Standard of Care for Infection Control in 2018

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Nothing to declare
Disclosures

- AHRQ and CDC are funding unrelated studies
What Does the Title Mean?
What Does the Title Mean?

SOP
STANDARD
OPERATING
PROCEDURE

STANDARD OPERATING PROCEDURES
STANDARD OPERATING POLICIES & PROCEDURES

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Outline

- **Something old**
  - Prevention
  - Investigation and intervention
  - Follow up

- **Something new/borrowed**
  - Sequencing
  - Informatics/Computational approaches
  - Human factors engineering
  - Bioemergency response
SOMETHING OLD: OUTBREAK PREVENTION
Infection Control Hierarchy

Most effective

Least effective

ELIMINATION
ENGINEERED CONTROLS
ADMINISTRATIVE CONTROLS
PERSONAL PROTECTION EQUIPMENT
Elimination: Just Say NO!

- NO WATER WALLS
- NO ARTIFICIAL NAILS
- NO MULTIDOSE VIALS
- NO SLATTED CEILINGS
DON’T SHARE FINGER STICK DEVICES
CLEAN GLUCOMETERS BETWEEN PATIENTS
Administrative Controls

Policy and Procedure Manual

Infection Prevention and Control

SUBJECT/TITLE: TUBERCULOSIS PREVENTION AND CONTROL PLAN (TB Plan)

PURPOSE: The objective of this policy is to prevent the spread of tuberculosis to visitors and healthcare workers and provide a guide for the care of persons suspected or confirmed as having Mycobacterium tuberculosis (TB).

POLICY:

A. Administrative Controls

- Personal protective equipment

- Every person counts

- TB Infection Control in HIV Clinics and Out-Patient Settings: A Team Approach
Travel Health Alert
Have you traveled to/from West Africa in the past 21 days?

- Guinea
- Liberia
- Sierra Leone

Tell the check-in clerk.

Clerk Checklist
- Patient has traveled to one of these countries in the past 21 days:
  - Guinea
  - Liberia
  - Sierra Leone
- Hand patient a mask.
- Place patient in room right away.
- Notify healthcare team patient for Ebola.

Ebola Screening Form

1. Exposure criteria within the past 21 days before the onset of symptoms:
   (patient meets one or more criteria)
   Date
   Notes
   A. Has patient traveled from an area where Ebola transmission is active (Guinea, Liberia, and Sierra Leone)?
   B. Has patient had contact with blood or other body fluids or human remains of a patient known or suspected to have Ebola?
   C. Has patient had any contact with a person known or suspected to have Ebola?

2. Symptom Review (Patient has one or more of the following symptoms)
   A. Fever (>37.7°C, 100°F) or self-reported
   B. Severe headache
   C. Muscle pain
   D. Vomiting
   E. Diarrhea
   F. Abdominal pain
   G. Unexplained hemorrhage

3. Patient meets one or more criteria in section #1
   - Call Iowa Department of Public Health
     1. During business hours call 800-942-2796;
     2. After hours call 515-323-4360 – the Iowa State Patrol will contact the person on call
   - Call Hospital Epidemiology (515-356-1806)

4. Patient meets criteria in both sections #1 and #2
   - Complete Section #3
   - Use isolation precautions
     1. Make sure patient is wearing a surgical mask.
     2. Place patient in single patient room or an airborne infection isolation room if available.
     3. Use the following personal protective equipment: gloves, fluid resistant gown, eye protection (face shield) and respiratory protection (surgical mask).
     4. Double glove if patient vomiting, bleeding or has diarrhea.
     5. If patient is admitted, coordinate patient placement in SNECH Bay 4.
Administrative Controls

PRACTICE, PRACTICE, PRACTICE
Environmental/Engineered Controls
Environmental/Engineered Controls
Environmental/Engineered Controls

COOLING TOWER CHECKLIST
Personal Protective Equipment
PPE for Preventing Transmission

- Consistent use of surgical mask or N95 vs inconsistent use: ↓ SARS acquisition (RR 0.23 [95% CI 0.07-0.78]; P = .02)
  

- Universal gowning & gloving
  - ↓ contamination of HCW’s clothes (aOR 0.3 [95% CI 0.2-0.6])
    
  
  - ↓ MRSA acquisitions compared with standard care (difference, −2.98 acq/1000 person days; 95% CI, −5.58 to −0.38; P = .046).
    
    AD Harris et al. JAMA 2015;310:1571-1580
SOMETHING OLD: OUTBREAK INVESTIGATION & FOLLOW UP
Outbreak: Definition

- Increase in incidence beyond the expected in a defined geographic area, within a defined period of time
- A significant increase ($p < 0.05$) in the rate of certain events above that noted in the past
Implicit Assumptions

- Case definition has not changed
- Methods for diagnosing the disease or identifying the organism have not changed
- Case finding methods have not changed
Pseudoepidemic

- Real clusters of false infections
- False clusters of real infections
**L pneumophila** Pseudo-outbreak

- 13 patients had contaminated BAL cultures
- Immersed uncapped sterile saline syringes in ice
- Ice machine wasn’t maintained by the hospital

Outbreak Investigation Steps

- Confirm the diagnosis
- Collect basic data about the patients & infection
- Create a linelist (spreadsheet) with patient data
- Do case finding
- Create a case definition
- Create an epidemic curve
- Confirm that this is an outbreak
- Implement initial control measures based on current information
Fig. 1 CASES OF GASTROENTERITIS IN PASSENGERS ON CRUISE SHIP A, BY DATE OF ONSET, JUNE 6–14, 1981
Epi Curve: Continuing Common Source

Epidemic Curve, Legionnaires’ Disease Outbreak, Long-Term Care Facility A, Ohio, 2013

Outbreak Investigation Steps

- Develop a hypothesis about reservoir & mode of spread
- Design & conduct:
  - Observational studies
  - Microbiologic, molecular epidemiologic studies
  - Comparative studies
  - Studies to confirm the mode of transmission/biological plausibility
  - Surveys
- Communicate results
- Implement definitive interventions
Demonstrate Biological Plausibility

UIHC’s Engineering Control: HCU Hose Portal
Follow Up

- Continue surveillance
- Assess efficacy of interventions
- Identify lessons learned & incorporate the lessons into:
  - Policies & procedures
  - Practice & processes
  - Education
  - New, safer designs
Continue Surveillance

Look for Clues

- The epidemic curve may suggest the mode of transmission
- Multiple organisms causing infection at a single site or associated with invasive procedures may suggest problems with technique
- An unusual organism may be a clue to a problem (*M. chimaera, A. xylosoxidans*)
Unusual Organism: *A. xylosoxidans*

- Probability that all 9 pts w/ *A. xylosoxidans* bacteremia had PCA pumps by chance alone $P < 0.001$.
- Risk factors for *A. xylosoxidans* bacteremia:
  - PCA pump use for morphine (OR, undef; $P < .001$).
  - PCA pump cartridge with morphine started by nurse C (OR, 46; 95% CI, 4.0–525.0; $P < .001$).
- Nurse C resigned.
- HCWs handling PCA pump cartridges must be observed by a 2nd staff member.
- Pharmacy staff dispose of residual medication.

SOMETHING NEW/BORROWED: SEQUENCING
Sequencing: Confirming the Source

AE Warner, et al.
Am J Infect Control 2015;43:53-58
### Whole Genome Sequencing

<table>
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<th>Indistinguishable</th>
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<th>Possibly related</th>
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</table>

Comparison of PFGE to WGS for typing from outbreak collections 29% of the time, 0 band difference by PFGE = not clonal by WGS.

SOMETHING NEW/BORROWED: INFORMATICS/COMPUTATIONAL APPROACHES
Spread of CR-
*Klebsiella* at NIH

Modeling Spread Across a Network: The Network Structure

Positive CRE lab tests per 10,000 admissions (NHSN 2015) vs. Endemic prevalence and patient transfer network

Courtesy of Rachel Slayton from CDC
Modeling Intervention Effects

SL Barnes et al. Infect Control Hosp Epidemiol 2014;35:1156-1162
Computer Visioning: Observe Practice

SOMETHING NEW/BORROWED: HUMAN FACTORS ENGINEERING
Human Factors: Prevent Faulty Design

Systems Oriented Event Analysis

Fig 1. Patient-centered operational thinking to establish a system concept.

Fig 2. A system hierarchy of scabies outbreak control.

SOMETHING NEW/BORROWED: BIOEMERGENCY RESPONSE
Bioemergency Response
Summary & Conclusions

- Infection prevention & control staff can use the infection control hierarchy to:
  - Identify problems that could lead to outbreaks
  - Interventions that may prevent or terminate outbreaks
- The standard approach to outbreak investigation & follow up remains effective today.
- Infection prevention & control staff can identify new tools for outbreak prevention & investigation by interacting with experts from other fields.
- Be prepared for emerging & re-emerging infections