Outbreak Management and Investigation

Basics of Infection Prevention
2-Day Mini-Course
November 2018

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How Hospitals, Nursing Homes Keep Lethal "Superbug" Outbreaks Secret

Vague rules and patchy requirements often keep this information from the public

A REUTERS INVESTIGATION
By Deborah J. Nelson, David Rhode, Benjamin Lesser, Ryan McNeil
December 23, 2016

Emails suggest linens to be 'likely' source in deadly mold outbreak at Pittsburgh hospitals

By Lauren del Valle, CNN Updated 5:24 PM ET, Mon April 3, 2017

Los Angeles Times
A veil of secrecy shields hospitals where outbreaks occur

By Melody Peterson– April 18, 2015

State to step up inspections at hospitals with high infection rates

By Melody Peterson- March 1, 2017
Objectives

• Recognize unusual infections or disease occurrences that require action
• List steps to begin an outbreak investigation
• Discuss development of line lists and epi curves for investigating, confirming, and managing an outbreak
• Describe internal and external communication
• Describe outbreak reporting and collaboration between Public Health and hospitals
LAC FACTS

• Covers 4300 square miles
• Over 10 million residents
• 94 acute care hospitals
• Over 350 sub-acute/long-term care facilities

*Ref: 2010 US Census, Redistricting Census 2000 Tiger/Line Files, Office of Health Assessment and Epidemiology, September 2002
ACUTE COMMUNICABLE DISEASE CONTROL (ACDC) PROGRAM

MISSION:
• To reduce communicable diseases (other than tuberculosis, sexually transmitted diseases and HIV) in Los Angeles County

• ACDC Units:
  – Healthcare Outreach Unit
  – Hospital Outbreak & Biothreat Response
  – Hepatitis, Antimicrobial Resistance, Influenza & Skilled Nursing Facilities
  – Food-borne Disease
  – Vector-borne Diseases
MDRO Outbreaks in Acute Care Facilities, LAC, 2013 -2017

<table>
<thead>
<tr>
<th>Year</th>
<th>A. baumannii</th>
<th>MRSA</th>
<th>C. difficile</th>
<th>CRKP</th>
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<tbody>
<tr>
<td>2013</td>
<td>2</td>
<td>0</td>
<td>0</td>
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<td>2014</td>
<td>0</td>
<td>5</td>
<td>3</td>
<td>3</td>
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<tr>
<td>2015</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>2016</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2017</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Reported Outbreaks in Non-Acute Healthcare Facilities
LAC, 2010-2014
REGULATIONS / REPORTING REQUIREMENTS
CALIFORNIA HEALTH REGULATIONS

- California Code of Regulations (CCR)
  - Title 17
    - Public Health
      - **Reportable Diseases & Conditions, §2500**
  - Title 22, Social Security
    - GACH, Acute Psych, SNF, Intermediate Care, etc.
      - **Reporting, §70737**
- California Health & Safety Code
What Is Reportable?

- Over 88 communicable diseases, conditions, syndromes
- Unusual diseases
- Emerging diseases
- Outbreaks of any disease
Urgency Reporting Requirements

• Report immediately by phone
  – Meningococcal infection
  – Outbreaks of any disease

• Report within 1 working day
  – Food-borne disease

• Report within 7 calendar days
  – Legionellosis
Why Report?

- Required by law
- Determine extent of morbidity
- Evaluate risk of transmission
- Implement rapid interventions
  - Protect public/healthcare workers
When Should You Report?

• Report **immediately** to Public Health when:
  – A new, novel or emerging pathogen/disease is identified, e.g. *Candida auris*, Zika, Ebola
  – An unusual or rarely seen organism in the facility is identified, e.g. MDR CRE
  – Decision is made to conduct molecular testing
    • PFGE
    • Whole genome sequencing
When Should You Report? (2)

– Infection Prevention suspects a cluster or unusual event and is conducting an investigation

– A consultant is hired to assist with the hospital investigation
  • Legionellosis
  • Aspergillosis

– Death(s) are linked to an unusual pathogen or infectious disease
Examples of Unusual Occurrences in Hospitals

- Increase or cluster of healthcare-associated **infections**
- Increase in cases of a **reportable disease**
- **Water leak** damage to hospital kitchen, resulting in interruption in ability to provide food for patients
- **Fire** in pharmacy resulting in loss of medication stock
- **NICU** admits more neonates than hospital has license to care for leading to possible overcrowding
- **Food poisoning** that affects patients or staff
Report Outbreaks/Unusual Diseases To:

- ACDC
- HFID/CDPH

and

- LPHN or Morbidity
- District Office by Location
OUTBREAK INVESTIGATION
OUTBREAK OR CLUSTER?

• Outbreak
  – The occurrence of more cases of disease than expected in a given area (unit) or among a specific group of people over a particular period of time
  – Cases have a common cause or presumed to be related to one another in some way

• Cluster
  – An aggregation of cases in a given area over a particular period without regard to whether the number of cases is more than expected
Is it an Outbreak?

An increase in number of cases of disease above what is normally expected (baseline) on a particular unit or specific site

- Influenza
- Norovirus
- Clostridium difficile
- Carbapenem-Resistant Enterobacteriaceae (CRE)
- One case of healthcare-associated *Legionella*, *Salmonellosis*
- One case of post-operative group A *streptococcus* infection
Recognizing an Outbreak

Greater number of infections than usual are found during routine surveillance

- 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
Sources for Identifying Potential Outbreaks

- Microbiology lab: Reviews culture reports for trends and unusual pathogens
- Local physicians: Phone calls or office visits from patients reporting similar unusual symptoms
- Public Health: Seeing large volume of an illness in community
- Nursing units: new symptoms common to multiple patients or ill employees
- Emergency Department
Endemic vs. Epidemic Infections

- Endemic: No. of Cases of a Disease over Time
- Epidemic: Spike in No. of Cases of a Disease over Time
Steps in an Outbreak Investigation

- Verify the diagnosis and confirm possible outbreak
- Define a case; refine as you learn more
  - Example “patient with new onset diarrhea after surgery”
- Conduct case finding
  - Make a line list
  - Characterize by **person, place, time**
- Identify team members, e.g. ICU director, lab manager
- Implement immediate control measures if needed
- Evaluate control measures – any new cases?
- Communicate findings with leadership
As you begin...

• Talk to the lab and ask them to save ALL isolates that might be part of the outbreak!

• Save potential reservoirs (e.g., multi-dose medications, antiseptics, equipment, food) for possible culturing later.
Document the Outbreak Investigation

Word to the wise... your documentation will be needed:

• Start a file folder immediately
• Make notes of
  o What you did each day
  o Who was notified
  o Include dates and times
• Keep a timeline
• Keep everything!
Notification of 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 you and your team are taking to keep patients and staff safe

• **Contact:** local public health (Acute Communicable Disease Control)*

• **Contact:** California Department of Public Health, Licensing and Certification (Health Facilities Inspection Division)*

*LAC only
Confirming an Outbreak

If you suspect an outbreak

• Don’t panic
  o Suspected outbreak may be a “pseudo-outbreak”
    o May result from problems with collection methods, rumors, data inaccuracies

• Evaluate initial data or reports of disease
  o Look carefully at lab or clinical reports to confirm initial findings
  o Interview staff
  o Rule out misdiagnoses or lab errors
Case Finding

• Look back in time for more cases
  o Microbiology lab may be able to help
• Characterize cases of disease by person, place and time – add info to your line list
  o Who got sick?
  o Where were they when they got sick?
  o When did they get sick?
• May need to collect specimens
  o Patient cultures
  o Environmental cultures
  o Staff/HCW cultures (Be wary of swabbing noses of employees/physicians)
Investigate Symptomatic Patients

• What are the prominent symptoms?
• When did they begin?
• Did fever occur? When? Other vital signs?
• Who may have been exposed?
  o Maintain census for affected unit
  o List staff who provided care
• How many and who ate which foods? Who became ill?
Develop a Line List

• Include
  o Name and Medical Record Number
  o Age, Sex, Diagnosis
  o Unit or location
  o Date of Admission / Date of onset
  o Procedures
  o Symptoms
  o Positive cultures

• Use of an Excel spreadsheet can be helpful

• Blank outbreak logs may be available from local public health
## Sample Line List

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

**Checkpoint:** What do these patients have in common?
## Sample Line List for Foodborne Outbreak

<table>
<thead>
<tr>
<th>Name</th>
<th>MR #</th>
<th>Unit/Room</th>
<th>Symptoms</th>
<th>Onset</th>
<th>Foods Eaten</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lopez</td>
<td>64654</td>
<td>414</td>
<td>N/V/D</td>
<td>3/3</td>
<td>Potato Salad Tuna Sandwich Iced Tea</td>
</tr>
<tr>
<td>Ball</td>
<td>45463</td>
<td>623</td>
<td>N/V/D</td>
<td>3/3</td>
<td>Potato Salad Meat Loaf Lemonade</td>
</tr>
<tr>
<td>Penn</td>
<td>76785</td>
<td>733</td>
<td>N/V/D</td>
<td>3/3</td>
<td>Potato Salad Ham Sandwich Pepsi</td>
</tr>
<tr>
<td>Newby</td>
<td>33435</td>
<td>544</td>
<td>N</td>
<td>3/3</td>
<td>Macaroni &amp; Cheese Coffee</td>
</tr>
</tbody>
</table>
Implement Outbreak Control Measures

Based on working hypothesis

• Food outbreak?
  o Stop serving suspected food item
  o Ask dietary to save food (Testing may be useful)

• Suspect contaminated IV fluids?
  o Remove from use and save suspected lot numbers
  o Consider culturing
  o Notify manufacturer or distributor

• Pseudomonas cluster in NICU?
  o Review hand hygiene compliance
  o Observe equipment and cleaning protocol
  o Need to cohort/isolate patients, cohort staff?
Develop an Epidemic Curve

• Graph showing all cases of disease during the epidemic period
  o Cases plotted by illness onset date or time

• Helps to determine
  o whether problem is ongoing
  o if additional cases are forthcoming
  o if control measures are effective

• Visualization of cases with and without suspected exposure variables can assist in determining cause of the outbreak
Epi Curve Example

Norovirus Illness in a SNF by Date of Onset (n=42)
PATIENT SAFETY CONCERNS or Other Considerations

- Is transmission ongoing?
- Does the unit need to be closed?
- Is the outbreak isolated only to this facility?
  - Consult with LAC, CDPH and CDC
- Is patient safety compromised?
Outbreak Investigation Considerations

- Investigation may not occur in a step-wise fashion
- Steps often done simultaneously
- Information constantly evolving, things can move very quickly
- Case definition may change
- You may not know which intervention was the most effective
- Sometimes cause of outbreak cannot be identified
- Does the public need to know?
Outbreaks Happen

<table>
<thead>
<tr>
<th>Hepatitis C transmission in an outpatient clinic</th>
<th>Cluster of NICU pseudomonas infections</th>
<th>Patients with positive Legionella</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Question if improper injection practices are used</td>
<td>• Who cleans the respiratory therapy equipment?</td>
<td>• Can you rule out community onset?</td>
</tr>
<tr>
<td>• Clean medication preparation area?</td>
<td>• Any “common bags” of medication used?</td>
<td>• Did you have units out of service for some time so water lines are contaminated?</td>
</tr>
</tbody>
</table>

http://phil.cdc.gov/phil/quicksearch.asp
ACDC INVESTIGATION PROCESS
INITIAL INTAKE

• Date reported, reporter, and phone number
• Facility information
• Affected unit
• Organism
• Outbreak time period
• Number affected (cases), severity
• Number of deaths
• Control measures implemented
• Suspected mode of transmission
INITIAL DATA REQUESTS

• Line list
• Case medical records
• Laboratory reports, including sensitivities
• Background data for organism
• Summary of control measures
• Floor plan of unit
• Case room location from admission to discharge
• Policies/Procedures
ADDITIONAL DATA REQUESTS

• Staff list
  – Direct care staff
• Facility investigation report
• Pharmacy list
• Microbiology list
• Dietary list
• Consultant’s report
  – E.g. air samples, water sample results
RECOMMENDATIONS (1)

• Appropriate isolation/cohorting
• Handwashing enforcement
• Staff education
• Identify common procedures, multi-dose meds, reusable supplies
• Review relevant policy/procedures
RECOMMENDATIONS (2)

• Environmental cultures
• Environmental cleaning
• Surveillance cultures
  - Patient
  - Staff
• Report additional cases
• Collect specimens
• Hire environmental consultant w/hospital expertise
ACDC Surveillance

• May Include:
  – Daily/Weekly status update
    • Phone &/or email
    • Surveillance period varies
  – Conference call
  – Coordinate isolates to PHL for strain testing
  – Provide management recommendations
  – Site investigation
  – Case control study
SITE INVESTIGATION

• Entrance/exit conference
• Outbreak Details
  – Chart review
  – Policy/procedure review
• Interview staff
• Tour facility
  – Observe procedures
• Environmental assessment
• Laboratory assistance
When is it Over?

• When transmission no longer occurs
  • No additional cases are identified
  • All requested documents are received

  – Routine investigation
    • Closure email

  – Complex investigation
    • Closure letter
      » Investigation summary
      » Final recommendations
CASE STUDY
Outbreak Call

- **When:** March 2006

- **Where:** <100-Bed Acute Care Hospital

- **Patients:** Chronic respiratory illness
  Most ventilator-dependent

- **Status:** 8 culture positive patients
  4 more in subsequent week

- **Organism:** *Elizabethkingia meningoseptica*
**Elizabethkingia meningoseptica (EM)**

- *Flavobacterium meningosepticum, Chryseobacterium meningosepticum*
- Rare human pathogen
- Gram-negative MDRO
- Waterborne transmission
Case Definition

A patient who was blood or sputum culture positive for EM, with or without symptoms, 48 hours post-admission from March 2005 through May 2006.
Chart Review

Total cases: 40

- Infected: 19
- Colonized: 8
- Lab Confirmed: 13
ACDC Initial Recommendations

• Contact precautions
• Cohort patients
• Hand hygiene
• Staff education
Consultation

Consultation:
• CDPH
• CDC
  – No EM outbreaks reported statewide or nationally

• LADWP
  – 10 water samples collected for analysis
  – All samples negative for EM
Environmental Surveillance

- Cultures collected by ACDC:
  - 2 ICU sinks, 1 ICU soap dispenser
  - 5 patient room sinks
  - 2 tap water samples
  - 1 endotrachael tubing system

- All environmental cultures were negative for EM
Hand Hygiene Compliance

• Nursing 63%
• Ancillary staff 62%
• Physicians 100%
• Isolation compliance 53%

• Improvements needed in:
  – wearing gowns in isolation rooms
  – removing masks upon leaving room
  – removing gloves and performing hand hygiene after leaving the room
Review of Hospital Policy/Procedures

• Hand hygiene & handwashing
  – Hospital policy: 10 seconds
  – CDC guidelines: 15 seconds
• Infection control surveillance
• Contact precautions
PHN Site Visit

- 5 PHN site visits
  - Unannounced
  - May 25, 2006 to June 26, 2006

Observational Checklist
- Hand hygiene compliance
- Patient/Staff cohorting compliance
- PPE compliance
Outbreak Over: Cases Decreased to Zero
Thank you!

• Acute Communicable Disease Control – for Infection Control Consultation
  – Phone: (213) 240-7941

• Outbreak Reporting to Public Health Morbidity Unit
  – Phone: (888) 397-3993
  – Fax: (888) 397-3778

  – Business Hours: Monday - Friday 8 AM – 5 PM