STUDENT VERSION

Cases in Population-Oriented Prevention (C-POP)

A Community Outbreak of Influenza-Like Illness

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A Case Exercise in Bioterrorism Preparedness: A Community Outbreak of Influenza-Like Illness

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* Modified for medical students and locale; adapted to microbiology.

Objectives: At the end of the case, the student will be able to:

- Learn characteristics of disease surveillance
- Learn to generate hypotheses regarding an outbreak
- Learn how to develop an action plan that minimizes the impact of an outbreak on the community
- Learn the components of a comprehensive response and the role of community participants
- Provide a case based scenario to challenge learners to respond to a realistic public health emergency.

Homework prior to class:

1. **Describe characteristics of Category A bioterrorism agents.**
2. **List the Category A**

http://www.bt.cdc.gov/agent/agentlist-category.asp

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Part 1

Section A: The Outbreak

It is November 2006 in Greenville, NC. The holiday season is approaching. More people are spending most of their time indoors as cooler weather has arrived. The Emergency Departments (ED) at Pitt County Memorial Hospital has notified the local health department that there has been an increase in number of people presenting to the ED with influenza-like illness in the last 48 hours. On November 12th, the health department and hospital infection control practitioners hold a conference call to discuss the situation.

1. **What significance, if any, does the report of "increased number" of ill individuals from the infection control practitioners have?**

2. **What is the difference between disease-specific and syndromic surveillance?**

3. **What is the difference between active and passive surveillance activities? Which would you employ in this situation?**

4. **What diseases in your community must be reported to the health department?**

5. **In the above situation, what additional information would you request from the hospital emergency departments?**

6. **Are there other sources that you are interested in gathering information from? If so, what specific information are you seeking?**

Section B: Outbreak Update

The hospitals report that most patients presenting with the "flu-like" symptoms have mild symptoms including fever and chills, weakness, malaise, and headache and have not required hospitalization, although one hospital reports that a 45 year old male was admitted for fever 104°F, pneumonia, vomiting, and delirium.

7. **To proceed with this epidemiologic investigation, a working case definition should be established. How do you decide on the case definition you will use to gather more information?**

Section C: Outbreak Update

After a case definition is determined, the infection control staff at each hospital provides basic demographic information about the patients who meet this definition.

Demographics:

- Males and females both are affected
- Wide range of ages are affected
- Some immunocompromised individuals are affected
- No clear geographic pattern to cases is noted

8. What hypotheses best fit the preliminary facts as presented? At this point, would you include the possibility that the syndrome observed is secondary to purposeful activity (bioterrorism)?

9. What conditions would be the leading possibilities on your differential diagnosis list and what microbiological lab tests would you consider ordering on these patients?

Section D: Outbreak Update – Morning of November 13th

The following morning, November 13th, the local health department requested follow-up information from area health care providers. Emergency Medical Services (EMS) report an increase in medical calls with complaints of flu-like symptoms. ED reports that many of the people seen within the last 72 hours are returning with progressive symptoms, some of whom have been admitted with high fevers (104-105°F) with chills, vomiting, and pneumonia. Most of individuals requiring hospitalization have no significant past medical history.

One hospital reports that a 30 year old male, admitted on 11/12/02 with the above symptoms developed lymphadenopathy and rapidly progressive respiratory and renal failure, has died.

A second hospital reports that a 65 year old male, admitted during the night, developed progressive respiratory failure and died. Tender, ulcerated skin lesions were noted on this patient.

Excluding the two above individuals, a total of 15 patients have been admitted to local hospitals for severe flu-like symptoms. In addition to these symptoms, some patients have been noted to have skin lesions and/or conjunctival necrosis.

10. What is the definition of epidemic? Is this an epidemic? Are the illnesses most likely related to exposure to an infectious or chemical agent?

11. Are you now concerned about person-to-person transmission? A summary of these recommendations appears below. Would you have followed these recommendations before the diagnosis was made? Why?

- First responders may be exposed to bacteria, viruses, or toxins as fine airborne particles. Biological agents are infectious through one or more of the following mechanisms of exposure, depending upon the particular type of agent: inhalation, with infection through respiratory mucosa or lung tissues; ingestion; contact with the mucous membranes of the eyes, or nasal tissues; or penetration of the skin through open cuts (even very small cuts and abrasions of which employees might be unaware).
- Existing recommendations for protecting workers from biological hazards require the use of half-mask or full face piece air-purifying respirators with particulate filter efficiencies ranging from N95 (for hazards such as pulmonary tuberculosis) to P100 (for hazards such as hantavirus) as a minimum level of protection.
- Emergency first responders typically use self-contained breathing apparatus (SCBA) respirators with a full face piece operated in the most protective, positive pressure (pressure demand) mode during emergency responses. This type of SCBA provides the highest level of protection against airborne hazards when properly fitted to the user's face and properly used. National Institute for Occupational Safety and Health (NIOSH) respirator policies state that, under those conditions, SCBA reduces the user's exposure to the hazard by a factor of at least 10,000. This reduction is true whether the hazard is from airborne particles, a chemical vapor, or a gas. SCBA respirators are used when hazards and airborne concentrations are either unknown or expected to be high. Respirators providing lower levels of protection are generally allowed once conditions are understood and exposures are determined to be at lower levels.

* Adapted from CDC and Department of Human Services "Interim Recommendations for the Selection and Use of Protective Clothing and Respirators Against Biological Agents".

12. What are the commonalities in approach for a naturally occurring outbreak versus one due to bioterrorism? What differences in approach may be warranted? In taking histories from a sample of patients, list the factors of interest in the categories of time (when), place (where) and person (who).

13. Do you order any additional microbiological tests on the individuals presenting with this condition? Why?

Section E: Outbreak update: Early Afternoon, November 13th

The emergency department continues to call in reports of individuals being evaluated for severe influenza-like symptoms. Local resources are overwhelmed. Because of growing concern about the number of stricken individuals, the local health department and county emergency operations activates the Incident Command System. The Public Health Director is appointed as incident commander and plans a community response.

Incident Command System (ICS) was initially developed to provide a coordinated and consistent approach to managing incidents/ events. It can be used to manage any emergency incident (such as air or rail accidents, acts of terrorism, OR natural hazards such as ice storms) or non-emergency event (such as the fishing derby or parades)

14. What entities, groups, or organizations should be convened at the Incident Command Post? (The entities that would be important in responding to this event)

Part 2

Response

At this point, students are divided into groups of four. They are the responsible public health entity responding to the incident commander with key recommendations on management of this outbreak of disease. They are responsible for developing an action plan.

Section F: Additional Information:

In the November 14th morning conference call, hospitals now report a total of 12 unusual deaths in people who presented with "flu-like" symptoms that progressed rapidly to respiratory failure or sepsis. The Emergency Department reports a total of 184 visits for "flu-like" symptoms. Primary care physicians are calling the health department about high numbers of walk-ins with "flu-like" symptoms. They are requesting guidance from the department. Panicked families inundate urgent care centers, and physician offices. Businesses and schools report increased absenteeism. Media questions the capacity of local agencies/hospitals to protect the public. By the end of the day, there is a report of 275 total cases of severe "flu-like illness"

- CDC and state epidemiologists assist in taking histories from a sample of patients looking for common factors focusing on **person** (how old are they, what is their occupation, do they have any medical conditions etc…), **place** (where do they live/work, have they traveled recently, where have they spent time recently etc…), and **time**.

- A factor that is elicited in 80 percent of the cases is a visit to a large shopping mall in Greenville

- Law enforcement reports that the initial investigation has revealed that a number of patients observed two men opening a large brief-case in the mall on November 8, 2006.

- Gram stains of blood cultures from some of the patients reveal small, nonmotile, aerobic, Gram-negative coccobacilli. A preliminary identification of *Francisella tularensis* is provided by an immunofluorescence test. Serologic tests are pending.

15. What is your hypothesis now, in regard to the sequence of events that led to this outbreak? Address how the agent may have been disseminated; what type of exposure was likely, whether the incubation period fits in this situation, etc.

16. What are the public health implications of tularemia?

17. **Even after the cause of this situation has been determined to be tularemia, first responders are concerned about person-to-person transmission. How will you respond to them?**

Section G: Community Prophylaxis

18. **Is there a need for prophylaxis of individuals in the community? Your group will design a community plan for prophylaxis. Do communities plan for these situations in advance? What sites will you use to dispense antibiotics? Where does the man and woman power come from to staff these centers? The antibiotics can be made available to you through the National Strategic Stockpile as described below. But you must decide on the best method to dispense them and notify the public. In preparing your plan, consider whether health care treatment facilities and prophylactic medication dispensing facilities should be separate. Will there be a need for law enforcement to provide security?**

A National Repository of Life-Saving Pharmaceuticals and Medical Material (Taken from the CDC at http://www.bt.cdc.gov/stockpile/index.asp)

The SNS is a national repository of antibiotics, chemical antidotes, antitoxins, life-support medications, IV administration, airway maintenance supplies, and medical/surgical items. The SNS is designed to supplement and re-supply state and local public health agencies in the event of a national emergency anywhere and at anytime within the U.S. or its territories.

The SNS is organized for flexible response. The first line of support lies within the immediate response 12-hour Push Packages. These are caches of pharmaceuticals, antidotes, and medical supplies designed to provide rapid delivery of a broad spectrum of assets for an ill defined threat in the early hours of an event. These Push Packages are positioned in strategically located, secure warehouses ready for immediate deployment to a designated site within 12 hours of the federal decision to deploy SNS assets.

Bioprophylaxis recommendation for tularemia is 14 days of post-exposure of ciprofloxin or doxcycline.

At this point, student groups report their recommendations and proposed action plan:

Section H: Communication with the Public

Another important component of response is communication with the public. Groups are to discuss the following and formulate recommendations:

19. List the concerns of the public in this type of situation.

20. What advice or reassurance can you give to the public at this point? Consider what the public will want to know about their risks and about what is being done.

21. What is the best approach for relaying this advice/information?

CHAPTER 41 - EPIDEMIOLOGY HEALTH

SUBCHAPTER 41A - COMMUNICABLE DISEASE CONTROL

SECTION .0100 - REPORTING OF COMMUNICABLE DISEASES

10A NCAC 41A .0101 REPORTABLE DISEASES AND CONDITIONS

(a) The following named diseases and conditions are declared to be dangerous to the public health and are hereby made reportable within the time period specified after the disease or condition is reasonably suspected to exist:

(1) acquired immune deficiency syndrome (AIDS) - 7 days;
(2) anthrax - 24 hours;
(3) botulism - 24 hours;
(4) brucellosis - 7 days;
(5) campylobacter infection - 24 hours;
(6) chancroid - 24 hours;
(7) chlamydial infection (laboratory confirmed) - 7 days;
(8) cholera - 24 hours;
(9) Creutzfeldt-Jakob disease – 7 days;
(10) cryptosporidiosis - 24 hours;
(11) cyclosporiasis - 24 hours;
(12) dengue - 7 days;
(13) diphtheria - 24 hours;
(14) *Escherichia coli*, shiga toxin-producing - 24 hours;
(15) ehrlichiosis - 7 days;
(16) encephalitis, arboviral - 7 days;
(17) enterococci, vancomycin-resistant, from normally sterile site - 7 days;
(18) foodborne disease, including but not limited to Clostridium perfringens, staphylococcal, and Bacillus cereus - 24 hours;
(19) gonorrhea - 24 hours;
(20) granuloma inguinale - 24 hours;
(21) Haemophilus influenzae, invasive disease - 24 hours;
(22) Hantavirus infection – 7 days;
(23) Hemolytic-uremic syndrome/thrombotic thrombocytopenic purpura - 24 hours;
(24) Hemorrhagic fever virus infection – 24 hours;
(25) hepatitis A - 24 hours;
(26) hepatitis B - 24 hours;
(27) hepatitis B carriage - 7 days;
(28) hepatitis C, acute - 7 days;
(29) human immunodeficiency virus (HIV) infection confirmed - 7 days;
(30) legionellosis - 7 days;
(31) leptospirosis - 7 days;
(32) listeriosis – 24 hours;
(33) Lyme disease - 7 days;
(34) lymphogranuloma venereum - 7 days;
(35) malaria - 7 days;
(36) measles (rubeola) - 24 hours;
(37) meningitis, pneumococcal - 7 days;
(38) meningococcal disease - 24 hours;
(39) monkeypox – 24 hours;
(40) mumps - 7 days;
(41) nongonococcal urethritis - 7 days;
(42) plague - 24 hours;

(43) paralytic poliomyelitis - 24 hours;
(44) psittacosis - 7 days;
(45) Q fever - 7 days;
(46) rabies, human - 24 hours;
(47) Rocky Mountain spotted fever - 7 days;
(48) rubella - 24 hours;
(49) rubella congenital syndrome - 7 days;
(50) salmonellosis - 24 hours;
(51) severe acute respiratory syndrome (SARS) – 24 hours;
(52) shigellosis - 24 hours;
(53) smallpox – 24 hours;
(54) streptococcal infection, Group A, invasive disease - 7 days;
(55) syphilis - 24 hours;
(56) tetanus - 7 days;
(57) toxic shock syndrome - 7 days;
(58) toxoplasmosis, congenital - 7 days;
(59) trichinosis - 7 days;
(60) tuberculosis - 24 hours;
(61) tularemia - 24 hours;
(62) typhoid - 24 hours;
(63) typhoid carriage (Salmonella typhi) - 7 days;
(64) typhus, epidemic (louse-borne) - 7 days;
(65) vibrio infection (other than cholera) - 24 hours;
(66) whooping cough - 24 hours;
(67) vaccinia – 24 hours;
(68) yellow fever - 7 days.