to clinical site and forwarded to state and CDC

Anthrax: Clinical Case Detection and Response
Defining the Solution

- Business processes
- Information types
- Semantic model
- Terminology
- Standard messages
- Transport components
- Routing infrastructure
Business Processes

- **Detection and Monitoring** – support of disease and threat surveillance
- **Analysis** – facilitating real-time evaluation of live data feeds
- **Information resources and knowledge management** – reference information, distance learning, decision support
- **Alerting and communication** – transmission of emergency alerts, routing professional discussions, collaborative activities
- **Response** – management support of recommendations, cases, prophylaxis, vaccinations, lab results, etc.
Preparedness and Response

- Detection and Monitoring
  - Syndromic surveillance
  - Health Indicators
  - Existing surveillance for specific agents
  - Laboratory Response Network (LRN)

- Response
  - Outbreak management systems
    - Dynamic information requirements
    - Configurable
    - Integrate with existing activities
  - Laboratory Response Network
  - Clinical care data
Information Types

- Cases, contacts and exposure groups
- Laboratory orders and results
- Syndromic and health indicator data
- Interventions
- Environmental data
- Spatial data
- Health alerts
- Recommendations
Semantic Model

- Must have shared understanding of common concepts
  - What is a Case? Sample? Outbreak? Investigation?
- Concepts have explicit relationships to each other
  - Cases may have contacts that may become cases
  - Persons may be exposed to agents that contaminate specific locations
  - Samples for Laboratory orders generate results
- Concepts and relationships are documented in shared semantic models
  - HL7 RIM
  - Public Health Domain Information Model (PHDIM)
  - Public Health Logical Data Model (PHLDM)
Terminology

- Standard code systems will be employed wherever possible
  - LOINC, SNOMED, NDC, HL7, ...
- PHIN makes use of both standard vocabulary and CDC defined and maintained vocabulary
- CDC and partners will continue to work with standards organizations to fill existing gaps
- Code system tables for PHIN messaging will be made available for electronic download
Standard Messages

- Clinical sector to Public Health
  - Electronic lab reporting (v 2.3.1)
  - Chief complaint (v 2.3.1)
  - Lab, pharmacy and supply orders (v 2.3.1)

- Internal Public Health
  - Disease specific messages (v 3)
  - Generic notification message (v 3)

- Bioterrorism
  - Bioterrorism lab results (v 2.4)
Standard Messages

- Areas of current or future work
  - Generic disease outbreak messages
  - Bioterrorism lab orders and queries
  - Laboratory chain of custody
  - Additional disease specific messages
  - Food safety
  - Environmental sample results
Message Transport

PHIN Messaging System

- Handles Physical, Network, Session, and Encryption requirements
- Built on ebXML Standard
- Based on message-oriented transactions between a sender and a recipient
- Fully secure – used widely for financial transactions
- Supports XML packaging of any type of data exchange format (both HL7 versions 2 and 3)
Routing Infrastructure

- Information flow in emergencies must be close to real time
- Emergency partners may not be the same as routine partners
- Same network used for routine and emergency data exchange
- Data exchange pathways may not always be in place prior to emergency
- Support dynamic registration of new nodes
- Support dynamic discovery of new nodes and services
Conclusions

- Progress
  - Understanding business processes
  - Public health standards adoption
  - Specific Implementations

- Hurdles
  - Cost and complexity
  - Variety of V 2.X implementations
  - Existing systems and support
  - Dynamic information requirements of outbreak investigations
  - Complexity of routing infrastructure