Point Prevalence Survey of Healthcare Associated Infection (HAI) and Antimicrobial use (AU) in US nursing homes: Urinary Tract Infections (UTI)

Data from Centers for Disease Control and Prevention (CDC) & the Emerging Infections Program (EIP)

July 10, 2019
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Division of Healthcare Quality Promotion, CDC
Primary objectives: CDC 2017 NH prevalence survey

- Measure number/proportion of HAIs and HAI types in nursing homes
  - Using revised McGeer criteria for residents in LTC\(^1\)

- Identify number/proportion and types of antimicrobial drugs used in nursing home residents

Stone at al. ICHE 2012
Surveillance 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

When McGeer and colleagues proposed the first set of infection surveillance definitions specifically for use by long-term care facilities, they described three levels of patient care: (1) supervision and care for impaired cognition, (2) assistance with activities of daily living (ADLs), or (3) skilled nursing
Prevalence survey: Infection types included

- **Urinary tract**
  - Symptomatic UTI (SUTI)
  - Cather-associated SUTI (with indwelling urinary catheter)

- **Respiratory tract**
  - Pneumonia
  - Lower RTI
  - Cold/pharyngitis

- **Gastrointestinal**
  - Gastroenteritis
  - CDI
  - Norovirus

- **Skin, Soft tissue**
  - Cellulitis, soft tissue and wound
  - Fungal skin infection
  - Herpes simplex or zoster
  - Scabies

- **Mucosal**
  - Ear
  - Eye (conjunctivitis)
  - Oral candidiasis

- **Systemic**
  - Bloodstream infection
  - Sepsis
Symptomatic Urinary Tract Infection (SUTI): Without Indwelling Catheter

- No indwelling urinary catheter present at first UTI sign/symptom onset

- **And** positive urine culture
  
  A. Indwelling urinary catheter specimen with at least $10^5$ CFU/ml of *any number of microorganisms* or

  B. Voided urine culture specimen with at least $10^5$ CFU/ml of *no more than 2 species of microorganisms* or

  C. Straight (in/out) catheter specimen with at least $10^2$ CFU/ml of *any number of microorganisms*

**And** criteria 1, 2 or 3 met

Criteria 1

- Either of the following:
  - Acute dysuria
  - Acute pain, swelling, or tenderness of testes, epididymis or prostate

Criteria 2

- Either of the following:
  - Fever
  - Leukocytosis
  - **AND** $\geq 1$ from Urinary Sign list (below):
    - Acute costovertebral angle pain/tenderness
    - Suprapubic pain/tenderness
    - Gross hematuria
    - New/marked increase incontinence
    - New/marked increase urgency
    - New/marked increase frequency

Criteria 3

- Absent Fever and Leukocytosis:
  - Fever
  - Leukocytosis
  - **AND** $\geq 2$ from Urinary Sign list:
Cather-associated Symptomatic Urinary Tract Infection (CA-SUTI): With Indwelling Urinary Catheter

- Indwelling urinary catheter present at first UTI sign/symptom onset
- And positive urine culture
  - Indwelling urinary catheter specimen with at least $10^5$ CFU/ml of *any number of microorganisms* or
  - Voided urine culture specimen with at least $10^5$ CFU/ml of *no more than 2 species of microorganisms* or
  - Straight (in/out) catheter specimen with at least $10^2$ CFU/ml of *any number of microorganisms*

And ≥1 of the following:
- Fever
- Rigors
- New onset hypotension
- *Acute change in mental status* or acute functional decline AND Leukocytosis
- New/marked increase in suprapublic pain
- Costovertebral angle pain or tenderness
- Acute pain, swelling or tenderness of the testes, epididymis or prostate
- Purulent (pus) discharge from around the catheter
Prevalence survey: Definition for NH-onset infection

- In addition to meeting one of the infection definitions

- For HAI to be a NH-onset infection
  - Infection **not** present at the time of NH admission
  - Onset on/after day 3 of NH admission
    - Where day of admission is day 1
NH prevalence survey: Percentage by HAI type

- Resp. tract, 28.8
- Urinary tract, 19.9
- Gastrointestinal, 8.4
- Musocil: Ear, eye, nose, mouth, 7.0
- Systemic, 3.2
- Skin, soft tissue, 32.6
NH prevalence survey: Percentage by HAI type

- Musocals: Ear, eye, nose, mouth, 7.0%
- Systemic, 3.2%
- Gastrointestinal, 8.4%
- Skin, soft tissue, 32.6%
- Urinary tract, 19.9%
- Resp. tract, 28.8%
UTI leading HAI type in LTCF in Europe

Figure 23. Distribution of types of HAI in the included LTCFs, HALT-2, 2013

www.ecdc.europa.eu
UTI most common HAI type Dept. of VA community living centers, 2007s

<table>
<thead>
<tr>
<th>NHAI</th>
<th>Number of NHAI</th>
<th>Percentage of all NHAI</th>
<th>Point prevalence, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptomatic UTI</td>
<td>179</td>
<td>29.2</td>
<td>1.64</td>
</tr>
<tr>
<td>Skin</td>
<td>79</td>
<td>12.9</td>
<td>0.72</td>
</tr>
<tr>
<td>Asymptomatic bacteriuria</td>
<td>64</td>
<td>10.4</td>
<td>0.58</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>49</td>
<td>8.0</td>
<td>0.45</td>
</tr>
<tr>
<td>Soft tissue</td>
<td>33</td>
<td>5.4</td>
<td>0.30</td>
</tr>
<tr>
<td>Decubitus ulcer</td>
<td>28</td>
<td>4.6</td>
<td>0.26</td>
</tr>
<tr>
<td>Gastrointestinal tract</td>
<td>26</td>
<td>4.2</td>
<td>0.24</td>
</tr>
<tr>
<td>Osteomyelitis</td>
<td>24</td>
<td>3.9</td>
<td>0.22</td>
</tr>
</tbody>
</table>

Tsan et al. AJIC 2010
NH prevalence survey: Urinary Tract Infections

- UTI prevalence rate of 0.48 per 100 residents
  - 80% were Symptomatic UTI
  - 20% Catheter associated - Symptomatic UTI

- Includes ONLY the UTIs that met the revised McGeer surveillance definitions
  - Positive urine culture + localizing urinary symptoms
    - Meeting criteria outlined on slides 5 + 6

- Excludes
  - Positive urine culture without localizing urinary symptoms
  - Localizing urinary symptoms without positive urine culture
  - Physician diagnosed UTI*
  - Resident prescribed an antibiotic for UTI*

*Unless, a UTI surveillance definition was also met
Measures of frequency: Incidence and Prevalence

Incidence: Incidence Rate
New cases in a population under observation over a given time period

Measure of risk of acquiring disease/infection
Example: Number of UTIs per 100,000 resident-days during 2019

Prevalence: Prevalence Rate
Existing cases in a population under observation at a given point in time

Measure of how widespread disease/infections is
Example: Number of UTIs per 100 residents on July 9, 2019
NHSN LTCF Component: UTI event data
Incidence rates – a measure of risk

<table>
<thead>
<tr>
<th>All urinary tract infections†</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NHs reporting</td>
<td>Event count</td>
<td>Resident days</td>
<td>Overall pooled crude rate</td>
</tr>
<tr>
<td>112</td>
<td>2,013</td>
<td>3,429,240</td>
<td>0.59</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Noncatheter, symptomatic urinary tract infections†</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NHs reporting</td>
<td>Event count</td>
<td>Non-catheter resident days</td>
<td>Overall pooled crude rate</td>
</tr>
<tr>
<td>110</td>
<td>1,593</td>
<td>3,258,717</td>
<td>0.49</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Catheter-associated symptomatic urinary tract infections§</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NHs reporting</td>
<td>Event count</td>
<td>Urinary catheter days</td>
<td>Overall pooled crude rate</td>
</tr>
<tr>
<td>109</td>
<td>407</td>
<td>170,523</td>
<td>2.39</td>
</tr>
</tbody>
</table>

UTI rates per 1,000 resident days; CA-SUTI rate per 1,000 urinary catheter days
Palms et al. AJIC 2018
NH prevalence survey:
Selected characteristics of residents with and without UTI*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>UTI</th>
<th>No UTI</th>
<th>Percent difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>48%</td>
<td>32%</td>
<td>+16%</td>
</tr>
<tr>
<td>Short-Stay: post acute care/skilled nursing</td>
<td>34%</td>
<td>19%</td>
<td>+15%</td>
</tr>
<tr>
<td>Any urinary catheter</td>
<td>18%</td>
<td>7%</td>
<td>+11%</td>
</tr>
<tr>
<td>Receiving wound care</td>
<td>29%</td>
<td>19%</td>
<td>+10%</td>
</tr>
<tr>
<td>&lt; 65 years of age</td>
<td>22%</td>
<td>17%</td>
<td>+5%</td>
</tr>
<tr>
<td>Pressure ulcer</td>
<td>7%</td>
<td>12%</td>
<td>+5%</td>
</tr>
<tr>
<td>Female</td>
<td>66%</td>
<td>62%</td>
<td>+4%</td>
</tr>
<tr>
<td>Receiving dialysis</td>
<td>5%</td>
<td>3%</td>
<td>+3%</td>
</tr>
<tr>
<td>Wheelchair bound or bed ridden</td>
<td>52%</td>
<td>54%</td>
<td>-2%</td>
</tr>
</tbody>
</table>

*UTIs that meet revised McGeer definition; ^Chi-square test
NH prevalence survey: Use of urinary devices

- 5% of residents had indwelling urinary catheter
- 2% of residents had “other” urinary catheter
  - Suprapubic catheters, condom catheters, urostomy or nephrostomy tubes
- 93% had no urinary devices
NH prevalence survey: NH variation in use of urinary catheters

Summary Statistics
No. Nursing Homes 161
25th Percentile 0.048
Median 0.067
75th Percentile 0.092

Any urinary device = Indwelling urinary catheter, Suprapubic catheters, condom catheters, urostomy or nephrostomy tubes
Variation in indwelling urinary catheter use: Prevalence survey in European LTCF, 2013

Dept. of VA Prevalence survey: 
Use of indwelling urinary catheter

<table>
<thead>
<tr>
<th>Year</th>
<th>Facilities, residents</th>
<th>% residents with Indwelling urinary catheter</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA, 2005 (Tsan, AJIC 2008)</td>
<td>133 CLC, 11,475 res</td>
<td>10.7</td>
</tr>
<tr>
<td>VA, 2007 (Tsan, AJIC 2010)</td>
<td>133 CLC, 10,939 res</td>
<td>11.0</td>
</tr>
</tbody>
</table>

- Dept. of VA prevalence surveys documented association between device use and HAI prevalence in LTC setting
Antibiotic for UTI ≠ UTI Surveillance Event

- NHSN LTCF Component* provides criteria to identify UTI Events for surveillance purposes

- Clinical guidelines are used to guide decisions on when to initiate antibiotics for suspected UTI, one example
  - Loeb Minimum Criteria for Initiation of Antibiotics
    - Undergoing an update

- They are different!
  - Because they not used for the same purpose

*Based on revised McGeer
Summary

- UTI among the most common type of HAIs in nursing homes
  - On a given day, ~1 in 200 NH residents with NH-onset UTI (revised McGeer)

- In prevalence surveys, SUTI are more common than CA-SUTI
  - Prevalence is a different measure to UTI Incidence, as used in NHSN

- Use of surveillance definitions are essential to ensure
  - The same thing (UTI) is being counted
  - To enable meaningful comparison with others
  - To correctly interpret changes over time

- Prevalence survey data aide our understating of how UTI criterion are used, and identify factors associated with UTI
  - Inform UTI prevention efforts
  - Inform NHSN surveillance
Acknowledgements:

- All 161 participating NHs
- All EIP site staff

Thank you!

CDC Project lead: Dr. Nicola Thompson  ndthompson@cdc.gov

For more information, contact CDC
1-800-CDC-INFO (232-4636)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.