



Outbreaks: What Skilled Nursing Facilities Need to Know

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Objectives

- Describe public health and reporting requirements
- Discuss how to conduct an outbreak investigation
 - List steps in an outbreak (i.e. line lists and epi curves) for confirmation, investigation, and control
- Describe actual outbreak scenarios



LAC FACTS

- 99 acute care hospitals
- Over 350 sub-acute/long-term care facilities



*Ref: 2010 US Census (2015), Redistricting Census 2000 Tiger/Line Files, Office of Health Assessment and Epidemiology, September 2002



LOS ANGELES COUNTY DEPARTMENT OF PUBLIC HEALTH ACUTE COMMUNICABLE DISEASE CONTROL (ACDC)

MISSION:

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



Antimicrobial Resistance, Influenza, and Skilled Nursing Facilities (ARIS)

- Serve as liaisons between Public Health and LAC skilled nursing facilities
- Improve infection control and patient safety
- Conduct infection control assessments
- Oversee influenza surveillance and reporting of community associated *S. aureus*/MRSA



Healthcare Outreach Unit

- Serve as liaisons between Public Health and LAC Hospitals and other Healthcare Facilities
- Increase mandatory disease reporting
- Investigate and manage CRE hospital & ambulatory care outbreaks
- Characterize burden of HAIs and AR in LAC



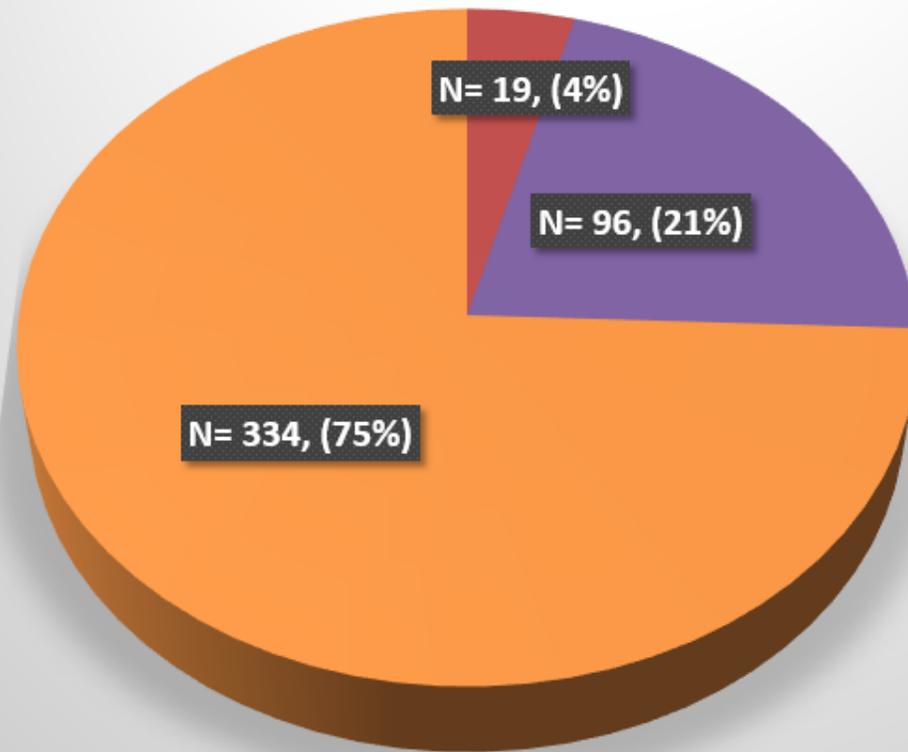


Health Facilities Inspection Division (Licensing & Certification)

- Acute care hospitals
- LTAC
- Skilled Nursing Facilities (SNFs)
- Homes for the developmentally disabled
- Hospice Programs
- Ambulatory surgical centers
- Dialysis clinics
- Primary care clinics
- Home Health Agencies
- Congregate Living Facilities



LAC Reported Outbreaks, 2015



- GACH
- SNF
- Community



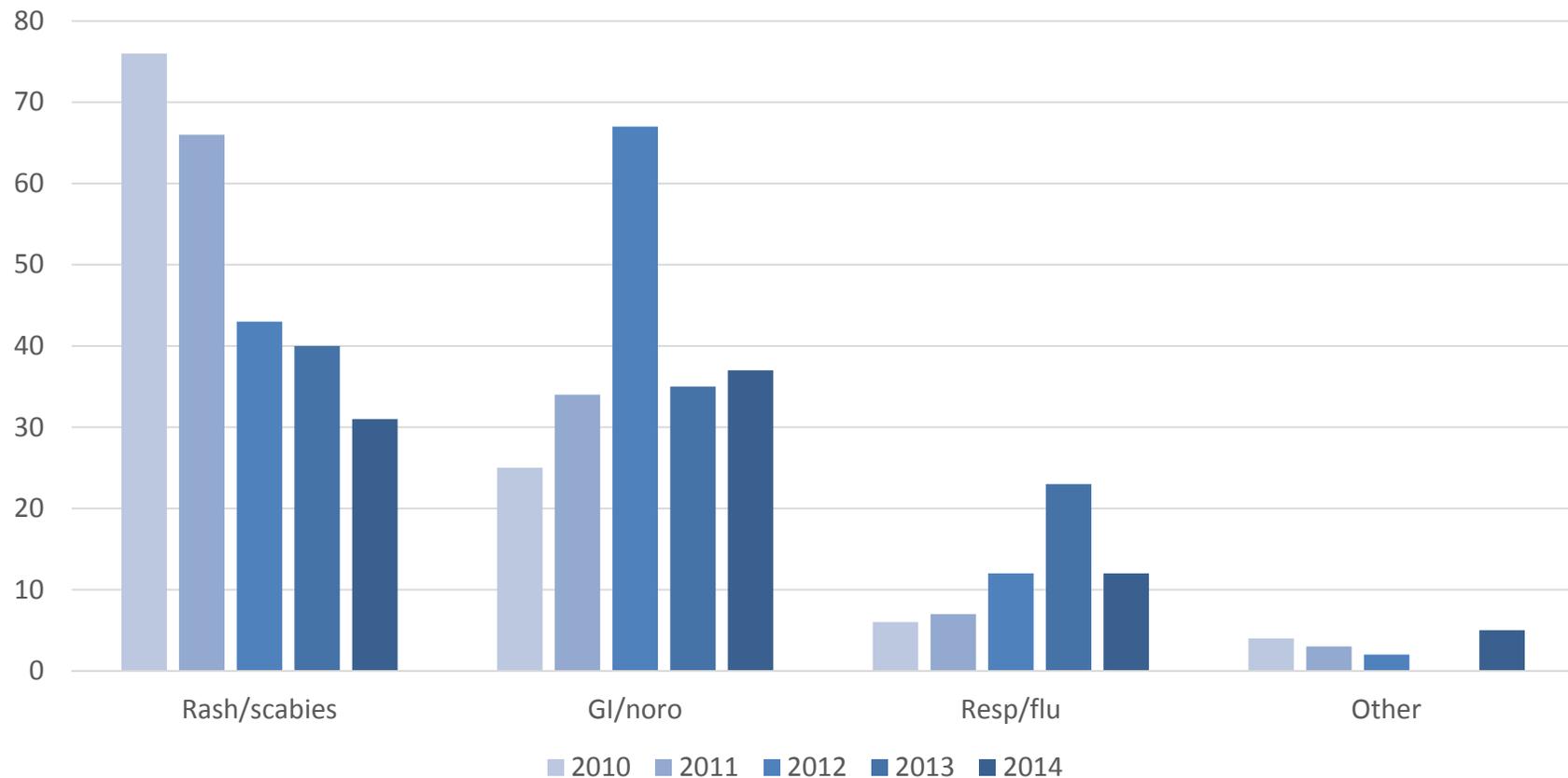
LAC Reported Outbreaks

[outbreaks (patients)]

| Facility Type | 2010 | 2011 | 2012 | 2013 | 2014 |
|---------------|------------|------------|------------|------------|------------|
| GACH | 27 (316) | 16 (217) | 24 (228) | 19 (122) | 25 (218) |
| SNF | 111 (1121) | 110 (1510) | 124 (2292) | 98 (1782) | 85 (1253) |
| Com. | 145 (2060) | 227 (3261) | 227 (2970) | 229 (3553) | 363 (3607) |



Reported Outbreaks in Non-Acute Healthcare Facilities





REGULATIONS





What Is Reportable?

County of Los Angeles • Department of Public Health

REPORTABLE DISEASES AND CONDITIONS

Table 1.7, California Code of Regulations (CCR), § 2800

It is the duty of every healthcare provider, knowing or in attendance on a case or suspected case of any diseases or conditions listed below, to report to the local health officer for the jurisdiction where the patient resides. "Health care provider" encompasses physicians (doctors, osteopaths, osteia medicine practitioners), veterinarians, podiatrists, physician assistants, registered nurses (nurse practitioners, nurse midwives, school nurses), infection control professionals, medical examiners/ coroners, dentists, and chiropractors, as well as any other person with knowledge of a case or suspected case.

Urgency Reporting Requirements

☛ Report immediately by telephone. ☜ Report within 1 working day of identification. ☞ Report within 7 calendar days from time of identification.

| REPORTABLE DISEASES | | |
|---|---|--|
| <ul style="list-style-type: none"> ☛ Acquired Immune Deficiency Syndrome (AIDS) ☛ Anthrax ☛ Arthropod-borne Encephalitis ☛ Botulism, human or animal + ☛ Bubonic, animal, except infection due to <i>Besnoitia</i> + ☛ Brucellosis, human + ☛ Campylobacteriosis ☛ Chancroid + ☛ Chickenpox (Varicella), only hospitalized and fatal cases; do <u>not</u> report cases of herpes zoster or shingles ☛ Chikungunya virus ☛ Clostridium botulinum toxin, including lymphangitis venereum (LOV) + ☛ Cholera + ☛ Ciguatera Fish Poisoning ☛ Coccioidiomycosis ☛ Creutzfeldt-Jakob Disease (CJD) and other Transmissible Spongiform Encephalopathies (TSE) ☛ Cryptosporidiosis ☛ Cyclosporiasis ☛ Cyathostomiasis or Teniasis ☛ Dengue ☛ Diphtheria + ☛ Domestic Acid Urine (Shellfish) Poisoning ☛ Echinococcosis ☛ Erythema, specify etiology: viral, bacterial, fungal or parasitic ☛ Escherichia coli, single toxin producing (STEC) including E. coli O157 + ☛ Foodborne illness ☛ Foodborne outbreak; 2 or more suspected cases from separate households with same assumed source ☛ Giardiasis ☛ Gonococcal infection + ☛ Hemophilus influenzae, invasive disease only, less than 15 years of age ☛ Herpesvirus Infection ☛ Hemolytic Uremic Syndrome | <ul style="list-style-type: none"> ☛ 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) + (2841-2843) ☛ Influenza, laboratory confirmed cases only, all ages + ☛ Influenza, novel strains, human ☛ Legionellosis ☛ Leprosy (Hansen's Disease) ☛ Leptospirosis ☛ Lyme Disease ☛ Malaria + ☛ Measles (Rubella) ☛ Meningitis, specify etiology: viral, bacterial, fungal, or parasitic ☛ Meningococcal Infection ☛ Mumps ☛ Myxitis, Acute Flaccid + ☛ Paralytic Shellfish Poisoning ☛ Pelvic Inflammatory Disease (PID) + ☛ Pertussis (Whooping Cough) ☛ Plague, human or animal + ☛ Poliomyelitis Infection ☛ Psittacosis ☛ Q Fever ☛ Rabies, human or animal ☛ Relapsing Fever ☛ Respiratory syncytial virus, ICU or fatal cases, and <5 years only + ☛ Rift Valley Fever (non-rift Valley Mountain Spotted Fever), including T-lypha and T-lypha-like illnesses ☛ Rocky Mountain Spotted Fever ☛ Rubella (German Measles) ☛ Rubella Syndrome, Congenital ☛ Salmonellosis, other than Typhoid Fever + ☛ SARS (Severe Acute Respiratory Syndrome) ☛ Scabies, atypical or crusted + ☛ Scombroid Fish Poisoning ☛ Shiga Toxin, selected types | <ul style="list-style-type: none"> ☛ Shigellosis ☛ Shigellosis (Shedde) ☛ Shylock's cross infection, deaths only or admission to an intensive care unit of a person who had not had surgery or dialysis, both hospitalized, or resided in a long-term care facility in the past year, and did not have an attending cabinet or percutaneous medical cabinet at the time of culture ☛ Streptococcal infection, outbreaks of any type ☛ Streptococcal Infection, individual case in a food handler or dairy worker ☛ Streptococcal Infection, Invasive Group A, including Streptococcal Toxic Shock Syndrome and Necrotizing Fasciitis; do <u>not</u> report individual cases of pharyngitis or scarlet fever + ☛ Streptococcus pneumoniae, invasive + ☛ Syphilis + ☛ Tetanus ☛ Toxic Shock Syndrome ☛ Trichinosis ☛ Tuberculosis + + ☛ Tularemia, animal ☛ Tularemia, human + ☛ Typhoid Fever, cases and carriers + ☛ Vibrio Infection + ☛ Viral Hemorrhagic Fevers, human or animal (e.g., Dengue, Chikungunya, Ebola, Lassa and Marburg viruses) ☛ West Nile Virus (WNV) Infection ☛ Yellow Fever ☛ Yersiniosis ☛ Zika Virus Disease ☛ Zika Virus Infection, Congenital |
| Reportable Non-Communicable Diseases or Conditions | | |
| <ul style="list-style-type: none"> ☛ Alzheimer's Disease, and Related Conditions (CCR § 2802, § 2805, § 2810) | <ul style="list-style-type: none"> ☛ Disorders Characterized by Loss of Consciousness (CCR § 2805, § 2810) | <ul style="list-style-type: none"> ☛ Infectious Prion Protein (Health and Safety Code § 103200) |

Reportable to the Los Angeles County Department of Public Health
 Bacterial isolates and material files shall be forwarded to Los Angeles County Public Health Laboratory for confirmation. Health care providers must still report all such cases separately. Public Health Laboratory (62) 652-7303
 For questions regarding the reporting of HIV/AIDS, STD or TB, contact the respective program:
 Division of HIV and STD Programs TB Control Program
 HIV reporting (213) 351-8196 STD reporting (213) 744-2100 (213) 745-0830
 www.publichealth.lacounty.gov/hiv/tb/ www.publichealth.lacounty.gov/tb/

To report a case or outbreak of any disease, contact the Communicable Disease Reporting System
 Tel: (888) 397-3993 • Fax: (888) 397-3779

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



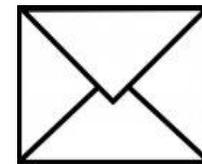
Why Report?

- Required by law
 - California Code of Regulations, Title 17, Public Health, Section 2500
 - Outbreaks of any disease—Report immediately by telephone
- Determine extent of morbidity
- Evaluate risk of transmission
- Implement rapid interventions
 - Protect public/healthcare workers



Urgency Reporting Requirements

- Report immediately by phone
 - Meningococcal infection
 - Outbreaks of any disease
- Report within 1 working day
 - Scabies, atypical or crusted
- Report within 7 calendar days
 - Legionellosis





Unusual Infectious Disease Occurrences and Emergencies

- Infectious disease outbreaks and other healthcare emergencies must be reported to local public health *and* CDPH Health Facilities
- All cases of reportable diseases and conditions* must be reported to local public health
- Single cases of certain diseases are emergencies and require immediate action, e.g. influenza and crusted scabies infections

* Refer to California or LAC Reportable Diseases and Conditions list (see references)



OUTBREAK INVESTIGATION





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 throughout



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

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





Is it an Outbreak?

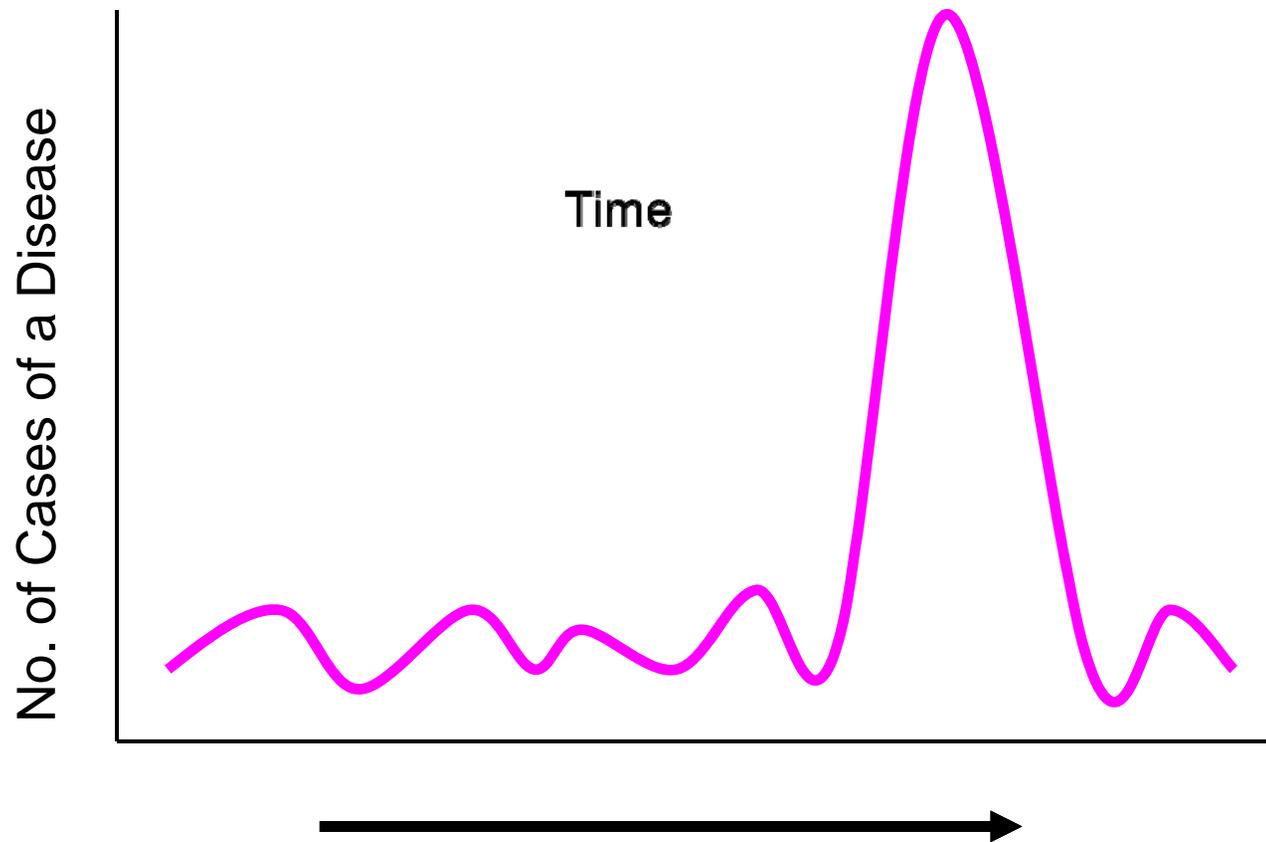
An increase in number of cases of disease above what is normally expected (baseline) on a particular unit or specific site

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



Endemic vs. Epidemic Infections

- Time





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 office (Acute Communicable Disease Unit)
- **Contact:** California Department of Public Health, Licensing and Certification



Common Healthcare-related Outbreaks

- Related to food
 - Salmonella, campylobacter, norovirus, staph
- Related to improper sterilization / disinfection
 - Pseudomonas related to scope processing
- Related to community visits to ER / admits
 - Influenza, measles, pertussis
- Related to improper infection prevention practices
 - Cluster of MRSA, VRE, Acinetobacter, C difficile
 - Scabies transmission



Confirming an Outbreak

If you suspect an outbreak

- Don't panic
 - Many suspected outbreaks are “pseudo-outbreaks”
 - Result from problems with collection methods, rumors, data inaccuracies
- Evaluate initial data or reports of disease
 - Look carefully at lab or clinical reports to confirm initial findings
 - Interview staff
 - Rule out misdiagnoses or lab errors
- Ask microbiology lab to save isolates



Case Finding

- Look back in time for more cases
 - Lab or pharmacy records may be able to help
- May need to collect specimens
 - Patient cultures
 - Environmental cultures
 - Be wary of swabbing noses of employees/physicians
- Characterize cases of disease by person, place and time – add info to your line list
 - Who got sick?
 - Where were they when they got sick?
 - When did they get sick?



Investigate Symptomatic Patients

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



Develop a Line List

- Include
 - Name and Medical Record Number
 - Age, Sex, Diagnosis
 - Unit or location
 - Date of Admission / Date of onset
 - Procedures
 - Symptoms
 - Positive cultures
- Use of an Excel spread sheet can be helpful
- Blank outbreak logs may be available from local public health



Sample Line List

| Name | MR# | Admit Date | Age | Sex | Unit /Room | Culture | Surger y | 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 |

Checkpoint: What do these patients have in common?



Before 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., multidose medications, antiseptics, equipment, food) for possible culturing later.





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 LACDPH, CDPH and CDC
- Does the public need to know? Is patient safety compromised?



Implement Outbreak Control Measures

Based on working hypothesis

- Acute blood borne pathogen infection?
 - Review policies and procedures for anything that comes in contact with blood and body fluids (glucometers)
 - Review consultants (dental, podiatry)
- Multidrug resistant organism cluster?
 - Review hand hygiene compliance
 - Observe equipment and cleaning protocol
 - Need to cohort/isolate?



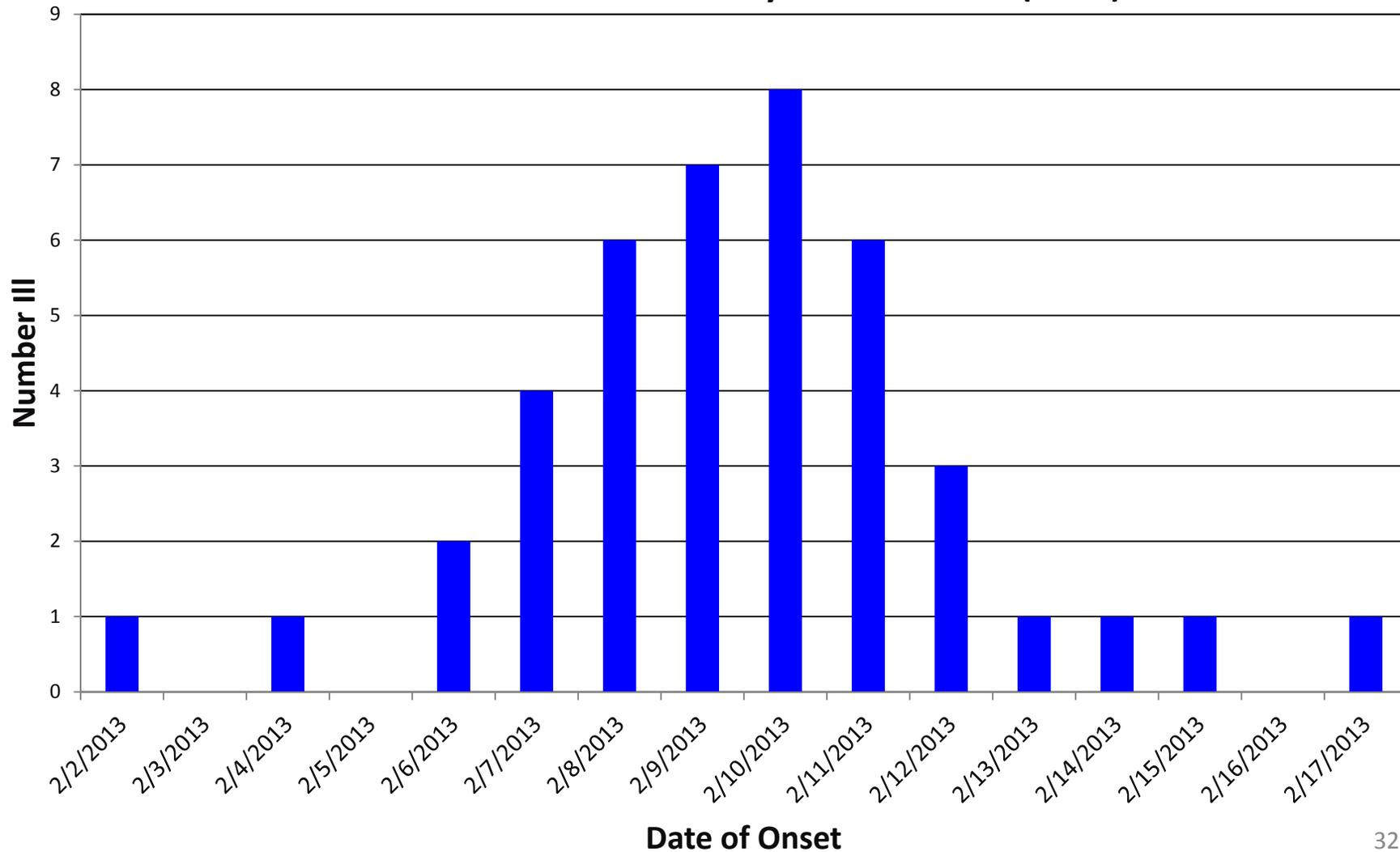
Develop an Epidemic Curve

- Graph showing all cases of disease during the epidemic period
 - Cases plotted by illness onset date or time
- Helps to determine
 - whether problem is ongoing
 - if additional cases are forthcoming
 - 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)





Outbreak Investigation Considerations

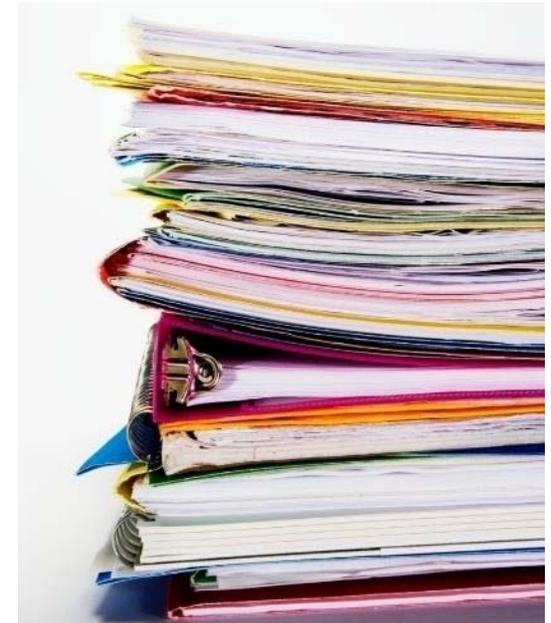
- Investigation may not occur in a step-wise fashion
- Steps often done simultaneously
- Information constantly evolving
- Case definition may change
- You may feel like you are “drinking from a fire hose” because things can move very quickly
- You may not know which intervention was the most effective
- Sometimes cause of outbreak cannot be identified



Document the Outbreak Investigation

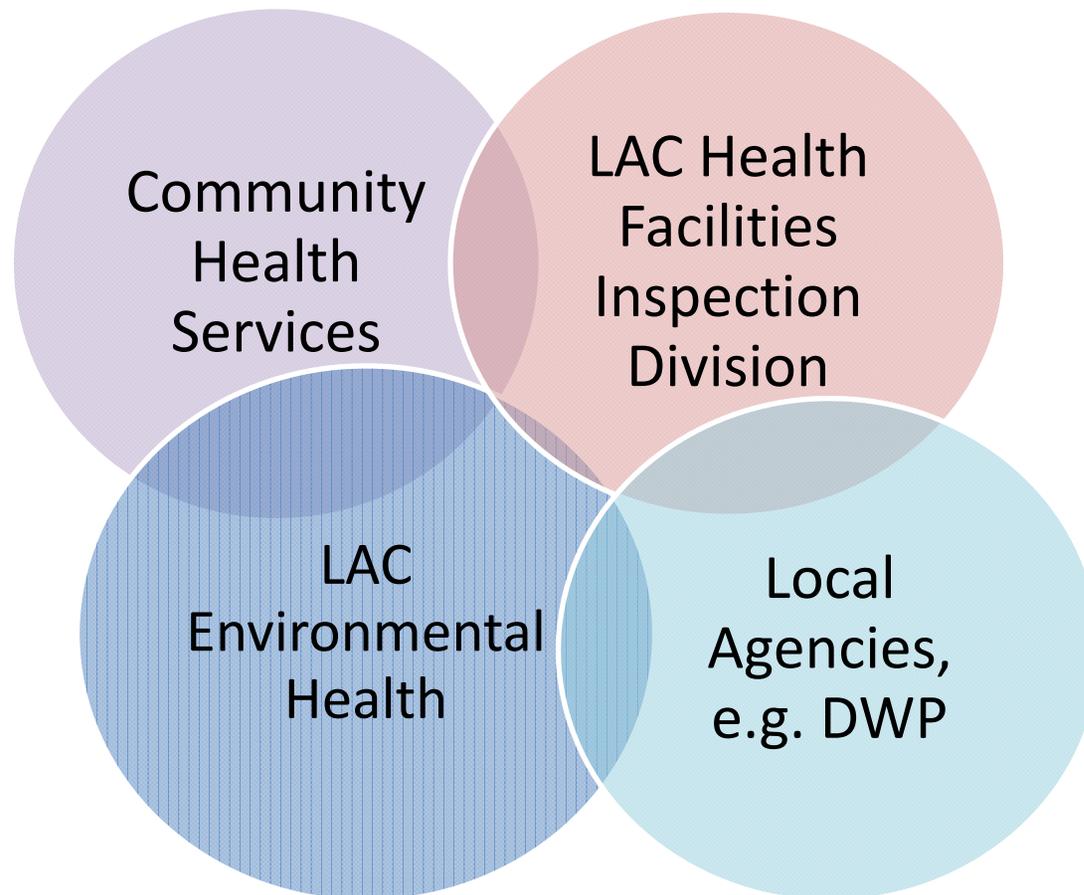
Word to the wise...

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





JOINT SITE INVESTIGATION





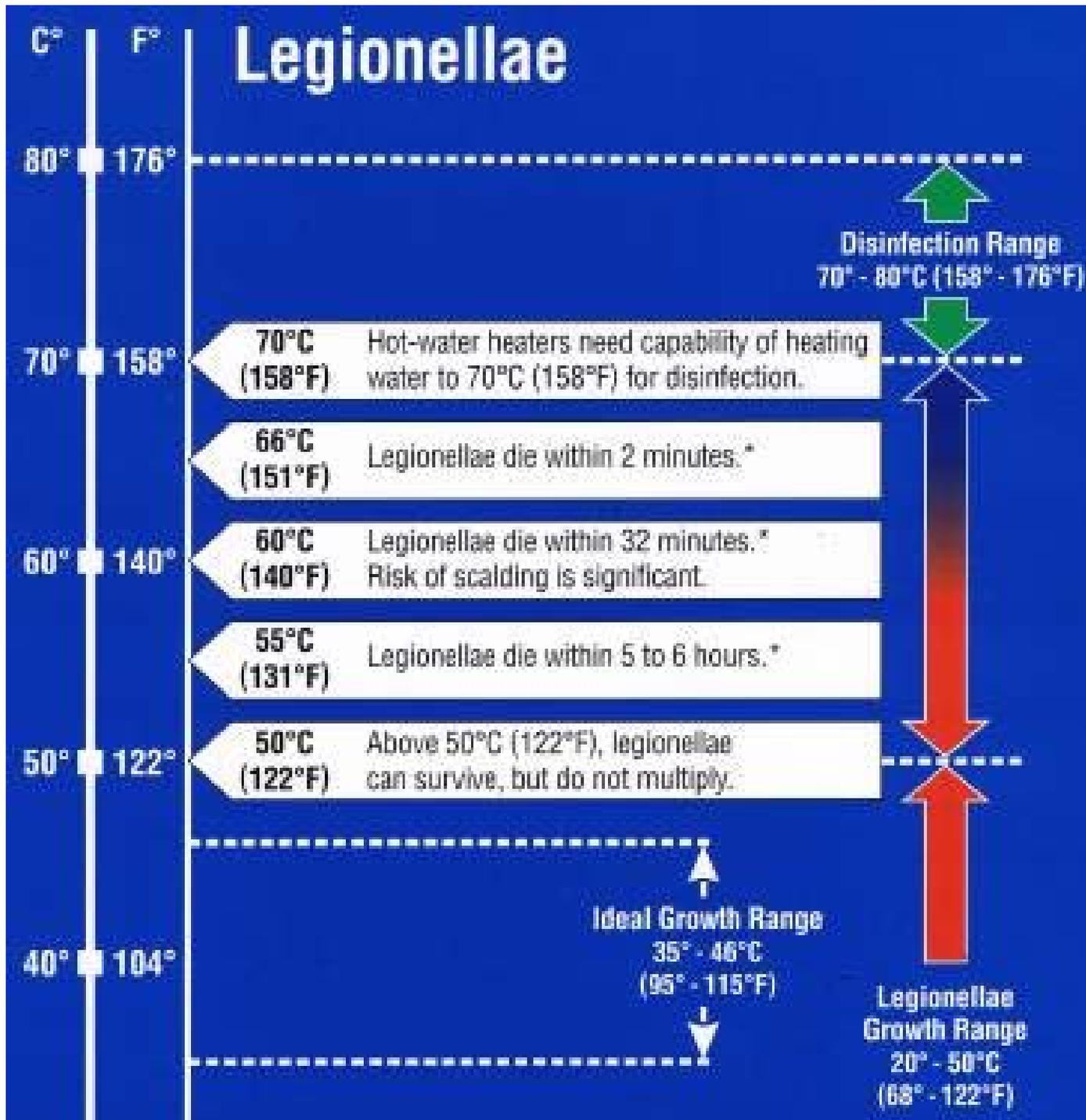
LEGIONELLA OUTBREAK SCENARIO





Legionellosis

- Etiology:
 - Gram-negative aerobic bacilli, majority *Legionella pneumophila* serogroup 1
- Epidemiology:
 - Found naturally in the environment, esp. warm water
 - Risk factor include: older age, smoking, immunocompromised conditions
 - Inhalation of aerosolized water contaminated with *Legionella*, not person-to-person



Title 22: Temperature of hot water must be:

48.9°C (120°F)

40.5°C (105°F)



Case Scenario of Legionella Outbreak

Background

- Dec 2014- ACDC received a Confidential Morbidity Report (CMR) of a single case of Legionella pneumonia (**C1**) from **hospital A** who resides at **SNF X**.
- ACDC Hospital Outreach Unit (HOU) public health nurse (PHN) reviewed medical records received from **SNF X** and **hospital A**.
 - conducted **6 months of retrospective review**
 - on-going **2 month prospective surveillance** for residents with nosocomial pneumonia



Legionella Outbreak – Background (2)

- 13 days later- **2nd resident (C2)** of SNF X was hospitalized with pneumonia at **hospital B** and positive for *Legionella pneumophila* serogroup 1 by urine antigen
- Jan 2015- **3rd case (C3)** was identified by the facility and reported to ACDC during the prospective surveillance period



Case Definition & Case Characterization

Case Definition

- Definite HA case: Patient was at the facility continuously for \geq 10 days before symptom onset and positive legionella test
- Possible HA case: Patient was at the facility for 1-9 nights prior to symptom onset and positive legionella test
- **2 definite HA cases**
 - Residing at **SNF X** for many months before the onset of their illness
- **1 possible HA case**
 - Recent admission from **hospital A** and undergoing dialysis 3x a week at **Hospital A** while she stayed at the facility.



Site Investigation

- Jan 2015- **ACDC conducted a joint site investigation** with Department of Public Health (DPH) Environmental Health (EH) to gather additional information and conduct environmental sampling
 - policies, procedures and logs were obtained from the facility and reviewed by ACDC staff
- Feb 2015- a second site visit was conducted by DPH EH staff to inspect the Heating Ventilation and Air Conditioning (HVAC) units
 - Preliminary findings: no evidence that the HVAC system could be the source of dissemination of contaminated air.



Case Room Review

- ACDC reviewed the room locations for all cases during the duration of their time at the facility
 - double occupancy rooms
- C1- Rm 121A **next to a utility room in which a dead leg in the plumbing system was found and a positive culture was obtained**
- C2- Rm 104B since admission
- C3- Rm 208B for few days, and then moved to 226A during incubation period, ambulatory and most likely used both showers, proximal to the room locations



Control Measures and interim recommendations

- Notify all new and current residents and employees will of the investigation
- Discontinued use of showers to minimize water aerosol exposure to residents pending water and swab test results- sponge baths for residents is allowed
- Recommended routine ice machine cleaning and maintenance. Continue to consume ice and potable water at this time



Control Measures and interim recommendations (2)

- Close water features
- Pending the water and swab test results from the LAC Public Health Laboratory
- Notify the ACDC physician or PHN immediately upon diagnosis of new nosocomial cases at the facility.
 - tested for Legionella (Urine Legionella Antigen, respiratory culture for legionella)



Environmental Sampling & Results

| EH Sample # | ACDC Sample # | Sample Type | Time Collected | Location (Room #) | Description | Result |
|--------------------|----------------------|--------------------|-----------------------|--------------------------|--------------------------|---|
| 1 | 1S | Swab | 10:48am | Kitchen, Ice machine | | <i>Legionella Anisa</i> |
| 2 | 1B | Water | 1055am | Shower 3a, left | Pre-flush, left shower | <i>No Legionella species isolated</i> |
| 3 | 2B | Water | 1104am | Shower 3b, right | Post-flush, right shower | <i>No Legionella species isolated</i> |
| 4 | 2S | Swab | 1048am | Shower 3a, left | Pipe | <i>No Legionella species isolated</i> |
| 5 | 3S | Swab | 1116am | Shower 1A | Pipe | <i>No Legionella species isolated</i> |
| 6 | 3B | Water | 1118am | Shower 1A | Post-flush | <i>Legionella pneumophila serogroup 1, CFU=~250 CFU/L</i> |
| 7 | 4B | Water | 1126am | Room 121 | Sink, cold pre-flush | <i>No Legionella species isolated,</i> |
| 8 | 5B | Water | 1129am | Shower 1B | Pre-flush, not tested | n/a |



Interim Follow-up

- Hire consultant company to implement a permanent water maintenance plan



CONCLUSION

- ACDC completed follow up of active prospective surveillance on Mar 2015
- No additional HA Legionella cases have been reported



MDRO OUTBREAK





***Klebsiella pneumoniae* Characteristics**

- Gram negative bacteria
- Found in normal flora of mouth, skin and intestines
- Cause up to 14% of primary bacteremia due to gram negative sepsis
- 4th leading cause of hospital acquired pneumonia
- Easily accumulates mechanisms of resistance
- Leads to multi- or pan- drug resistance



Mechanisms of Carbapenem Resistance

- Amp C beta lactamases
- ESBL with porin mutation
- Carbapenemases
 - *K. pneumoniae* carbapenemase (KPC)
 - Most common
 - Bla_{kpc} gene on plasmids
 - Verona-integron encoded metallo-beta-lactamase (VIM)
 - New Delhi metallo-beta lactamase (NDM)



- Carbapenems treat severe infections of ESBL gram-negative pathogens
- Resistance to carbapenems evolved in *Enterobacteriaceae*
- CRKP has become the most common species of carbapenem-resistant *Enterobacteriaceae*
- CRKP has rapidly emerged as a new threat in public health esp. as a healthcare associated pathogen
- Los Angeles County has high rates of CRE



CRKP Investigation at SNF

- Call from hospital IP
 - Noted 5 patients from same SNF CRKP culture positive on admission within a 4 week period
 - 4 of these patients were on a vent



Investigation cont.

- Visit made by ACD and HFID
 - Positive patients were located within a few rooms of one unit
 - Some lapses in infection control practices observed
- Isolates from 3 patients available for PFGE
 - Two patients closely related; third patient unrelated
- Recommendations made to SNF and hospital to discuss better communication of MDRO status at patient transfer



Findings

- Poor communication between hospital and SNF
 - Communication is key when transferring patients
 - Patient status important in order to implement appropriate precautions in a timely manner



- Questions for SNFs:
 - Does your facility track CRE positive patients?
 - do you have a background rate or count of these infections?
 - Does your facility have policies/procedures for contact precautions for residents who have MDROs?
 - Do you monitor hand hygiene among healthcare staff?



Resources and References

- APIC Text
- APIC colleagues
- Control of Communicable Disease in Man
- Local public health officer
- LAC Liaison Public Health Nurse
- www.cdc.gov
- <http://www.cdph.ca.gov/programs/hai/Pages/default.aspx>
- www.outbreak-database.com
- <http://www.publichealth.lacounty.gov/acd/index.htm>



Thank you!

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

- Acute Communicable Disease Control – for Infection Control Consultation
 - Phone: (213) 240-7941
 - Business Hours: Monday - Friday 8 AM – 5 PM