Conducting an Outbreak Investigation

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When do you find out about an outbreak??
Outbreak Definition

- The occurrence of more cases of disease than expected in a given area or among a specific group of people over a particular period of time
- Cases above your usual endemic rate
10 Steps in an Outbreak Investigation

OUTBREAK INVESTIGATION FORM

1. **Verify the diagnosis; identify the agent.**

   - Describe the initial magnitude of the problem and what symptoms got the facility’s attention.
   - What diagnosis has been established?
   - What agent (bacterial, viral, other) has been identified?
   - Develop a case definition (specific criteria for a case). Example: All residents who have had 3 or more loose stools in the last 24 hours.

2. **Confirm that an outbreak exists.**

   **CASE DEFINITION:**
Step 1: Verify the diagnosis; identify the agent

- What got your attention?
- Is there a specific diagnosis?
- What agent has been identified?
  - Bacterial
  - Viral
  - Fungal
  - Other
Develop a case definition

- Define the case—Establish or verify the diagnosis of reported cases, including...
  - WHAT: The pathogen, site, and clinical signs and symptoms
  - WHO: Characteristics of the population in which the problem is occurring
  - WHERE: Geographic location of the problem
  - WHEN: How long the problem has been occurring
- Keep case definition simple, objective and measurable
- Definition may need redefining after further data collection
Step 2: Confirm that an outbreak exists

- Case-finding – use your case definition
- Total number of cases so far
- Compare the current incidence with the usual or baseline incidence
- Institute early control measures
- Open lines of communication

- If an outbreak exists, PROCEED.
Is there really a problem?

- A 2 to 2.5 fold increase in the infection rate of any site, pathogen or site and pathogen combination almost always justifies an evaluation.
Step 3: Search for Additional Cases

- Use the case definition
- Alert others to report cases
  - Lab
  - MDs
  - Staff
  - Outpatient clinics
Step 4: Characterize the Cases by Person, Place and Time

- Person: characteristics
  - Age
  - Sex
  - Disease
  - Exposures
  - Treatments

- Place
  - Hall
  - Room
  - Unit
  - Outside exposures

- Time
  - Period of the outbreak
  - Probable source
Develop an Epidemic Curve

![Bar chart showing the number of cases over the day of onset.](image)
What is an Epidemic Curve and How Can it Help in an Outbreak?

- An epidemic curve (epi curve) is a graphical depiction of the number of cases of illness by the date of illness onset

- Epi Curve slides from UNC School of Public Health
What is an Epidemic Curve and How Can it Help in an Outbreak?

- An epi curve can provide information on the following characteristics of an outbreak:
  - Pattern of spread
  - Magnitude
  - Outliers
  - Time trend
  - Exposure and/or disease incubation period
Outbreak Pattern of Spread

- The overall shape of the epi curve can reveal the type of outbreak
  - Common source
  - Point source
  - Propagated
Outbreak Pattern of Spread—Common Source

- People are exposed continuously or intermittently to a harmful source
- Period of exposure may be brief or long
- Intermittent exposure often results in an epi curve with irregular peaks that reflect the timing and the extent of exposure
Example of an Epi Curve for a Common Source Outbreak with Intermittent Exposure
Outbreak Pattern of Spread—Common Source

- Continuous exposure will often cause cases to rise gradually (and possibly to plateau, rather than to peak)
Example of an Epi Curve for a Common Source Outbreak with Continuous Exposure
Outbreak Pattern of Spread–Point Source

- Typically shows a sharp upward slope and a gradual downward slope
- Is a common source outbreak in which the period of exposure is brief, and all cases occur within one incubation period
Example of an Epi Curve for a Point Source Outbreak
Outbreak Pattern of Spread–Propagated

- Is spread from person to person
- Can last longer than common source outbreaks
- May have multiple waves
- The classic epi curve for a propagated outbreak has progressively taller peaks, an incubation period apart
Example of an Epi Curve for a Propagated Outbreak
Step 5: Form a Tentative Hypothesis
What is your best guess?

- Review the literature
- Best guess re:
  - Reservoir
  - Source
  - Mode of Transmission
Formulate Tentative Hypothesis

- Don’t forget: Commercially supplied medications and devices suspected as causes of an outbreak should be reported to the CDC and FDA immediately

- Slide courtesy of Connie Steed
Data Collection and Specimen Management

- Save everything!
- Cohort supplies which might be suspect in the outbreak
- Contact microbiology lab to save all patient isolates

Slide courtesy of Connie Steed
Data Collection and Specimen Management

- Use a notebook to keep accurate documentation of activities
- Collect information on all cases: Decide ahead of time what you will need to look at
  - Demographic data—name, age, sex, date of admission, infection onset
  - Risk factors—procedures, medical devices, medication
  - Host factors—diabetes, malignancy, immunodeficiency

- Slide courtesy of Connie Steed
Review and Expand, if necessary, Control Measures

- Document control measures and when implemented
- Is assistance needed?

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Step 7: Test your Hypothesis

- Outbreak may end before you get to this point
- Epidemiologic studies may be necessary
- Get help if needed
Step 8: Refine the Control Measures

- Add additional measures if needed
- Delete any not determined to be helpful
Step 9: Monitor and Evaluate the Control Measures

- Insure compliance!
- If you don’t look, you don’t know!
- Have cases stopped?
  - If not, consider additional measures
Step 10: Prepare and Disseminate a Report

- Your outbreak investigation paperwork – forms, line listings, etc may become part of your report
Publish It!!