Syndromic Surveillance in North Carolina: The Public Health Epidemiology Program
Rachel Long | 9.15.2010

The Need: October 2001

- Robert Stevens (index case)
  - Begins to feel ill on Sept 30, last day of 5 day visit in NC
  - Dies Oct 5 of inhalational anthrax in FL
- Anthrax incubation period is generally 2-7 days
- Was he exposed in NC?
- FBI, CDC: NC Public Health, are there other cases in your hospitals?
The Idea: Hospital-based Public Health Epidemiologists

- Creation of a public health network
  - Disease surveillance
  - Prevention and control activities

How to create this bridge?
- Hospital-based
- Public health funded

Hospital-based Public Health Epidemiologist (PHE) Program

- Only program of its kind in the nation

- CDC Cooperative Agreement Public Health Preparedness and Response for Bioterrorism

- Purpose:
  - upgrade state and local public health preparedness and response
    - bioterrorism
    - outbreaks of infectious disease
    - public health threats and emergencies
Public Health Epidemiologist Program

Hospital liaison with public health

• Point of Contact for hospital personnel regarding community-acquired infection
• Education of clinicians on public health issues
  • Communicable diseases, influenza, respiratory hygiene
• Assistance with disease reporting
• Assistance with investigations

“if these elements are currently stored electronically by a hospital, they must be submitted to the State in the specified format at least once every 12-24 hours beginning January 1, 2005”
North Carolina Hospital Emergency Surveillance System (NCHESS)

“The initiative makes North Carolina the first state in the nation to have a fully automated statewide hospital emergency department surveillance system. NCHESS will provide real-time surveillance of hospital emergency department visits across North Carolina.”

PHE Hospital Selection

• ED Volume and Bed Size
• Hospital System or Network
• 11 Hospitals ≈ 65% of NC ED Visits
• Geopolitical Considerations
  – Population and geography
  – Health systems with large referral bases
Defining Syndromic Surveillance

• Syndromic Surveillance is ongoing, systematic collection, analysis, interpretation, and application of real-time indicators for diseases and outbreaks that allow for their detection before public health authorities would otherwise note them.

*Sosin, 2003
Syndromic surveillance

- Early and most common group of signs and symptoms before full blown disease expression
  - “Fever and rash” instead of “Smallpox”
  - “Double vision,” “difficulties swallowing” instead of “Botulism”
  - “Influenza-like illness,” and “mediastinal widening on chest X-ray” instead of “inhalational anthrax.”

Goals of Syndromic Surveillance

- Early detection of clusters
  - Syndromes (Gastroenteritis, Respiratory, Rash/Fever, Influenza like illness (ILI), Neurological (Meningitis/Encephalitis, Botulinic), Hemorrhagic
  - Influenza
  - Food borne epidemics
  - Chemical toxicities and poisonings
- Quick investigation
Daily Surveillance

- **Active Surveillance**
  - Influenza
  - Community-Acquired Pneumonia
  - Severe invasive CA-MRSA
  - Category A Bioterrorism Agents

- **Syndromic Surveillance**
  - Influenza-Like Illness
  - Gastrointestinal Illness
  - Neurological Illness
  - Fever/Rash Illness

North Carolina Disease Event Tracking and Epidemiologic Tool

- **Early Event Detection using existing electronic data**
  - Suspicious patterns, e.g., bioterrorism, detected using CDC’s Early Aberration Reporting System (EARS) software

- **Broader public health surveillance:**
  - Infectious disease trends, e.g., influenza, varicella
  - Post-disaster
  - Injury, occupational health, chronic conditions, etc.
NC DETECT Reporting Basics

- 24/7/365 Secure Web access
- Tables, graphs and maps
- Aggregate and line listing reports with customization options
- Updates twice a day
- Role-based access

NC DETECT Data Volume

- Hospital Emergency Departments*
  - ED
    - 110 (98%) hospitals
    - 12,000 new visits / day (65,000 total processed)
- Poison Center Calls
  - CPC
    - 120,000+ calls / year
- Pilot data
  - Wildlife
  - Veterinary lab
  - Urgent care
- Ambulance Runs
  - EMS (PreMIS)
    - 1600 treated / day
    - (~ 800,000 total calls / year)
- NC DETECT
  - ETL, data repository, analytic components, Web portal
- BioSense / CDC
  - (ED Data only)
Syndromes Monitored

- Fever/Rash
- Gastrointestinal
- Influenza-like
- Neurological
- Respiratory

ED Data Elements

- Patient and Visit IDs
- Date of Birth, Sex
- City, County, State, 5-digit ZIP
- Arrival Date/Time
- Chief Complaint and History Present Illness (if available)
- Triage Acuity Rating
- ED Disposition
- Blood Pressure
- Temperature
- Diagnosis and Injury codes
- Procedure codes
- Transport Mode to ED
- Insurance Coverage
- Hospital
Welcome!

The North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT) is North Carolina’s statewide syndromic surveillance system. NC DETECT was created by the North Carolina Division of Public Health (NC DPH) in 2004 in collaboration with the UNC Department of Emergency Medicine to address the need for early event detection and timely public health surveillance in North Carolina using a variety of secondary data sources. Authorized users are currently able to view data from emergency departments, the Carolinas Poison Center, and the Prehospital Medical Information System (PreMIS) as well as pilot data from the NC State College of Veterinary Medicine, laboratories, and select urgent care centers.

NC DETECT is designed, developed, and maintained by staff at the Department of Emergency Medicine at the University of North Carolina at Chapel Hill with funding by the NC DPH. New functionality is added regularly based on end user feedback.

For more information, please visit the links on this page and/or send email to ncdetect@beprvn.med.unc.edu.

Reports

Syndromic Surveillance Reports
1. Syndrome Overview Report
2. Syndrome Case Report
3. Weekly Syndromic Report

Annotation Reports (Beta)
1. Add Comments to Signals and Events (if authorized)
2. Create a New Event
3. View All Signals and Events (if authorized)

PHI Surveillance Reporting
1. PHI Weekly Data Entry Report
2. PHI Weekly Summary Report (For PHI hospitals only)

PHI Access
1. Retrieve ED Medical Record Number

Create Your Own Reports
1. ED Custom Search Report (Beta)

Disaster Surveillance Reports
1. Disaster Overview Report (Beta)
2. Disaster Line Listing Report (Beta)
3. Hurricane Erin Report - Download in Excel (Beta) (For PHRE 1 & PHRE 2 only; report takes 30 seconds - 1 minute to download)
### Add Comments to Signals and Events (If authorized)

**Notes:**
- When using this report, please adhere to the Annotation Protocol.
- The syndrome counts and CUSUM flags in the Annotation Reports are updated for a 30-day window. Syndrome counts and CUSUM flags older than 30 days may be different as a result when comparing syndrome counts and/or CUSUM flags in Annotation reports to those in the Syndrome reports (which are generated on the fly).

<table>
<thead>
<tr>
<th>Date</th>
<th>Disease</th>
<th>Location</th>
<th>Score</th>
<th>Priority</th>
<th>Action Needed</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-09-07</td>
<td>CDC ILI</td>
<td>Mission</td>
<td>7</td>
<td>C3</td>
<td>Not Yet Documented</td>
<td>0 Edit</td>
</tr>
<tr>
<td>2010-09-07</td>
<td>CDC ILI</td>
<td>Pardee</td>
<td>4</td>
<td>C1</td>
<td>No Action Needed</td>
<td>1 Edit</td>
</tr>
</tbody>
</table>

- 2010-09-08: 21:24:00.0, Rachel Long-Syndrome Count: 4 C1, No Action Needed. All visits Henderson county residents. Many severe sore throats, no labs confirming Flu or other respiratory virus. Two 10 year olds in this group of 4 Rachel Long, PHE Mission Hospital.

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<th>Priority</th>
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<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-09-07</td>
<td>GI Severe</td>
<td>Pardee</td>
<td>9</td>
<td>C2C3</td>
<td>No Action Needed</td>
<td>1 Edit</td>
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- 2010-09-08: 21:26:00.0, Rachel Long-Syndrome Count: 9 C2C3, No Action Needed. All visits Henderson with one Transylvania resident. Some were respiratory illnesses. Rachel Long, PHE Mission Hospital.

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<th>Score</th>
<th>Priority</th>
<th>Action Needed</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-09-07</td>
<td>Respiratory Ill</td>
<td>Pardee</td>
<td>10</td>
<td>C3</td>
<td>Not Yet Documented</td>
<td>0 Edit</td>
</tr>
</tbody>
</table>

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<tr>
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<th>Priority</th>
<th>Action Needed</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-09-06</td>
<td>CDC ILI</td>
<td>Mission</td>
<td>10</td>
<td>C3</td>
<td>No Action Needed</td>
<td>1 Edit</td>
</tr>
</tbody>
</table>

- 2010-09-08: 21:12:00.0, Rachel Long-Syndrome Count: 10 C3, No Action Needed. One age group noted: 3 visits age group 2-4 years of age. All Bucyrus residents. One adenovirus identified and many S. pyogenes at Mission. Rachel Long, PHE Mission Hospital.
Examples of NC DETECT graphs then and now
Rabies PEP graph: Haywood County
Limitations of Syndromic Surveillance

“syndromic surveillance for terrorism is not intended for early detection of single cases or limited outbreaks because the early clinical manifestations of diseases that might be caused by terrorism are common and nonspecific.”

May 07, 2004   MMWR/53(RR05); 1-11

Examples of Outbreak/CDC involvement/Education
Case Study

- March 18: 22 yr old presented to Mission and delivered baby girl
- Discharged March 20
- March 22: patient seen in Emergency Dept. with chest pain, respiratory distress and unresponsive
  - Patient expired
  - Cause of death undetermined

Group A Strep Outbreak
Findings

- A total of 10 confirmed cases were identified
  - One small group was from a nursing home
- 6 specimens were sent off for “fingerprinting” by Pulse Field Gel Electrophoresis (PFGE)
  - 5 were identical
Epi-Aid Report:
LaCrosse Virus Encephalitis in Children in Western North Carolina, September-October, 2005

Mission Hospital
March 2009
Pertussis Outbreak

Orange indicates confirmed case
Green is a probable case

56 exposed

MOM
155 mothers and babies

Baby

2 nurses

71 ancillary staff

Mission Hospital
March 2009
Pertussis Outbreak

44 staff exposed

2
class

98 exposed

Staff

42 exposed

Taught 2 classes

CV nurse

8 patients

44 staff exposed

8 patients

Taught 2 classes

CV nurse

56 exposed

Mission Hospital
March 2009
Pertussis Outbreak

155 mothers and babies

Baby

2 nurses

71 ancillary staff

MOM

98 exposed

Staff

44 staff exposed

2
class

98 exposed

Staff

42 exposed

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CV nurse

8 patients

44 staff exposed
Outbreak of Hepatitis A Associated with Contaminated Spring Water — North Carolina, 2006
Example of Education for Physicians within hospitals

Communicable Disease Reporting

A Clinicians Pocket Guide
Rachel Long
Public Health Epidemiologist

Severe Invasive MRSA Surveillance

**Purpose:** To evaluate the changing epidemiology of MRSA and assess the indicators for Public Health Importance

January 16, 2007
Trends in Staph Resistance: Community and Hospital Settings


Methicillin-Resistant SA

MRSA: North Carolina

- Severe Invasive MRSA Prevalence in North Carolina

- Emergency Department Study at Mission Hospitals
Jan 7, 2009 : Henderson County Hospital

• 24 yo 6 days post-partum  
  – vaginal birth at 36 weeks 5 days, complicated pregnancy  
• Called OB Jan 7th with c/o leg and arm swollen and painful, feeling bad, and advised to come to ED  
• EMS called to transport b/c she could not stand up  
• ROS: 1 day of ShOB, chills, rapid worsening Jan 7th, poor po intake x 2 days
Emergency Department Education

Examples of Reports
Two Weekly “Regional Reports”

- No influenza isolated at Mission hospital out of a total of 64 viral panels performed.
- Blue Ridge Regional identified 3 positive influenza A by rapid screening.
- Transylvania Regional had 0 positives out of 3 total tests performed.
- Other respiratory viruses isolated were: RSV (10 total rapid and viral panel), Adenovirus (1), and influenza (0).
- No seasonal influenza has been identified in North Carolina at this time.
- No Other at the UNC supporting “wane” in viral activity.
- Globally there is a decrease in pandemic influenza A/H1N1 activity.

Regional Syndromic Surveillance Report

Blue Ridge, McDowell, Mission, Pardee, and Transylvania Hospitals
Week Ending August 30, 2010

Overview: The Pertussis outbreak in Buncombe county continues with at least 13 confirmed positives to date. This is a highly communicable disease. You can help prevent the spread of disease through appropriate masking of patients in clinical areas as well as encouraging vaccination of not only children but adolescents and adults. If this disease is suspected or confirmed call 250.1503 in Buncombe or your local health center for your county. Please refer to this CDC link for questions about the disease and or vaccination: http://www.cdc.gov/pertussis/index.html

The cryptosporidium outbreak appears to be contained with the closing of Lake Powhatan. Samples have been sent to the CDC for genetic typing of the Cryptosporidium species.

Respiratory Illness: There were 72 visits this week found to fit the NC DETECT case definition which is the same as last week’s number.

Aberrations were found on 8/24 at Blue Ridge and Mission. On 8/25 Pardee had an aberration. No patterns were noted.

Pathogens isolated at Mission this past week which could fit this category were: RSV, B. pertussis, Group A Strep, M. pneumoniae, and H. influenzae.

Gastrointestinal Illness: There were 631 visits identified this week as compared to 774 the previous week. No pathogens were detected which would
Gastrointestinal Illness: There were 631 visits identified this week as compared to 774 the previous week. No pathogens were detected which would fit this category.

Gastrointestinal Severe: There were 59 visits which fit this category this past week as compared to 139 the previous week. One aberration was found at Mission on 8/29. No patterns were identified on this data. Pathogens isolated were: Campylobacter (1).

Fever/Rash Illness: There were 12 visits identified this week as compared to 13 the previous week. No aberrations and no pathogens were identified which would fit this category.

Influenza: No positives were identified at any of the 5 facilities this week. However, other Public Health Epidemiology hospitals with PCR testing capability have isolated 1 flu (statewide) each week for the past 3 weeks.

Category A Agents: There were no Category A Agents detected this past week.

Thanks so much. If you have any question please call or email.

Rachel W. Long MEd, MT, CIC
Public Health Epidemiologist
Manager Infection Prevention and Epidemiology
Mission Hospital

Individual Hospital Weekly Report
Other uses

- Examples of specific conditions monitored using NC DETECT
  - Asthma
  - Injuries
  - Carbon monoxide poisoning
  - Diabetes
  - Infectious diseases by diagnosis

- User-defined report format

Current Users

- Public Health Epidemiologists
  - State, Regional and Local
  - Hospital-based

- Hospital
  - Infection Control Nurses
  - ED clinicians

- Others
  - Injury, stroke, occupational health, researchers
PHE Program Impact

- Facilitating implementation of NCHESS within respective facilities
- Facilitate automated laboratory reporting (communicable diseases, category A agents)
- Facilitate BT/Infectious Disease facility response plans
- Participate in study of sensitivity of North Carolina communicable disease reporting

PHE Network Contributions
PHE program helps connect the dots
Public-Private Partnership

http://www.ncdetect.org

References


• A special thanks to Dr. Lana Deyneka, Program Chair
• Public Health Epidemiologists