Enhanced Emergency Department Surveillance System Following the World Trade Center Disaster
New York City, September 14 - October 10 2001

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Background
Pre 9/11 Bioterrorism (BT) Detection Systems

- Passive reporting
  - Dependent on clinician/laboratory
- EMS 911 surveillance system
- Unexplained death surveillance
Post 9/11 BT Detection Systems

- Heightened alert for BT
  - E-mail and Fax broadcasts alerts
- NYCDOH infrastructure problems
  - Communications disrupted
  - Temporary relocation
Objectives

• Detect clusters of mild/non-specific illness representing prodromal stages of:
  – BT event
  – Other outbreaks

• Improve upon existing systems by
  – Clusters by time/space
  – Detect early BT illness
Methods

Enhanced Syndromic Surveillance

• 30 to 50 Epidemic Intelligence Service Officers (EISOS) stationed at Emergency Departments (EDs)
  – Sept 13 - 27
    • 15 hospitals emergency departments
    • 24 hour basis
  – Sept 29 - Oct 10 (due to resource limitations)
    • 12 hospitals emergency departments
    • 18 hour basis
Hospitals In Surveillance System
NEW YORK CITY DEPARTMENT OF HEALTH
ENHANCED EMERGENCY ROOM SURVEILLANCE

Instructions: FOR EACH PATIENT SEEN AT THE EMERGENCY DEPARTMENT
1. Stamp form at top left with patient imprint card
2. Triage/registration and health care provider fill out respective sections
3. Place in drop box

Triage/Registration Complete This Section

Date of visit: [ ]
Age: [ ] For age less than one year please use "1"
Home Zip Code: [ ] Work Zip Code: [ ]

Health Care Provider Complete This Section

Please check the ONE PREDOMINANT syndrome from the following list that best represents the PRIMARY condition of the patient:

- None of the following
- Trauma
- Smoke or dust inhalation
- Exacerbation of underlying respiratory condition (Asthma/COPD)
- Anxiety reaction (including somatic complaints, insomnia)
- Diarrhea/gastroenteritis (including vomiting or abdominal cramps)
- Upper or lower respiratory infection WITH fever
- Sepsis or non-traumatic shock
- Rash WITH fever (do NOT check unless both are present)
- Meningitis, encephalitis, or unexplained acute encephalopathy
- Botulism-like syndrome (cranial nerve impairment and weakness)
- Unexplained death with a history of fever

If you have any questions or need to reach the NYC Department of Health, please call 212-447-2676 and ask for the doctor on duty. If no one is available at that number, call the Poison Control Center at 212-744-7667.
Syndromes

• Diarrhea/Gastroenteritis
• Botulism-like syndrome
• Upper/Lower respiratory infection WITH fever
• Sepsis/Non-traumatic shock
• Rash With Fever
• Meningitis/Encephalitis/Encephalopathy
• Unexplained death WITH history of fever
• Trauma
• Smoke/Dust Inhalation
• Exacerbation of an underlying respiratory condition
• Anxiety reaction
• None of the above
Daily Analysis

- Frequencies
- Cumulative Sum Statistic (CUSUM)
- Spatial scan statistic
- Alarm defined as $p < 0.02$
Follow-Up of Alarms

• Goals
  – Rapid investigation
  – Verify cluster of patients
  – Verify if BT-related illness
• Facilitated by EISOs at EDs
  – Review individual charts
  – Review lab results
  – Call patients at home
  – Follow up on hospitalized patients
### Results

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total visits reported</td>
<td>65,535</td>
</tr>
<tr>
<td>Trauma</td>
<td>12.7%</td>
</tr>
<tr>
<td>Asthma</td>
<td>5.3%</td>
</tr>
<tr>
<td>Gastrointestinal illness</td>
<td>3.1%</td>
</tr>
<tr>
<td>Respiratory infection with fever</td>
<td>3.0%</td>
</tr>
<tr>
<td>Anxiety reaction</td>
<td>1.4%</td>
</tr>
<tr>
<td>Other syndromes (Sepsis, Rash, etc.)</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

*For both staffing periods*
# Citywide CUSUM “Alarms”

<table>
<thead>
<tr>
<th>Syndrome</th>
<th># Alarms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sepsis/Non-traumatic shock</td>
<td>3</td>
</tr>
<tr>
<td>Rash with fever</td>
<td>1</td>
</tr>
<tr>
<td>Respiratory Infection with fever</td>
<td>3</td>
</tr>
<tr>
<td>Exacerbation/respiratory condition</td>
<td>8</td>
</tr>
<tr>
<td>Gastrointestinal illness</td>
<td>5</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>20</strong></td>
</tr>
</tbody>
</table>

*For both staffing periods*
## Spatial Cluster “Alarms”

<table>
<thead>
<tr>
<th>Syndrome</th>
<th>Hospital</th>
<th>Zip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory with fever (Adult)</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Rash with fever (Adult)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Sepsis/non-traumatic shock (All ages)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Gastrointestinal illness (All ages)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>6</strong></td>
<td><strong>14</strong></td>
</tr>
</tbody>
</table>

*For both staffing periods

*α = 0.02
Summary

- “Alarms” occurred on 15 (63%) of 24 analyzable surveillance days
- No BT-associated outbreaks detected
- 85% completeness for 24 hr staffing vs. 75% for 18 hr staffing ($\chi^2, p < 0.001$).
Resources

- Daily personnel resources
  ~30 EISOs onsite
  ~9 NYCDOH/~4 CDC staff at main office
- Transportation resources
  ~5 drivers on call 24-hours
- Monetary
  >$1 million in CDC funds (excluding salaries)
  >$50,000 in DOH funds for overtime staffing
Discussion

• Substantial resources to implement
• Alleviate concerns for BT
• Utility of having onsite staff to investigate “alarms”
Epilogue
Electronic ED system

- 33 hospitals, 67% of NYC ED visits
- Daily electronic data submission
- 7-day/wk system
- Temporal and spatial analysis of key syndromes
  - Febrile illness
  - Respiratory syndromes
  - Diarrheal/gastrointestinal syndromes
- Investigation of clusters
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