

# Outbreaks and Unusual Infection Occurrences

Last Updated 2019

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Basics of Infection Prevention  
Healthcare-Associated Infections Program  
Center for Health Care Quality  
California Department of Public Health



# Objectives

- Discuss unusual infections or disease occurrences that require action
- Review the action steps in an outbreak investigation
- Discuss development of line lists and epidemiology curves for investigating, confirming, and managing an outbreak
- Describe internal and external communication

# Definitions\*

- **Outbreak**
  - Occurrence of cases **above the expected** or baseline level
  - **Number of cases** indicating an outbreak will **vary**
  - Outbreak designation is **relative to the usual frequency of the disease**
  - **A single case** of a communicable disease long absent from a population or the first invasion by a disease not previously recognized requires **immediate reporting** and epidemiologic investigation
- **Unusual Disease Occurrence**
  - A **rare disease** or a newly apparent or emerging disease

\*California regulatory definitions, Titles 17 and 22

# Outbreak Examples

- An infectious disease outbreak or **increased incidence** of disease due to any infectious occurring in residents or persons working in the facility
- A **single case** of colonization or infection with a novel MDRO that was never previously or only rarely encountered in the United States (for example, **VRSA**, mcr-1-producing bacteria, *Candida auris*, or any pan-resistant MDRO)
- A single case or first emergence of a MDRO that is encountered regularly in some areas of the United States (for example, **CRE**)
- Intra-facility infectious disease outbreak of influenza, gastroenteritis, pneumonia, or respiratory syncytial virus
- Foodborne infectious disease outbreaks

# Outbreak Examples - continued

- Infections associated with medical devices, transfusions, biologics, contaminated medications, replacement fluids, or commercial products
  - Single cases of reportable diseases and conditions (Title 17 §2500) if healthcare-associated, including **legionellosis, measles virus, invasive group A beta hemolytic *Streptococcus***
  - *S. aureus* showing reduced susceptibility to vancomycin
  - Clusters of positive tuberculosis test conversions
  - A single case of active pulmonary or laryngeal TB in a SNF resident or employee
  - Increased or unexpected morbidity or mortality associated with medical devices, practices, or procedures resulting in significant infections and/or hospital admissions
  - Closure of a unit or service due to infections
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# Examples of Unusual Infectious Disease Occurrences in Hospitals

- Cluster of healthcare-associated infections (HAI)
- Increase in cases of a reportable disease and conditions (Title 17)
- Cluster of MRSA colonized babies in NICU
- New antimicrobial resistant organism never seen in facility or appearance of organism after long absence

# Common Healthcare-Related Outbreaks

Related to:

- Community respiratory infections; increases in ER visits
  - Influenza, measles, pertussis
- Food
  - Salmonella, campylobacter, norovirus, staphylococcus
- Improper infection prevention practices
  - MRSA, VRE, acinetobacter, *C. difficile*
  - Scabies transmission

# Sources for Identifying Potential Outbreaks and Unusual Infectious Disease Occurrences

- Microbiology lab: Reviews culture reports for trends and unusual pathogens
  - Local physicians: Receives reports from patients with similar or unusual symptoms
  - Public health: Detects an increase of an illness in the community
  - Nursing units: Observes new symptoms common to multiple patients or employees
  - Emergency Department: Triaging increases in symptoms (e.g., nausea, vomiting, respiratory symptoms)
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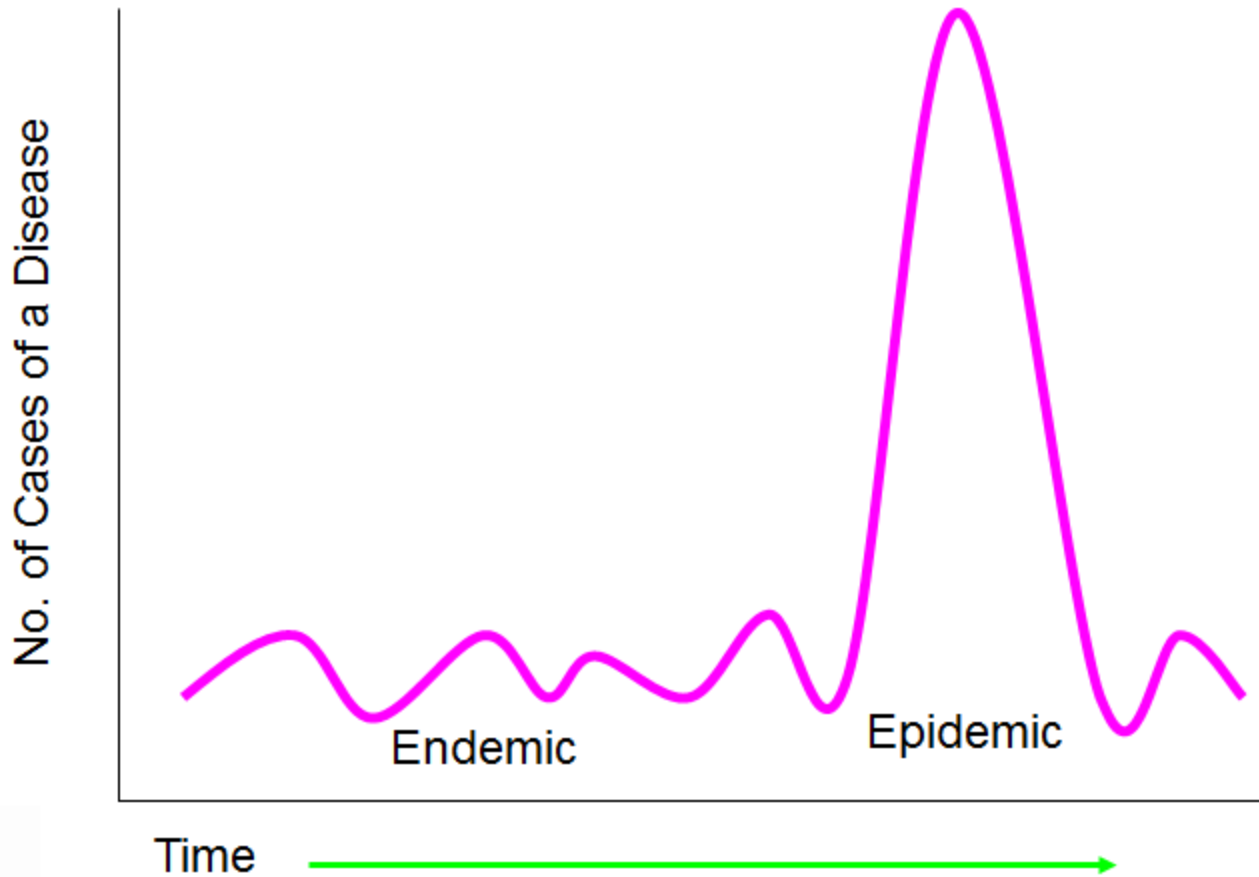
# Steps in an Outbreak Investigation

1. Establish the existence of an outbreak (or unusual occurrence)
2. Verify the diagnosis and report the outbreak
3. Construct a working case definition
4. Find cases systematically and record information
5. Characterize cases of disease by person, place, and time
6. Identify outbreak investigation team members
7. Implement outbreak control and prevention measures
8. Initiate or maintain surveillance
9. Communicate findings to appropriate parties throughout the investigation (for example, facility administration, local public health)

# Step 1 – Establish the Existence of an Outbreak

- Any increase in infection incidence found during routine surveillance may be an outbreak
  - Example: resistant *Acinetobacter* in sputum in several ICU patients
- An unusual pathogen or infection is identified
  - Example: Botulism, *Legionella*, CRE
- Reports of a cluster of patients or employees with same symptoms during same time period
  - Example: sudden onset of GI symptoms or diarrhea

# Endemic vs. Epidemic Infections



## Step 2 – Verify the Diagnosis and Report the Outbreak

If you suspect an outbreak:

- Evaluate initial data or reports of disease
  - Look carefully at laboratory or clinical reports to confirm initial findings
  - Interview staff
  - Rule out misdiagnoses or lab errors
- Ask microbiology lab to **save isolates**

Note: A suspected outbreak may be a “pseudo-outbreak” that resulted from problems with collection methods, rumors, data inaccuracies

# Reporting Outbreaks and Unusual Infectious Disease Occurrences

- Must be reported to local public health and CDPH
- In licensed facilities, all cases of reportable diseases and conditions\* (including outbreaks/unusual occurrences) must be reported to local public health and CDPH L&C
- Single cases of certain diseases are emergencies and require immediate action (for example, meningococcal infections)

\* California Reportable Diseases and Conditions list

<https://oehha.ca.gov/media/downloads/pesticides/report/reportablediseasesconditions.pdf>

## How to Notify Public Health Officials

- **Coordinate** with your facility administration; discuss situation and how it affects patient safety
  - **Determine** who makes the phone call and have information available about the occurrence and steps your team is taking to keep patients and staff safe
  - **Contact:** local public health office who will coordinate the outbreak investigation with others as needed
    - The local public health office may contact CDPH – HAI Program for assistance, and CDPH – HAI program may contact the CDC for assistance as needed
  - **Contact:** California Department of Public Health Licensing and Certification district office
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## Step 3 – Construct a Working Case Definition

- Refine the definition as you learn more
- Examples:
  - Patient with new onset of diarrhea after surgery
  - Patients with nausea, vomiting, and diarrhea after eating dinner on Thursday
  - Surgical site infections with MRSA after total knee replacement surgery

## Step 4 – Find Cases Systematically and Record Information

- Look back in time for more cases
  - Review lab or medical records
- Collect specimens, if needed
  - Patient cultures
  - Environmental cultures
  - HCP cultures only to verify hypothesis



# Develop a Line List

- Include:
  - Name
  - Medical record number
  - Age
  - Sex
  - Diagnosis
  - Unit or location
  - Admission date
  - Date of onset
  - Procedures
  - Symptoms
  - Positive cultures
- Use a spread sheet to organize notes
  - Blank outbreak logs may be available from local public health

# Investigate Symptomatic Patients

- What are the prominent symptoms?
- When did symptoms begin?
- Did fever occur? When? Describe other vital signs.
- Whom may have been exposed?
  - Maintain census for affected unit
  - List staff who provided care
- How many people and who ate which foods? Who became ill?

# Sample Line List

Checkpoint: What do these patients have in common?

Name	MR#	Admit Date	Age	Sex	Unit / Room	Culture	Surgery	Surgeon Room
Smith	23456	3/1	49	F	313	MRSA	CABG	Doe / 6
Jones	54328	3/2	55	M	314	MRSA	Appy	Moore / 5
Brown	34567	3/2	61	F	315	MRSA	Chole	Stone / 4

# Sample Line List for Foodborne Outbreak

Name	MR #	Unit/Room	Symptoms	Onset	Foods Eaten
Lopez	64654	414	N/V/D	3/3	Potato Salad Tuna Sandwich Iced Tea
Ball	45463	623	N/V/D	3/3	Potato Salad Meat Loaf Lemonade
Penn	76785	733	N/V/D	3/3	Potato Salad Ham Sandwich Pepsi
Newby	33435	544	N	3/3	Macaroni & Cheese Coffee

# Record Information From the Outbreak Investigation

## Tips:

- Start a file folder **immediately**
- Make notes of
  - What you did each day
  - Who was notified
  - Dates and times
- Keep a timeline
- Keep everything!
  - Your documentation will be needed



## Step 5 – Characterize Cases of Disease by Person, Place and Time

Called descriptive epidemiology

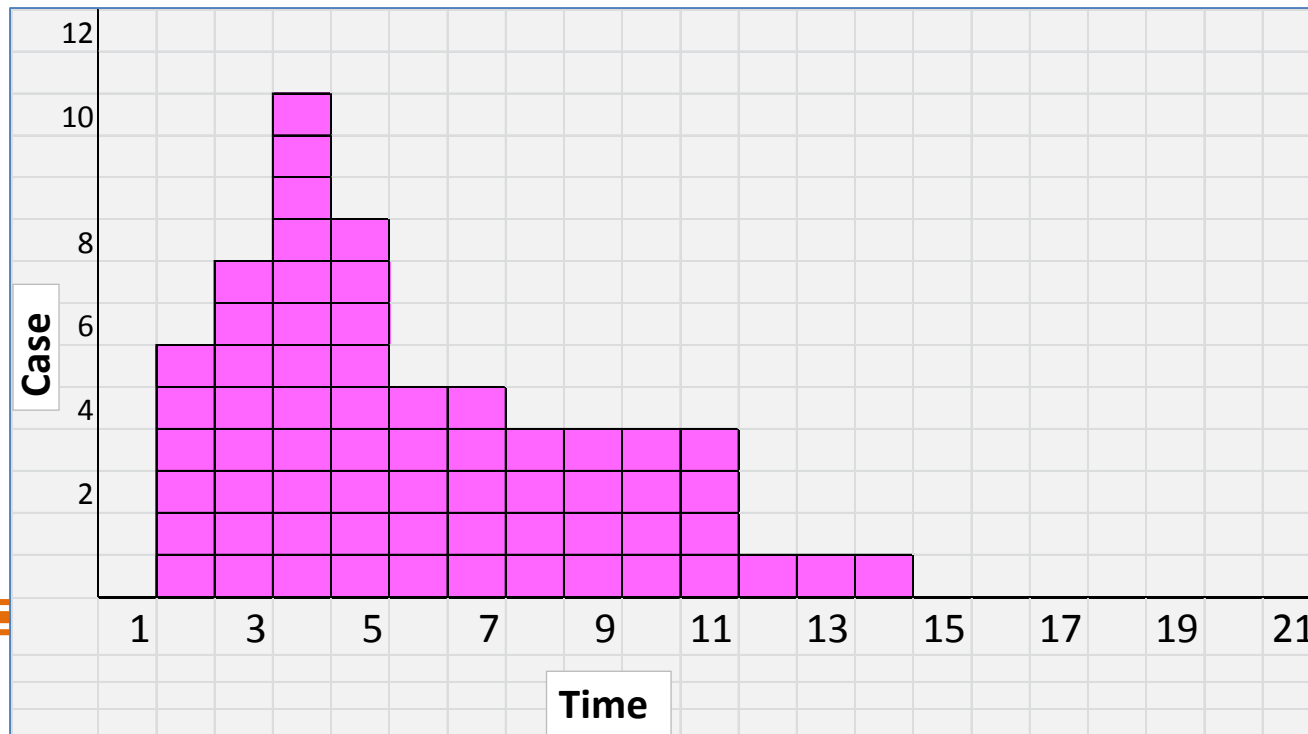
- Who got sick?
- Where were they when they got sick?
- When did they get sick?

## Develop an Epidemic Curve

- Create a graph showing all cases of disease during the epidemic period
- Plot cases by illness onset date or time
  - Helps to determine:
    - Whether problem is ongoing
    - If additional cases are forthcoming
    - If control measures are effective
- Visualizing cases with and without suspected exposure variables can assist in determining cause of the outbreak

# Epi Curve of Point Source Outbreak

- Most common form of epi curve
- Illustrates infection after single common exposure, such as food-borne disease outbreak
- Population is exposed for a short period of time





## Epi Curve of Extended Exposure Time

- CDC investigation of persons infected with the outbreak strains of *E. coli* O157:H7 by date of illness

Number of Persons



<https://www.cdc.gov/ecoli/2014/o157h7-05-14/epi.html>



# Step 6 – Identify Outbreak Investigation Team Members

Examples:

- Administration
- Laboratory Director
- ICU/Unit Director
- Food Services Director
- Sterilization and Processing Director
- Infectious Diseases Physician

# Step 7 – Implement Outbreak Control and Prevention Measures

- Norovirus outbreak
  - Close unit to new admits
- Food outbreak
  - Stop serving suspected food item
  - Ask dietary to save food because testing may be useful
- Suspect contaminated IV fluids
  - Remove from use and save suspected lot numbers
  - Consider culturing
  - Notify manufacturer or distributor

# Implement Outbreak Control and Prevention Measures - continued

- Acinetobacter cluster in ICU
  - Review hand hygiene compliance
  - Observe equipment and cleaning protocol
  - Cohort or isolate as appropriate

## Step 8 – Initiate or Maintain Surveillance

- Once control and prevention measures have been implemented:
  - Continue to monitor to validate measures are working and that the outbreak has not spread outside its original area

## Step 9 – Communicate Findings

- As noted in Step 1, communicating with those who need to know during the investigation is critical
- The final task is to summarize the investigation, its findings, and its outcome in a report and then to communicate this report
  - The communication usually takes two forms
    - An oral briefing
    - A written report

## Summary

- Outbreak investigation may not occur in a step-wise fashion
- Steps are often done simultaneously
- Information is constantly evolving
- Case definitions may change
- Status can change quickly
- May not know which control measure was most effective
- Sometimes the cause of the outbreak cannot be identified
- Local public health is available to assist in determining if an outbreak or unusual occurrence is happening

## Additional Resources and References

- Local public health officer
- APIC Text
- Worldwide Database for Nosocomial Outbreaks  
[www.outbreak-database.com](http://www.outbreak-database.com)
- Centers for Disease Control and Prevention [www.cdc.gov](http://www.cdc.gov)



# Questions?

For more information,  
please contact any  
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Or email

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