Outbreak Management and Investigation

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Acute Communicable Disease Control Program
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

Los Angeles Times
State to step up inspections at hospitals with high infection rates

By Melody Peterson- March 1, 2017

After 3 NICU babies die, Pennsylvania hospital says a waterborne bacteria may be to blame

Jordan Culver, USA TODAY Published 7:20 p.m. ET Oct. 7, 2019 | Updated 5:57 a.m. ET Oct. 8, 2019
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
LOCAL PUBLIC HEALTH
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, July 2018
ACUTE COMMUNICABLE DISEASE CONTROL (ACDC) PROGRAM

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

ACDC Units

- Hepatitis, Antimicrobial Resistance, & Influenza Unit
- Healthcare Outreach Unit
- Foodborne Diseases Unit
- Vector-borne diseases Unit
- Hospital Outbreak and Biothreat Response Unit
Most Common Outbreaks in Acute Care Facilities

- Acinetobacter baumannii
- MRSA
- C. difficile
- Carbapenem-resistant Enterobacteriaceae
- Waterborne diseases
- Norovirus
- Scabies
- Surgical Site Infection Outbreaks
REGULATIONS / REPORTING REQUIREMENTS
CALIFORNIA HEALTH REGULATIONS

• California Code of Regulations (CCR)
  o **Title 17**: Public Health
    o Reportable Diseases & Conditions List
  o **Title 22**: Social Security
    o GACH, Acute Psych, SNF, Intermediate Care, etc.

• California Health & Safety Code
What Is Reportable?

- Anthrax, human or animal
- Babesiosis
- Botulism: infant, foodborne, or wound
- Brucellosis, animal; except infections due to *Brucella canis*
- Brucellosis, human
- Campylobacteriosis
- Carbapenem-Resistant *Enterobacteriaceae* (CRE), including *Klebsiella sp.*, *E. coli*, and *Enterobacter sp.*, in acute care hospitals or skilled nursing facilities
- Chancroid
- Chickenpox (Varicella), only hospitalizations, deaths, and outbreaks (≥3 cases, or one case in a high-risk setting)
- Chikungunya Virus Infection
- *Chlamydia trachomatis* infection, including lymphogranuloma venereum (LGV)
- Cholera
- Ciguatera Fish Poisoning
- Coccidioidomycosis
- Creutzfeldt-Jakob Disease (CJD) and other Transmissible Spongiform Encephalopathies (TSE)
- Cryptosporidiosis
- Cyclosporiasis
- *Haemophilus influenzae*, invasive disease only, all serotypes, less than 5 years of age
- Hantavirus Infection
- Hemolytic Uremic Syndrome
- Hepatitis A, acute infection
- Hepatitis B, specify acute or chronic
- Hepatitis C, specify acute or chronic
- Hepatitis D (Delta), specify acute or chronic
- Hepatitis E, acute infection
- Human Immunodeficiency Virus (HIV) Infection, stage 3 (AIDS) (§2641.30-2643.20)
- Human Immunodeficiency Virus (HIV), acute infection (§2641.30-2643.20)
- Influenza deaths, confirmed cases only, all ages
- Influenza, novel strains, human
- Legionellosis
- Leprosy (Hansen’s Disease)
- Leptospirosis
- Listeriosis
- Lyme Disease
- Malaria
- Measles (Rubeola)
- Meningitis, specify etiology: viral, bacterial, fungal, or parasitic
Urgency Reporting Requirements

Report IMMEDIATELY by phone

📞 Anthrax, human or animal

Report within 1 working day

✉️ Hepatitis A, acute infection

Report within 7 calendar days

📅 Legionellosis
Where to Report?

Los Angeles County ACDC AND Los Angeles County HFID
To report a case or outbreak of any disease, contact the Communicable Disease Reporting System
Tel: (888) 397-3993 or (213) 240-7821 • Fax: (888) 397-3778 or (213) 482-5508
Health Professionals Reporting Webpage: www.publichealth.lacounty.gov/clinicians/report
Health Facilities Inspection Division

How to Contact the Department of Health Services, Licensing and Certification Program
Tel: (800) 228-1019 or (323) 869-8500

In Los Angeles County, the Health Facilities Inspection Division has the following sections and districts:

- ACUTE HOSPITALS
  - NORTH DISTRICT
  - WEST DISTRICT
  - SAN GABRIEL DISTRICT
  - EAST DISTRICT
- CLINICS
  - HEALTH AGENCIES
  - INTERMEDIATE CARE FACILITIES-DEVELOPMENT

NORTH DISTRICT
15643 Sherman Way, Suite 200
Van Nuys, CA 91406
Tel: (818) 901-4375
- Antelope Valley
- Burbank
- Calabasas
- Canoga Park
- Chatsworth
- West Valley
Why Report?

• Required by law
• Determine extent of morbidity
• Evaluate risk of transmission
• Implement rapid interventions
  o Protect public/healthcare workers
  o Delay or Failure to report
Immediate Reporting to Public Health

• An unusual or rarely seen organism in the facility is identified, e.g. MDR CRE
• A new, novel or emerging pathogen/disease is identified, e.g. *Candida auris*, Zika, Ebola
• Decision is made to conduct molecular testing
  – PFGE
  – Whole genome sequencing
Examples of When to Report

– 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

"outbreak"
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
Examples of Outbreaks

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 a new, novel or emerging pathogen/disease
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, Anthrax, Colistin and Carbapenem resistant

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
- Local physicians
- Public Health
- Nursing Units
- Emergency Department
Endemic vs. Epidemic Infections

No. of Cases of a Disease

Endemic  Epidemic

Time
Steps in an Outbreak Investigation

- **Verify the diagnosis** and confirm outbreak
- **Define a case**
  - Example “Patients at XX hospital on the surgical ICU who have been diagnosed with c. diff from January 2015 to April 2015”
- **Conduct case finding**
  - Make a line list
- **Identify team members**, e.g. ICU director, lab manager
- **Implement immediate control measures**
- **Evaluate control measures**
- **Communicate findings**
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
As you begin...

• Save all isolates!
• Save potential reservoirs for possible culturing later
  – multi-dose medications
  – Antiseptics
  – Equipment
  – food
Document the Outbreak Investigation

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

- Start a file folder immediately
- Make notes of
  - What you did each day
  - Who was notified
  - Include dates and times
- Keep a timeline
- Keep everything!
Notification of Public Health Officials

• **Coordinate** with your facility Administration

• **Determine** who makes the phone call and have information available

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

• **Contact:** California Department of Public Health, Licensing and Certification (Health Facilities Inspection Division)*
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
## 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 Need to cohort/isolate patients
  o Review hand hygiene compliance
  o Observe equipment and cleaning protocol
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

Hepatitis C transmission in an outpatient clinic
- Question if improper injection practices are used
- Clean medication preparation area?

Cluster of NICU pseudomonas infections
- Who cleans the respiratory therapy equipment?
- Any “common bags” of medication used?

Patients with positive Legionella
- Can you rule out community onset?
- Did you have units out of service for some time so water lines are contaminated?

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
Outbreak Call

• When: March 2016

• 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 2015 through May 2016.
Chart Review

Total cases: 40

- Infected: 19
- Lab Confirmed: 13
- Colonized: 8

Total cases: 40
ACDC Initial Recommendations

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

Consultation:

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

• LAC DPH – Environmental Health
  – 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 endotracheal 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

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

• 5 PHN site visits
  • Unannounced
  • May 25, 2016 to June 26, 2016

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

• Talar Kamali, RN, BSN, PHN, CIC
  Assistant Program Specialist

• 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