Infection Surveillance in Skilled Nursing Facilities
Objectives

• Discuss basic principles of epidemiology and how they apply to healthcare-associated infection (HAI) surveillance

• Review recommended surveillance practices

• Describe surveillance outcome and process measures for infection prevention

• Review surveillance definitions (McGeer Criteria)
Surveillance

The purpose of surveillance is to identify infections and to monitor adherence to recommended IPC practices in order to reduce infections and prevent the spread of pathogens among residents, staff, and visitors.

_CDC LTCF IP Training Course_ (courses.cdc.train.org/Module4_InfectionSurveillance_LTC/module_4_infection_surveillance_less on_1_9_purpose_of_surveillance.html)
Epidemiology

- Definition: Study of disease in populations
  Clinical care: focus on the individual
  vs
  Epidemiology: focus on the group

- Healthcare epidemiology answers questions such as:
  - What factors contribute to increased infection rates?
  - What populations are at higher risk for developing HAI?
  - How have HAI changed over time?

- Assessment of trends over time
Epidemiology of Infection Prevention

• Goal is HAI prevention
• Professional societies
  • Association for Professionals in Infection Control and Epidemiology (APIC)
  • Society for Healthcare Epidemiology of America (SHEA)
  • Infectious Diseases Society of America (IDSA)
• Epidemiology and surveillance underlay HAI prevention
  • Use data for action!
Epidemiologic Surveillance

• The ongoing, systematic collection, recording, analysis, interpretation, and dissemination of data

• Reflects rate of disease onset or current disease status of a community or population (e.g., SNF)

• Aims to identify risk factors for disease

• Used for public health action to reduce illness and death
Surveillance

A surveillance system is an information loop that starts and ends with communication and action.

Flow of Surveillance Data
Key Tenets of HAI Surveillance

- A written surveillance plan
  - Discussed in Communications Module
  - Based on the facility annual risk assessment
  - What HAI am I tracking? Why?
  - How will data be used?
  - Where are opportunities to prevent HAI in my facility?
- The intensity of surveillance efforts need to be maintained over time
- Stay consistent over time; always apply same surveillance definitions
Recommended Practices for Surveillance

1. Assess the population
2. Select the outcome or process for surveillance
   • Comply with State and Federal requirements
3. Use surveillance definitions (McGeer criteria in LTC)
4. Collect surveillance data
5. Calculate and analyze infection rates
6. Apply risk stratification methods
7. Report and use surveillance information

Examples of Process Measures

• CAUTI prevention: percent urinary catheters with appropriate indication
• CLABSI prevention: percent adherence to central line maintenance practices
• CDI prevention: thoroughness of environmental cleaning
• HAI prevention: percent adherence to hand hygiene
Examples of Outcome Measures

- Central line associated bloodstream infection (CLABSI) rate
- Urinary Tract Infection (UTI) rate
- Catheter associated UTI (CAUTI) rate
- *C. difficile* infection rate
Measuring Infections

**Incidence**
- Number of persons in a population who develop a disease or condition within a specified period of time
- Measure of NEW infections

**Prevalence**
- Proportion of persons in a population who have a disease or condition at a given point in time
- Measure of infections that are present
Incidence

Incidence measures the frequency of disease onset (i.e., rate). Answers: ‘What is the risk of X occurring?’

Incidence = (number of new cases) during a specified time period
(size of a specific population)

Example:

\[
\frac{5 \text{ scabies infections}}{180 \text{ residents}} = 0.027 \times 100 = 2.7 \text{ new infections per 100 residents in the facility during January 2020}
\]
Prevalence

Prevalence measures disease status in a population at a particular time. Answers: ‘How common is X?’

Prevalence = (# of existing cases) during a specified time period
(size of a specific population)

Example:

\[
\frac{2 \text{ residents colonized with MRSA}}{10 \text{ residents admitted Mar 31, 2019}} \times 100 = 20\% 
\]
Incidence Density Rate

Incidence density accounts for variation in the time each person is at risk for the event.

Incidence density rate =

\[
\frac{\text{(# of new cases)}}{\text{(person-time at risk)}} \text{ during a specified time period}
\]

Example:

\[
\frac{5 \text{ UTI}}{1050 \text{ of resident days}} = 0.00476 \times 1000 = 4.76 \text{ UTI per 100 resident days in June 2020}
\]
Clinical vs Surveillance Definitions

• Clinical
  • Patient centered
  • Used for therapeutic decisions

• Surveillance
  • Population based
  • Applied exactly the same way each time
HAI Surveillance Definitions

• Case definition (surveillance definition)
  • Clinical and laboratory characteristics that a patient must have to be counted as an event or case for tracking purposes
  • Time, place, & person (e.g., age, sex)
Laboratory-based surveillance

A surveillance method in which the reports of cases come from clinical laboratory data only (forgoing case review/symptoms)
Applying Surveillance Definitions

• Always refer to written definitions to ensure accuracy of applying case definitions
  • Use standardized, published, validated definitions where available (McGeer)
• For accurate and valid comparisons, use the same definitions
  • If definitions change, the comparability of rates over time will be compromised
Collect Surveillance Data

- Include IP, staff, and others with responsibility or interest
- Limit collection to only what is needed
- Be involved in efforts when creating or revising the electronic health records to enable HAI data collection
Numerator Data

• Numerator = number of instances of the “event” being measured
• Includes:
  • HAI identified through **active** surveillance: CLABSI, CAUTI
  • HAIs identified by **laboratory** finding alone: CDI
  • Care **practices, processes,** observations: hand hygiene, gown and glove use compliance
• Record point in time or time period

\[
\begin{align*}
\text{Numerator} & \quad \Rightarrow 2 \text{ CAUTI} \\
& \quad \quad 180 \text{ catheter days} \\
& \quad \Rightarrow 5 \text{ CDI} \\
& \quad \quad 900 \text{ resident days} \\
& \quad \Rightarrow 25 \text{ hand hygiene successful} \\
& \quad \quad 50 \text{ hand hygiene observations}
\end{align*}
\]
Denominator Data

- Denominator = number of residents or procedures being followed, the population size, or person-time at risk (resident or line days)
- Includes: procedures, observations, number of employees or number of resident days

- 20 employees received flu shot
- 30 employees
- 2 UTI
- 1500 resident days
- 25 hand hygiene successful
- 50 hand hygiene observations
Report and Use Surveillance Data

“The demonstrable power of surveillance is in sharing findings with those who need to know and who can act on the findings to improve patient safety.”


- Plan for distribution of findings
- Report to health care providers most able to impact patient care
- Report in a manner to stimulate improvement
- Use visual displays of data (e.g., charts, graphs, tables)
Sample Bar Chart

Contact Precaution Adherence 2020

% Adherence

Jun-20 | Jul-20 | Aug-20 | Sep-20

Unit A | Unit B | Unit C

0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90

Heathcare-Associated Infections Program
Sample CDI Chart

2018 CDI Present on Admission and LTC Onset

Educated staff on Contact Precautions and environmental cleaning

CDI Facility Onset

CDI Present on Admission

Jan-18  Feb-18  Mar-18

Number CDI Cases
Sample Line Graph

2018 Adherence to Contact Precautions

% Adherence

Jan-18  Feb-18  Mar-18

Unit A  Unit B  Unit C
Standardized Infection Surveillance Definitions for SNF

Survveillance Definitions of Infections in Long-Term Care Facilities: Revisiting the McGeer Criteria

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(See the commentary by Moro, on pages 978–980.)

Infection surveillance definitions for long-term care facilities (ie, the McGeer Criteria) have not been updated since 1991. An expert consensus panel modified these definitions on the basis of a structured review of the literature. Significant changes were made to the criteria defining urinary tract and respiratory tract infections. New definitions were added for norovirus gastroenteritis and Clostridium difficile infections.

Infect Control Hosp Epidemiol 2012;33(10):965-977
LTC Constitutional Criteria Used in Definitions

Constitutional findings used as part of infection surveillance definitions

- Fever
- Leukocytosis
- Acute change in mental status from baseline
- Acute functional decline
Constitutional Criteria - Fever

A. Fever

- Single oral temperature >37.8°C (>100.0°F)

  OR

- Repeated oral temperatures >37.2°C (99°F)
  or rectal temperatures >37.5°C (99.5°F)

  OR

- Single temperature >1.1°C (2°F) over baseline from any site (oral, tympanic, axillary)
Constitutional Criteria - Leukocytosis

B. Leukocytosis

- Neutrophilia (>14,000 leukocytes/mm³)
  (New 1/1/21: NHSN UTI definition neutrophilia >10,000 leukocytes/mm³)

  OR

- Left shift (>6% bands or >1,500 bands/mm³)
Constitutional Criteria – Acute Change in Mental Status From Baseline

C. All criteria must be present

- Acute onset
- Fluctuating course – behavior coming or going or changing in severity during assessment
- Inattention – unable to keep track of discussion or easily distracted

AND EITHER

- Disorganized thinking – rambling conversation, unclear flow of ideas, unpredictably switches subject
- Altered level of consciousness – different from baseline, hyperalert, sleepy, drowsy, difficult to arouse, non-responsive
Constitutional Criteria – Acute Functional Decline

D. Acute functional decline

- A new **3-point increase** in total activities of daily living (ADL) score (range, 0-28) from baseline based on the following ADL items scored from 0 (independent) to 4 (total dependence):
  - Bed mobility
  - Transfer
  - Locomotion within LTC facility
  - Dressing
  - Toilet use
  - Personal hygiene
  - Eating
Respiratory Infections Surveillance Definitions

- Four respiratory infection definitions with varying criteria
  1. Common cold symptoms/pharyngitis
  2. Influenza-like illness
  3. Pneumonia
  4. Lower respiratory tract (bronchitis or tracheobronchitis)
Common Cold or Pharyngitis Surveillance
Definition

At least 2 criteria must be present

- Runny nose or sneezing
- Stuffy nose
- Sore throat, hoarseness, or difficulty swallowing
- Dry cough
- Swollen or tender glands in the neck
Influenza-like Illness Surveillance Definition

Both Criteria 1 and 2 must be present

1. Fever (refer to constitutional criteria)

2. At least 3 of the following influenza-like illness sub-criteria

- Chills
- New headache or eye pain
- Myalgias or body aches
- Malaise or loss of appetite
- Sore throat
- New or increased dry cough
Pneumonia Surveillance Definition

All 3 criteria must be present

1. Interpretation of a chest radiograph as demonstrating pneumonia or the presence of a new infiltrate

2. At least 1 of the following respiratory subcriteria
   - New or increased cough
   - New or increased sputum production
   - $O_2$ saturation <94% on room air or a reduction in $O_2$ saturation of >3% from baseline
   - New or changed lung examination abnormalities
   - Pleuritic chest pain
   - Respiratory rate of >25 breaths/minute

3. At least 1 of the constitutional criteria
Lower Respiratory Tract Infection Surveillance

Definition

Bronchitis or tracheobronchitis
All 3 criteria must be present

1. Chest radiograph either not performed, or negative for pneumonia or new infiltrate
2. At least 2 of the respiratory subcriteria listed in previous slide
3. At least 1 of the constitutional criteria
NHSN: Symptomatic UTI (SUTI)

In resident without a Urinary Catheter or removed > 2 calendar days prior to event, where day of catheter removal is equal to day one

Must meet criteria 1, or 2 or 3

- **Criteria -1**
  - **Either** of the following:
    - Acute dysuria
    - Pain, swelling, or tenderness of testes, epididymis, or prostate

- **Criteria -2**
  - **Either** of the following:
    - Fever
    - Leukocytosis
  
  - **AND**
  
  - **ONE** or more of the following:
    - Costovertebral angle pain or tenderness
    - Suprapubic pain
    - Gross hematuria
    - New or increased incontinence
    - New or increased urgency
    - New or marked increased frequency

- **Criteria -3**
  - **Two or more** of the following:
    - Costovertebral angle pain or tenderness
    - Suprapubic tenderness
    - Gross hematuria
    - New or increased incontinence
    - New or increased urgency
    - New or marked increased frequency

- Positive urine culture, with no more than 2 species of organisms, at least one is a bacterium of $\geq 10^5$CFU/ml

  (Yeast, and other organisms, which are not bacteria, are not acceptable UTI pathogens)
NHSN: Catheter Associated Symptomatic UTI (CA-SUTI)

In resident With an indwelling Urinary Catheter in place or removed within 2 calendar days prior to event onset, where day of catheter removal is equal to day 1

One or more of the following:

- Fever
- Rigors
- New hypotension, with no alternate noninfectious cause
- New confusion/functional decline w/no alternate diagnosis AND leukocytosis
- New onset costovertebral angle pain or tenderness
- New or marked increase in suprapubic tenderness
- Acute pain, swelling or tenderness of testes, epididymis or prostate
- Purulent discharge from around catheter

AND

- A positive urine culture, with no more than 2 species of organisms, at least one is a bacterium of >10^5 CFU/ml
  (Yeast, and other organisms, which are not bacteria, are not acceptable UTI pathogens)
HEALTHCARE-ASSOCIATED INFECTIONS PROGRAM

NHSN: Asymptomatic Bacteremic UTI (ABUTI)

With or without a urinary catheter and no qualifying fever or signs or symptoms of UTI

- Resident has no qualifying fever or localizing urinary signs or symptoms (specifically no urgency, frequency, acute dysuria, suprapubic tenderness, or costovertebral angle pain or tenderness.) *If no catheter is in place, fever as only sign would not exclude ABUTI if other positive criteria are met.*

**AND**

- A positive urine culture, with no more than 2 species of organisms, at least one is a bacterium of $\geq 10^5$CFU/ml
  (Yeast, and other organisms, which are not bacteria, are not acceptable UTI pathogens)

**AND**

- A positive blood culture with at least 1 matching organism in urine culture
Norovirus Gastroenteritis

Both criteria 1 and 2 must be present

1. **At least one** of the following subcriteria
   - Diarrhea: 3 or more liquid or watery stool above what is normal for the resident in 24 hours
   - Vomiting: 2 or more episodes in 24 hours

2. Positive stool specimen detected by electron microscopy, enzyme immunoassay, or polymerase chain reaction (PCR)
**Clostridium difficile Infection**

Both criteria **1 and 2** must be present

1. **One** of the following GI subcriteria
   - Diarrhea: 3 or more liquid or watery stool above what is normal for the resident in 24 hours
   - Presence of toxic megacolon

2. **One** of the following diagnostic subcriteria
   - Stool positive for *C. difficile* toxin A or B, by culture, or PCR
   - Pseudomembranous colitis identified during endoscopy or surgery or in histopathologic examination of biopsy
Other Gastroenteritis

At least 1 of the following criteria must be present in resident with symptoms NOT from another cause (medication, tube feeding)

1. Diarrhea- 3 or more liquid, watery stool above what is normal for resident in 24 hours

2. Vomiting: 2 or more episodes in 24 hours

3. Both of the following signs and symptoms subcriteria
   - A stool specimen positive for a pathogen (such as *Salmonella*, *Shigella*, *E. coli* 0157:H7, *Campylobacter* spp, rotavirus)
   - At least 1 of the following gastrointestinal (GI) subcriteria
     - Nausea
     - Vomiting
     - Abdominal pain or tenderness
     - Diarrhea
Scabies

Must meet both criteria 1 and 2

1. A maculopapular and/or itching rash
2. At least 1 of the following scabies subcriteria
   - Physician diagnosis
   - Lab confirmation (scraping or biopsy)
   - Epidemiologic linkage to a case of scabies with lab confirmation
Skin, Soft Tissues, and Mucosal Infection

See McGeer criteria for surveillance definitions

- Cellulitis
- Fungal oral or perioral infections
- Herpesvirus skin infections
  - Cold sores
  - Shingles
- Conjunctivitis
  - “Pink eye”
Sample Surveillance Log

<table>
<thead>
<tr>
<th>Patient Name</th>
<th>Culture Date</th>
<th>Site</th>
<th>ORGANISM CULTURED</th>
<th>ABX start</th>
<th>ABX stop</th>
<th>HAI Y/N</th>
<th>TYPE ISOLATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admit Date:</td>
<td>MRN:</td>
<td></td>
<td></td>
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<tr>
<td>Prev. Hosp:</td>
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<td>DOB:</td>
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<tr>
<td>Dialysis:</td>
<td>Vent:</td>
<td>Trach:</td>
<td>Wounds:</td>
<td></td>
<td></td>
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<td>CL date:</td>
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<td>FC date:</td>
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<td>reason:</td>
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<tr>
<td>Co-morbidities:</td>
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</tr>
</tbody>
</table>
## NHSN UTI Data Collection Tool

### Event Details

*Specify Criteria Used: (check all that apply)*

<table>
<thead>
<tr>
<th>Signs &amp; Symptoms</th>
<th>Laboratory &amp; Diagnostic Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever: Single temperature $\geq 37.8^\circ \text{C} (&gt;100^\circ \text{F})$, or $&gt; 37.2^\circ \text{C} (&gt;99^\circ \text{F})$ on repeated occasions, or an increase of $&gt; 1.1^\circ \text{C} (&gt;2^\circ \text{F})$ over baseline</td>
<td>Positive urine culture with no more than 2 species of microorganisms, at least one of which is a bacterium of $\geq 10^8 \text{ CFU/ml}$</td>
</tr>
<tr>
<td>Rigors</td>
<td>New onset hypotension</td>
</tr>
<tr>
<td>New onset confusion/functional decline</td>
<td></td>
</tr>
<tr>
<td>Acute pain, swelling, or tenderness of the testes, epididymis, or prostate</td>
<td></td>
</tr>
<tr>
<td>Acute dysuria</td>
<td>Purulent drainage at catheter insertion site</td>
</tr>
</tbody>
</table>

**New and/or marked increase in (check all that apply):**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Urgency</td>
<td>Costovertebral angle pain or tenderness</td>
</tr>
<tr>
<td>Frequency</td>
<td>Suprapubic tenderness</td>
</tr>
<tr>
<td>Incontinence</td>
<td>Visible (gross) hematuria</td>
</tr>
<tr>
<td></td>
<td>Leukocytosis ($&gt; 14,000 \text{ cells/mm}^3$), or Left shift ($&gt; 6%$ or $1,500 \text{ bands/mm}^3$)</td>
</tr>
<tr>
<td></td>
<td>Positive blood culture with 1 matching organism in urine culture</td>
</tr>
</tbody>
</table>
# Sample Resident HAI Worksheet

**Revised McGeer Criteria for Infection Surveillance Checklist**

<table>
<thead>
<tr>
<th>Patient Name:</th>
<th>MRN:</th>
<th>Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Infection:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date of Review:</td>
<td></td>
<td></td>
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<tr>
<td>Reviewed by:</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>UTI: □ evaluated □ criteria met</th>
<th>RTI: □ evaluated □ criteria met</th>
<th>SSTI: □ evaluated □ criteria met</th>
<th>GITI: □ evaluated □ criteria met</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

### Table 1. Constitutional Criteria for Infection

<table>
<thead>
<tr>
<th>Fever</th>
<th>Leukocytosis</th>
<th>Acute Mental Status Change</th>
<th>Acute Functional Decline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single oral temp &gt;37.8 °C (100 °F), OR</td>
<td>&gt;14,000 WBC / mm³, OR &gt;6% band, OR ≥1,500 bands / mm³</td>
<td>Acute onset, AND Fluctuating course, AND Inattention, AND Either disorganized thinking, OR altered level of consciousness</td>
<td>3-point increase in baseline ADL score according to the following items: 1. Bed mobility 2. Transfer 3. Locomotion within LTCF 4. Dressing 5. Toilet use 6. Personal hygiene 7. Eating [Each scored from 0 (independent) to 4 (total dependence)]</td>
</tr>
<tr>
<td>Repeated oral temp &gt;37.2 °C (99 °F), OR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeated rectal temp &gt;37.5 °C (99.5 °F), OR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single temp &gt;1.1 °C (2 °F) from baseline from any site</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 2. Urinary Tract Infection (UTI) Surveillance Definitions

**UTI without indwelling catheter**

- Must fulfill both 1 AND 2.
  - 1. At least one of the following sign or symptom
    - Acute dysuria or pain, swelling, or tenderness of testes, epididymis, or prostate
    - Fever or leukocytosis, and ≥ 1 of the following:
      - Acute costovertebral angle pain or tenderness
      - Suprapubic pain
      - Gross hematuria
    - New or marked increase in incontinence
    - New or marked increase in urgency
    - New or marked increase in frequency
    - If no fever or leukocytosis, then ≥ 2 of the following:
      - Suprapubic pain
      - Gross hematuria

**Selected Comments**

The following 2 comments apply to both UTI with or without catheter:

- UTI can be diagnosed without localizing symptoms if a blood isolate is the same as the organism isolated from urine and there is no alternate site of infection.
- In the absence of a clear alternate source of infection, fever or rigor, with a positive urine culture result in the non-catheterized resident or acute confusion in the catheterized resident will often be treated as UTI. However, evidence suggests that most of these episodes are likely not due to infection of a urinary source.
Summary

• The IP must understand the basic principles of epidemiology and apply them to HAI surveillance

• Accurate and consistent data collection, recording, analysis, interpretation, and communication of findings is an essential part of the infection prevention and surveillance plan

• Surveillance of process measures helps focus prevention activities to improve adherence to care practices that prevent infections

• Consistent application of standard surveillance definitions will ensure accurate comparison over time
Infection Prevention Guide to Long-Term Care

Available at the APIC Website Store
(rise.apic.org/web/ItemDetail?iProductCode=SLS6008&Category=BOOKS)
References


Questions?

For more information, please contact

HAIProgram@cdph.ca.gov

Include “SNF IP Training Class” in the subject line

Post Test

Now that you have completed this module,
Click on the “Post Test” link when it pops up
To Return to Learning Stream and take the post test

If the Post Test link does not pop up, you will be sent a link via e-mail