Healthcare-Associated Infections in U.S. Nursing Homes:
Results from a Prevalence Survey Pilot

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Healthcare-Associated Infections in Nursing Homes

❑ **HHS National Action Plan to Prevent Healthcare-Associated Infections (HAIs) in Long-Term Care Facilities (LTCFs) – 2013**

  ▪ National priority to reduce HAIs in nursing homes (NHs)

❑ **However, the national burden of HAIs in US NHs is not well defined**

❑ **Available prevalence estimates[1]**

  ▪ Based on decades old data

  ▪ Using studies with small numbers of facilities

  ▪ Large variation in methods and HAI definitions used

  ▪ Wide range, from 2.4% to 18.4%

1. Strausbaugh, L. J., & Joseph, C. L. (2000). The Burden of Infection in Long-Term Care. *Infection Control & Hospital Epidemiology, 21*(10), 674-679.

Infection Surveillance in Nursing Homes

❑ **Barriers to performing infection surveillance**
- Lack of detailed medical record documentation
- No established surveillance methods
- Limited surveillance experience

❑ **Prevalence survey (PS) approach well suited to NHs**
- Time-limited, less resource intense
- Recently effectively implemented in acute care[1]

❑ **Previous 1-day PS conducted**
- Veterans Affairs nursing homes (2005, 2007, 2009)
  - Decrease in prevalence 5.6% to 4.2%
- European CDC (ECDC) project in long-term care facilities (2009, 2013)
  - Prevalence 5.0%

1. Magill SS, Edwards JR, Bamberg W, et al. Multistate point-prevalence survey of health care-associated infections. N Engl J Med 2014;370:1198-1208

Objectives

- **Pilot PS methods in US NHs**
  - CDCs Emerging Infections Program (EIP) surveillance infrastructure
    - Network of 10 state health departments and their collaborators
    - Trained HAI surveillance officers to collect data

- **Gain experience using new surveillance definitions[1]**

- **Inform development of larger PS**
  - Identify training needs
  - Challenges to and burden of data collection
  - Data for sample size calculation to generate national estimates

1. Stone, N. D., Ashraf, M. S., Calder, J., Crnich, C. J., Crossley, K., Drinka, P. J., Bradley, S. F. (2012). Surveillance Definitions of Infections in Long-Term Care Facilities: Revisiting the McGeer Criteria. *Infection Control & Hospital Epidemiology, 33*(10), 965-977. doi: doi:10.1086/667743

Setting and Participants

- **Single day PS conducted**
  - 9 NHs from 4 EIP sites: CT, MN, NM, NY

- **Nursing homes identified and recruited by EIP staff**

- **Eligibility requirements**
  - CMS certified nursing facilities
  - At least 120 licensed beds

Prevalence Survey Teams

❑ **Data collection activities performed by 2 teams working in sequence:**

NH Team (first)	EIP Team (follows up)
▪ Nursing Home staff identified to conduct PS activities	▪ EIP epidemiologists and/or surveillance officers
▪ RN or LPN as Team Leader	▪ Prior PS experience
▪ Other staff members to perform data collected determined by Team Leader	

❑ **CDC provided training via webinar to both groups of teams**

Data collected

NH Team	EIP Team

<u>BEFORE THE SURVEY DATE</u>
Completed survey on nursing home characteristics
 	
<u>ON THE SURVEY DAY</u>
• Collected resident characteristics:
    → Age
    → Gender
    →Location
    → Type of resident: Short/long-stay
    → Diabetes
    → Wheelchair bound/bedridden
 	
• Data collected by review of information from medical chart, or by direct observation of residents
	<u>RETROSPECTIVELY</u>
	• Collected resident characteristics
	    → Devices
	
	• Signs and symptoms of infections
	• Lab test data
	• Documentation of provider diagnosed infections
	
	• Data collected by review of information from medical chart

Infection Definitions

❑ **2012 McGeer infection surveillance definitions[1]**

  ▪ Original surveillance definitions published in 1991

  ▪ Revised by SHEA Long-Term Care Special Interest Group in 2012

❑ **Five major types**

  ▪ Respiratory Tract Infections

  ▪ Urinary Tract Infections

  ▪ Skin, Soft Tissue and Mucosal Infections

  ▪ Gastrointestinal Tract Infections

  ▪ Bloodstream Infections

❑ **Infection definitions applied by CDC staff to data collected by EIP Teams**

1. Stone, N. D., Ashraf, M. S., Calder, J., Crnich, C. J., Crossley, K., Drinka, P. J., Bradley, S. F. (2012). Surveillance Definitions of Infections in Long-Term Care Facilities: Revisiting the McGeer Criteria. *Infection Control & Hospital Epidemiology, 33*(10), 965-977. doi: doi:10.1086/667743

Data Analysis

- ❑ **Descriptive epidemiology of nursing homes and residents**
- ❑ **Number and type of HAI described**
- ❑ **HAI prevalence per 100 residents, and by resident characteristics calculated**
- ❑ **Differences in HAI prevalence compared using χ^2 - test**

Facility Characteristics (n=9)

	n	Range or %
Size, number beds	130	104-229
Type		
For profit	4	44.4
Not for Profit	5	55.6
Affiliation		
Multi-facility	4	44.4
Independent, free standing	3	33.3
Hospital system, free standing	2	22.2
Independent, continuing care retirement	1	11
Hospital system, attached	1	11

Facility Services and Infection Control (n=9)

|	n	Range or %
Facility Services provided		
Long-term general nursing	9	100
Long-term dementia	9	100
Skilled nursing/short-term rehab	9	100
Ventilator	9	100
Bariatric	6	66.7
Hospice Palliative	8	88.9
Infection Control Lead		
Highest level of training		
LPN	2	22.2
RN	7	77.8
Length of time in position, years	2	0-13
Years of experience, median	7	0-30
No specific IC training	4	44.4

Resident Characteristics (n=1272)

	n	Range or %
Age, median	85	22 – 91
Sex, male	375	29
Type of Resident		
Long-Stay	1089	86
Short-Stay	183	14
Diabetes	363	29
Wheelchair bound or bedridden	717	56
Device use	102	8

HAI Prevalence

	N (%)	HAI prevalence/100 residents
Overall	70	5.3
Gastrointestinal tract	26 (37)	2.0
Skin, Soft Tissue, Mucosal	21 (30)	1.7
Respiratory Tract	16 (23)	1.3
Urinary Tract Infection	6 (9)	0.5
Other infection(s)*	1 (1)	0.1
Bloodstream Infection	0	0

* Vaginosis
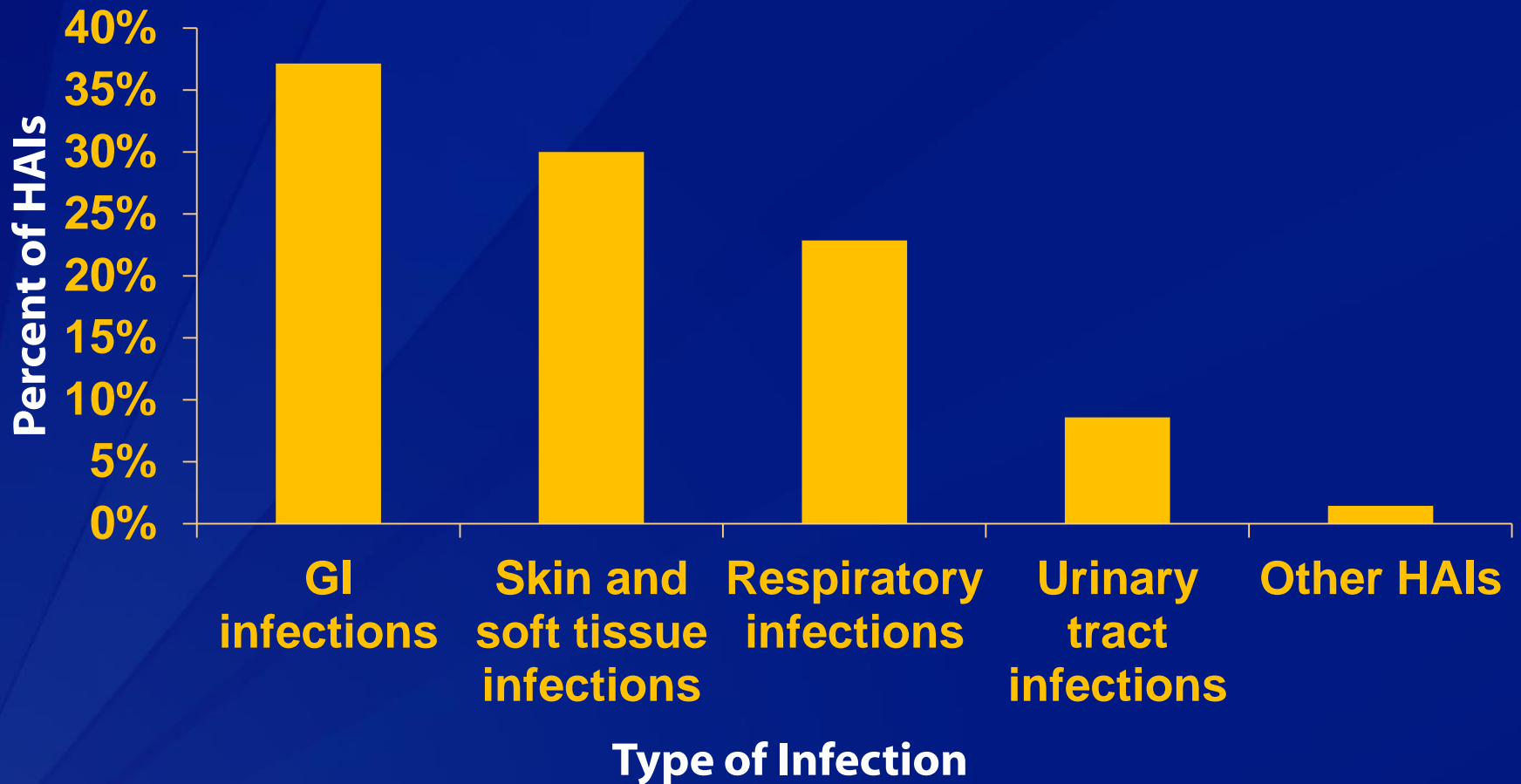
HAI Sub-Type

	n
Gastrointestinal Tract	**26**
Gastroenteritis	19
C. difficile	7
Skin, Soft Tissue, Mucosal	**21**
Cellulitis, Soft Tissue, or Wound Infection	13
Conjunctivitis	3
Oral Candida	2
Ear Infection	1
Fungal Skin Infection	1
HSV Infection	1
Respiratory Tract Infection	**16**
Cold/Pharyngitis	8
Lower Respiratory Infection	4
Pneumonia	4
Urinary Tract Infection	**6**
Catheter associated	4
No catheter	2

HAI Prevalence by Resident Characteristic

Resident characteristic		HAI prevalence/100 residents	χ^2 p-value
Age:	0-64	2.0	0.143
	65-84	4.5	
	85 +	6.3	
Gender:	Male	5.3	1.000
	Female	5.2	
Diabetes:	No	5.7	0.270
	Yes	4.1	
Wheelchair bound or bedridden:			0.201
	No	4.3	
	Yes	6.0	
Stay:	Long	4.7	0.031
	Short	8.7	
Device*:	No	4.8	0.018
	Yes	10.8	

* Indwelling urinary catheter, vascular device, ventilator or tracheostomy, PEG/J tube

Prevalence of Device Use by Resident Type

Resident type, n	Device use*, n (%)	χ^2 p-value
Short-stay, 183	35 (19.1)	
Long-stay, 1089	67 (6.2)	<.0001
Total, 1272	102 (8.0)	

HAI Prevalence by Resident Type and Device Use

Resident type	HAI prevalence			χ^2 p-value
	Device	No device	Overall	
Short-stay	20.0	6.1	8.7	0.016
Long-stay	6.0	4.6	4.7	0.549
	10.8	4.8		

Limitations

- **Small number of nursing homes**
  - Unable to assess differences in HAI types among short and long stay residents
  - Unable to assess facility-level factors associated with HAI prevalence

- **Challenges applying Revised McGeer definitions identified**
  - Sensitivity of gastroenteritis definition
    - Inclusion of noninfectious diarrhea
  - Specificity of respiratory tract definition
    - Exclusion of "true" influenza infections

Summary

- **Overall HAI prevalence, 5.3%**
  - Similar to VA and ECDC findings

- **Unlike VA and ECDC, Gastrointestinal tract infections most common type identified**
  - GI outbreak in 1 facility during prevalence survey
  - Poor implementation of gastroenteritis definition

- **HAI prevalence highest in short-stay residents, but largest number of HAIs in long-stay residents**
  - Increased prevalence in short-stay residents associated with device use

Conclusion

- **Burden of HAIs among the ~1.5M US nursing home residents could be large**

- **Difference in HAI prevalence and device-use among short- and long-stay residents identified**
  - Indicates HAI epidemiology and prevention strategies for these groups differ

- **Large-scale nursing home prevalence survey necessary to**
  - Estimate nation burden of HAIs in nursing home residents
  - Define epidemiology of HAIs and risk factors in short and long stay residents
  - Identify correlates of HAI prevalence at the facility level

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EIP site staff

- ❑ **Connecticut EIP**
- ❑ **Minnesota EIP**
- ❑ **New Mexico EIP**
- ❑ **New York EIP**

Other

- ❑ **Participating nursing home staff and residents**

Thank you

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Visit: www.cdc.gov | Contact CDC at: 1-800-CDC-INFO or www.cdc.gov/info

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GI Surveillance Definition

TABLE 7. Surveillance Definitions for Gastrointestinal (GI) Tract Infections

Criteria	Comments

A. Gastroenteritis (at least 1 of the following criteria must be present)
  1. Diarrhea: 3 or more liquid or watery stools above what is normal for the resident within a 24-h period
  2. Vomiting: 2 or more episodes in a 24-h period
  3. Both of the following sign or symptom subcriteria
    a. A stool specimen testing positive for a pathogen (eg, *Salmonella*, *Shigella*, *Escherichia coli* O157 : H7, *Campylobacter* species, rotavirus)
    b. At least 1 of the following GI subcriteria
      i. Nausea
      ii. Vomiting
      iii. Abdominal pain or tenderness
      iv. Diarrhea
	Care must be taken to exclude noninfectious causes of symptoms. For instance, new medications may cause diarrhea, nausea, or vomiting; initiation of new enteral feeding may be associated with diarrhea; and nausea or vomiting may be associated with gallbladder disease. Presence of new GI symptoms in a single resident may prompt enhanced surveillance for additional cases. In the presence of an outbreak, stool specimens should be sent to confirm the presence of norovirus or other pathogens (eg, rotavirus or *E. coli* O157 : H7).

B. Norovirus gastroenteritis (both criteria 1 and 2 must be present)
  1. At least 1 of the following GI subcriteria
    a. Diarrhea: 3 or more liquid or watery stools above what is normal for the resident within a 24-h period
    b. Vomiting: 2 or more episodes of in a 24-h period
  2. A stool specimen for which norovirus is positively detected by electron microscopy, enzyme immunoassay, or molecular diagnostic testing such as polymerase chain reaction (PCR)
	In the absence of laboratory confirmation, an outbreak (2 or more cases occurring in a long-term care facility [LTCF]) of acute gastroenteritis due to norovirus infection may be assumed to be present if all of the following criteria are present ("Kaplan Criteria"): (a) vomiting in more than half of affected persons; (b) a mean (or median) incubation period of 24–48 h; (c) a mean (or median) duration of illness of 12–60 h; and (d) no bacterial pathogen is identified in stool culture.

C. *Clostridium difficile* infection (both criteria 1 and 2 must be present)
  1. One of the following GI subcriteria
    a. Diarrhea: 3 or more liquid or watery stools above what is normal for the resident within a 24-h period
    b. Presence of toxic megacolon (abnormal dilatation of the large bowel, documented radiologically)
  2. One of the following diagnostic subcriteria
    a. A stool sample yields a positive laboratory test result for *C. difficile* toxin A or B, or a toxin-producing *C. difficile* organism is identified from a stool sample culture or by a molecular diagnostic test such as PCR
    b. Pseudomembranous colitis is identified during endoscopic examination or surgery or in histopathologic examination of a biopsy specimen
	A "primary episode" of *C. difficile* infection is defined as one that has occurred without any previous history of *C. difficile* infection or that has occurred >8 wk after the onset of a previous episode of *C. difficile* infection. A "recurrent episode" of *C. difficile* infection is defined as an episode of *C. difficile* infection that occurs 8 wk or sooner after the onset of a previous episode, provided that the symptoms from the earlier (previous) episode have resolved. Individuals previously infected with *C. difficile* may continue to remain colonized even after symptoms resolve. In the setting of an outbreak of GI infection, individuals could have positive test results for presence of *C. difficile* toxin because of ongoing colonization and also be coinfected with another pathogen. It is important that other surveillance criteria be used to differentiate infections in this situation.

Infections Meeting McGeer Definitions vs. Provider Diagnosed Infections

	McGeer	Provider
Overall	70	102
Gastrointestinal tract	26	9
Skin, Soft Tissue, Mucosal	21	37
Respiratory Tract	16	25
Urinary Tract Infection	6	31
Other infection(s)	1	0
Bloodstream Infection	0	0