Infection surveillance as a tool for quality improvement

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Presentation objectives

- Describe the importance of infection surveillance in nursing homes
- Identify ways to implement and apply infection surveillance criteria/definitions
- Discuss strategies for using infection surveillance data to improve antibiotic use

Burden of infections in US NHs

- Infection incidence data from NHs are varied
  - 3-7/1,000 resident-days from studies before 2000
  - 1.4-5.2/1,000 resident-days from studies after 2000
- Extrapolation to US NH population estimates between 1.6-3.8 million infections/year
- Limitations of estimates:
  - Data from small studies
  - No adjustments for resident or facility characteristics
  - Not representative of current NH population

*Strausbaugh LJ et al. ICHE 2000. 21(10): 674 —679;

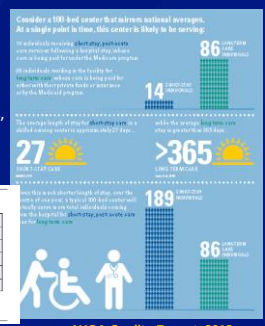
Impact of infections in US NHs

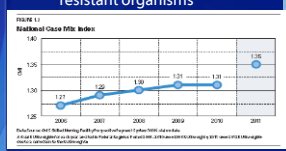
- Infections are among the most frequent causes of hospital transfers from nursing homes
  - Accounted for 36% of hospital readmissions from a skilled nursing facility within 30-days[1]
  - Resulted in 25% of all hospitalizations from 32 nursing homes in a single year[2]
- Hospitalization for acute infections result in excess cost compared to management in the nursing home[3]
  - Morbidity from hospital transfers (delirium, pressure wounds accelerate functional decline) causes poor resident outcomes and increase costs of care[4]

1.Ouslander JG et al. J Am Med Dir Assoc. 2011; 12: 95–203; 2. Kruger K et al. Nurs Res Pract 2011:247623. 3. Boockvar KS et al. J Am Geriatr Soc, 2008; 56:1206–1212
4. Boockvar KS et al. J Am Geriatr Soc, 2005; 53:590–596

Growing complexity of care in US nursing homes (NH)

- Post-acute care (Medicare) admissions are increasing in NH
- NH population has rising medical complexity
  - Increasing exposure to devices, wounds and antibiotics
  - High prevalence of multidrug-resistant organisms

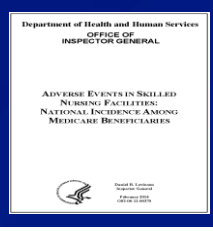




AHCA Quality Report, 2013

OIG Adverse Events Report, Feb 2014

- Reviewed representative sample of Medicare Skilled Nursing Facility (SNF) stays
  - Stay began within 1 day of hospital discharge
  - Length of stay <=35 days
- Identified all harm events using pre-defined clinical "triggers" to select charts for further review
- Categorized into levels of harm and preventability


Department of Health and Human Services
OFFICE OF INSPECTOR GENERAL

ADVERSE EVENTS IN SKILLED NURSING FACILITIES: NATIONAL INCIDENCE AMONG MEDICARE BENEFICIARIES

Table B-1: Modified Version of the NCC MERP Index for Categorizing Errors Used in the OIG study of Adverse Events in SNFs

Level	Description	Category
E	Harm occurred that caused temporary harm that required intervention.	Temporary Harm Event
F	Harm occurred that prolonged the SNF stay, resulted in a transfer to a different SNF or other post-acute facility and/or hospitalization (i.e., admission to a hospital observation unit, an emergency department, or inpatient care).	Adverse Event
G	Harm occurred that contributed to or resulted in permanent resident harm.	
H	Harm occurred that required intervention to sustain the resident's life.	
I	Harm occurred that may have contributed to or resulted in resident death.	

Source: Modified version of the NCC MERP Index for Categorizing Errors, Bernstein, Barach, Duncan, Double and Deutsch in Quality Safety Health Care 2007; 16:243–248 and Adverse Events in Skilled Nursing Facilities: Definition of Medication Errors Broadened, Press Release, June 12, 2007.

OIG report: Adverse Events in Skilled Nursing Facilities: National Incidence Among Medicare Beneficiaries (OEI-06-11-00370), February 2014

OIG Adverse Events Report, Feb 2014

- Overall, 22% of post-acute residents experienced an adverse event; another 11% experienced temporary harm
- 59% of all adverse events were deemed preventable
- Three categories of adverse events:
  - Medication errors (37%)
  - Resident care events, e.g., fall, dehydration, pressure ulcers (37%)
  - Infections (26%)

Table D-3: Point Estimates and Confidence Intervals for Total and Average Additional Medicare Costs Associated With Adverse Events

Estimate Description	Sample Size (n)	Total Cost	95-Percent Confidence Interval	
			Lower Bound	Upper Bound
Costs Associated With Adverse Events in SNFs				
Increased cost because of hospitalizations from adverse events that occurred during SNF stay	940	$207,979,213	$150,599,930	$265,360,492
Costs Associated With Preventable Adverse Events in SNFs				
Increased cost because of hospitalizations from preventable adverse events that occurred during SNF stay	100	$136,648,133	$84,361,921	$188,734,346

Source: OIG analysis of SNF stays and Medicare claims for 857 Medicare beneficiaries discharged in August 2011.

OIG report: Adverse Events in Skilled Nursing Facilities: National Incidence Among Medicare Beneficiaries (OEI-06-11-00370), February 2014

Harm from infections among SNF residents

- Infections were common and costly; Estimated mean Medicare cost for care and hospitalization -- $14,600/event

Type of Harm	Events related to infection	Infection events deemed preventable	Transfers to hospital from infection event
Adverse events (n=148)	39 (25.8%)	22 (59%)	34 (87.2%)
Temporary (n=113)	20 (16.8%)	9 (45%)	NA
Total Harm events (n=261)	59 (22.6%)	31 (51.7%)	34 (57.6%)

OIG report: Adverse Events in Skilled Nursing Facilities: National Incidence Among Medicare Beneficiaries (OEI-06-11-00370), February 2014

Types of infections among SNF residents

Type of Infection	Events (All harm)	Preventable events
Pneumonia and respiratory tract	15 (includes 2 cases of sepsis)	5 (33%)
Surgical site infection (superficial only)	14	9 (64%)
Urinary tract, associated with catheter	14 (includes 3 cases of sepsis)	10 (71%)
C.difficile infections	7	5 (71%)
Soft tissue and other	6	1 (17%)
Vascular device associated.	3	2 (67%)

OIG report: Adverse Events in Skilled Nursing Facilities: National Incidence Among Medicare Beneficiaries (OEI-06-11-00370), February 2014

Example of Harm: Case 1

- 86 year old with recent resection of colon cancer
  - Past history also included heart disease and hypertension
- Documented diarrhea during her 21-day SNF stay with 19 lb weight loss; receiving diuretics
- Became acutely confused (delirium) and transferred to Emergency Department
  - *C.difficile* stool toxin positive on admission
  - Diuretics discontinued and began IV fluids
- Failure to recognize *C. difficile* resulting in hospital transfer – deemed clearly preventable event

Example of Harm: Case 2

- 99 year old with urinary catheter placed in hospital for obstructive uropathy, admitted to SNF 7/7
  - D/c orders recommended follow-up in 2 weeks with urology
- On 7/20, patient afebrile, no documented complaints, but urine culture submitted
  - Culture revealed many bacteria, white cells on urinalysis
  - Started Augmentin and Rocephin on 7/20; Rocephin stopped on 7/23; Augmentin changed to Ertapenem 7/27 for 2nd culture
  - No documentation of signs/symptoms except urine results
- Sent to hospital 8/3 for antibiotic management; no documented follow-up with urology
- Poor management of urinary device – deemed clearly preventable event;
  - *Evidence of inappropriate antibiotic use?*

Gaps/opportunities to prevent infections in NHs

- **Better recognition of the problem**
  - Improved identification and communication of changes in status
  - Standardize the way infections are defined and reported to monitor the burden of the problem
- **Improved documentation of the response**
  - Inadequate documentation of actions leads to incomplete information and missed opportunities
  - Provide guidance and standards for implementing best practices
  - Improve communication across care transitions
- **Increased accountability for prevention**
  - Facility practices to prevent infection should be monitored for adherence and impact
  - Implement consistent methods for assessing the effectiveness of infection prevention activities

National infection reporting system

- CDC managed web-based data system designed for healthcare facility reporting of infections
  - Developed from established, voluntary reporting systems
  - Initial focus and experience with hospital reporting;
  - Tailored reporting for different healthcare settings
- Designed to track high-risk infection events to drive prevention efforts
  - Events related to devices/procedures
  - Events from antibiotic resistant organisms and C. difficile
- Reporting into NHSN has been incentivized by state/federal quality reporting programs in targeted healthcare settings (e.g., hospitals)

Benefits of NHSN surveillance: Data for action

- Standardizes surveillance definitions used by all participating in the system
- Provides data to inform local quality improvement
- Demonstrates trends in improvements and/or areas of opportunity for each infection reported in the system
- Provides comparisons of infection data with adjustments for facility and/or resident characteristics
- Provides national benchmarks to assess performance in local and national prevention efforts
- Creates data for validation of surveillance criteria

NHSN Long-term Care Facility Component: Data for Action

- NHSN infection reporting tailored for LTCF providers, released in September 2012
- Offers standardized event criteria and data analysis across facilities
- Reporting options
  - Urinary tract infections,
  - Multidrug-resistant organisms and *C.difficile*
  - Adherence to hand hygiene and gown/glove use

www.cdc.gov/nhsn/ltc

Targeted LTC Settings

Facilities eligible for enrolling in NHSN LTCF Component

- Certified skilled nursing facilities and nursing homes (SNF/NH)
- Intermediate/chronic care facilities for the developmentally disabled
- Assisted living facilities and residential care facilities
  - Currently limited to Prevention Process Measures

Modules & Events in the LTCF Component

- Healthcare-associated Infection Module
  - Urinary tract infection (UTI) events
    - Both catheter- and non catheter-associated
- Laboratory Identified (Lab-ID) Event Module
  - *C. difficile* infections (CDI)
  - Multidrug-resistance Organisms (MDRO)
    - Including: Methicillin-resistant *Staphylococcus aureus*, Vancomycin-resistant *Enterococcus*, Resistant *E. coli* and *Klebsiella*
- Preventions Process Measures Module
  - Hand hygiene adherence (observations)
  - Gown and glove use adherence (observations)

Standardized event definitions

- Symptomatic UTI events
  - Captures both catheter-associated and non-catheter related events
  - Criteria match the 2012 CDC/SHEA updated infection surveillance definitions for LTC
- Laboratory Identified (Lab-ID) MDRO/CDI events
  - Positive laboratory cultures used as a proxy for surveillance
  - Definitions match the Lab-ID event criteria being applied across all other healthcare settings (hospitals, inpatient rehabilitation facilities, long-term acute care)

Data analysis reports for users

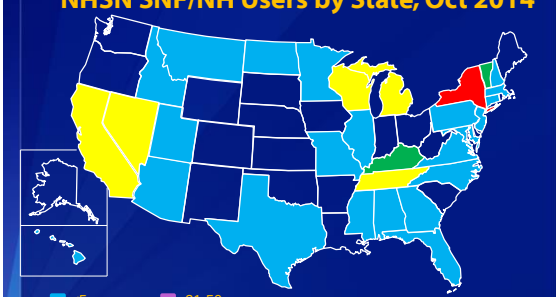
- Line lists generated to catalogue events
  - Organized by type of event (e.g., catheter-associated)
  - Organized by specific MDRO or C. difficile LabID events
- Rate tables generated for each event type
  - Total UTI Rate/1,000 resident-days
    - Will have separate incidence rates for catheter and non-catheter associated events
  - Total CDI Rate/10,000 resident-days
  - Total MDRO Rate/1,000 resident-days
- Percent adherence to prevention process measures
  - Hand hygiene and Gown/glove use

NHSN LTCF Component: Early enrollees

- **191 unique SNF/NHs actively enrolled as of 11/4/14**
  - Represents 1.2% of CMS certified nursing facilities in US
  - 31 states with at least one or more SNF/NH enrolled
- **170 with complete annual facility survey data**
- **Ownership**
  - 17 (10%) Government/Veterans administration**
  - 100 (59%) Non-profit**
  - 53 (31%) For profit
- **Affiliation**
  - 58 (34%) Hospital-based**
  - 66 (39%) Independent
  - 46 (27%) Multi-facility organizations
- **94% Dual certified facilities (Medicare and Medicaid)**

** proportions are higher than distribution nationally

NHSN SNF/NH Users by State, Oct 2014



Drivers which may Promote NHSN Use by SNF/NHs

- Participation in state health department led infection prevention collaboratives
  - Access to local resources to assist with NHSN use
  - Shared learning and support from other facilities
- Hospital partners in large healthcare systems providing NHSN support for their affiliated facilities
- Awareness of NHSN reporting by other healthcare provider types as part of state or federal quality reporting programs
  - No current programs have included SNF/NHs
  - Reporting programs in other post-acute care settings, e.g., long-term acute care hospitals and inpatient rehab facilities

HHS National Action Plan to Prevent HAIs: LTC Chapter

- Outlines the HHS priority actions for addressing infections in nursing homes and other LTC settings

http://www.hhs.gov/ash/initiatives/hai/actionplan/index.html .

HHS Priority Areas for preventing infections in NHs

- **Better recognition of the problem**
  - Increasing enrollment and reporting into the NHSN LTCF Component
  - Reporting *Clostridium difficile* infections (CDI) in NHSN
  - Reporting Urinary tract infections (UTI) in NHSN
- **Promoting best practices for prevention**
  - Increasing resident and healthcare personnel influenza vaccination coverage
  - Increasing resident pneumococcal vaccination coverage

http://www.hhs.gov/ash/initiatives/hai/actionplan/index.html .

Connecting the HHS infection prevention goals

Reduced antibiotic use

Reducing urinary tract infections

Reducing *C. difficile* infections

HHS Action Plan priorities 2&3 for SNF/NHs

"Call to action": Addressing antibiotic overuse and resistance in healthcare

Surveillance as a tool for improving quality

Why do we perform infection surveillance?

- To comply with regulatory expectations (F441)
- To determine infections which are most common or cause the most harm to residents and staff
- To identify new or increasing infections (e.g., outbreaks) affecting the population
- As a data collection method for assessing quality improvement activities

If someone new took over infection surveillance from you tomorrow, how confident are you that he/she would be able to gather data in the same way you are?

- A. Completely confident
- B. Slightly Confident
- C. Highly doubtful
- D. I'm not even sure I gather data the same way every day

Challenges to interpreting NH infection data

- Need for standardized infection surveillance criteria/definitions; utilized by all providers
- Need for accepted surveillance methodology which is feasible and applicable across facilities
- Lack of established national benchmarks for surveillance data
  - To be overcome as use expands in NHSN
- Need for validation of existing surveillance data

Standardizing surveillance definitions

- Well defined data elements applied consistently
- Standard criteria to ensure accuracy, reproducibility and the ability to trend data over time (even with different people doing surveillance)
  - Develop a data collection tool to support surveillance activities
  - Use IT resources to facilitate data collection if possible
- Use of nationally recognized definitions will enable comparisons of surveillance data with other facilities

Lee TB, et al. AJIC 2007; 35: 427-40

Surveillance definitions for LTCF: "McGeer criteria", 1991

American Journal of Infection Control
Volume 19 Number 1 February 1991

COMMENTARY

Definitions of infection for surveillance in long-term care facilities

- Original infection surveillance definitions for LTC
  - Consensus definitions lead by a Canadian researcher, Allison McGeer in the early 1990's
  - Adapted from CDC hospital infection surveillance definitions by a group of experts in the field
  - Though widely utilized in research/ state-mandated programs, never systematically validated

Minimum criteria for treating infections in LTCF: Loeb, 2001

Infect Control Hosp Epidemiol 2001; 22:120-124

Development of Minimum Criteria for the Initiation of Antibiotics in Residents of Long-Term–Care Facilities: Results of a Consensus Conference

Mark Loeb, MD, MSc; David W. Bentley, MD; Suzanne Bradley, MD; Kent Crossley, MD; Richard Garibaldi, MD; Nelson Gantz, MD; Allison McGeer, MD; Robert R. Muder, MD; Joseph Mylotte, MD; Lindsay E. Nicolle, MD; Brenda Nurse, MD; Shirley Paton, RN; Andrew E. Simor, MD; Philip Smith, MD; Larry Strausbaugh, MD

- Guidance for LTC on when to start antibiotics
  - Consensus definitions lead by Canadian researcher, Mark Loeb in early 2000's
  - Meant to be distinct from surveillance definitions and used to inform empiric antibiotic use
  - Used in antibiotic stewardship efforts with mixed results – minimal prospective evaluation or validation

CDC/SHEA infection surveillance definitions for LTC, 2012

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY OCTOBER 2012, VOL. 33, NO. 10

SHEA/CDC POSITION PAPER

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

- Reviewed and updated the criteria outlined in the original McGeer infection surveillance definition paper
- Revisions based on a structured review of evidence and consensus opinion of experts in the field
  - Significant changes to urinary tract and respiratory tract infections
  - Added norovirus gastroenteritis and *C. difficile* infection
- Definitions published without validation

http://www.jstor.org/stable/10.1086/667743

Comparing definitions of infection in LTC residents

- Fever criteria are different
  - McGeer 1991: >=38.0ºC (100.4ºF)
  - Loeb 2001: >37.9ºC (>100ºF) or 1.5ºC (>2.4ºF)over baseline
  - CDC/SHEA 2012: Single temp >37.8ºC (>100ºF); repeated temp >37.2ºC (>99ºF); or 1.1ºC (>2ºF) over baseline
- 2012 guidance sets lower temperature threshold and additional criteria (*e.g. change from baseline)* to define fever
- 2012 guidance defines acute mental status change
  - Uses scales found in MDS 3.0 reporting
- Subtle differences in infection specific criteria among all 3 guidance documents

2012 surveillance definitions: Constitutional criteria

A. Fever	1. A single oral temperature of >37.8°C (>100°F)	
	2. **OR** repeated oral temperatures of >37.2°C (99°F) or rectal temperatures >37.5°C (99.5°F)	
	3. **OR** a single temperature >1.1°C (2°F) over baseline from any site (oral, tympanic, axillary)	
B. Leukocytosis	1. Neutrophilia (>14,000 leukocytes/mm³)	
	2. **OR** Left shift (>6% bands or >1,500 bands/mm³)	
C. Acute mental status change from baseline	1. Acute onset	
	2. Fluctuating course	
	3. Inattention	
	4. **AND** either disorganized thinking or altered level of consciousness	
D. Acute functional decline	1. A new 3 point increase in activities of daily living (ADL) score (0-28) from baseline, based on the following 7 ADL items, each scored between 0 (independent) and 4 (total dependence):	
	a. Bed mobility	e. Toilet use
	b. Transfer	f. Personal hygiene
	c. Locomotion within LTCF	g. Eating
	d. Dressing	

Stone et al. Infect Contr Hosp Epi. 2012; 33: 965-977

Assessing mental status and functional status in the Minimum Data Set

Delirium

C1300. Signs and Symptoms of Delirium (from CAM©)

Code **after completing** Brief Interview for Mental Status or Staff Assessment, and reviewing medical record

Coding:	Enter Codes in Boxes	
0. **Behavior not present** 1. **Behavior continuously present, does not fluctuate** 2. **Behavior present, fluctuates** (comes and goes, changes in severity)	☐	**A. Inattention** - Did the resident have difficulty focusing attention (easily distracted, out of touch or difficulty following what was said)?
	☐	**B. Disorganized thinking** - Was the resident's thinking disorganized or incoherent (rambling or irrelevant conversation, unclear or illogical flow of ideas, or unpredictable switching from subject to subject)?
	☐	**C. Altered level of consciousness** - Did the resident have altered level of consciousness (e.g., **vigilant** - startled easily to any sound or touch; **lethargic** - repeatedly dozed off when being asked questions, but responded to voice or touch; **stuporous** - very difficult to arouse and keep aroused for the interview; **comatose** - could not be aroused)?

Section G **Functional Status**

G0110. Activities of Daily Living (ADL) Assistance

1. **ADL Self-Performance**
   Code for **resident's performance** over all shifts - not including setup. If the ADL activity occurred 3 or more times at various levels of assistance, code the most dependent - except for total dependence, which requires full staff performance every time

Coding:

Activity Occurred 3 or More Times

0. **Independent** - no help or staff oversight at any time
1. **Supervision** - oversight, encouragement or cueing
2. **Limited assistance** - resident highly involved in activity; staff provide guided maneuvering of limbs or other non-weight-bearing assistance
3. **Extensive assistance** - resident involved in activity, staff provide weight-bearing support
4. **Total dependence** - full staff performance every time during entire 7-day period

MDS 3.0 Nursing Home Comprehensive (NC) Version 1.00.2 10/01/2010

Comparing definitions: Urinary tract infection

McGeer, 1991

For residents without a urinary catheter:
At least 3 of the following signs

(a) Fever (~38°C) or chills,

(b) New or increased burning pain on urination, frequency or urgency,

(c) New flank or suprapubic pain or tenderness,

(d) Change in character of urine,

(e) Worsening of mental or functional status (may be new or increased incontinence).

Loeb, 2001

Residents without an indwelling catheter or intermittent catheterization

1a) Acute dysuria alone **OR**
1b) Fever of 100°F or a 2.4°F increase in baseline temp. **AND** a new or increase for at least one of the following:
2a) Urgency,
2b) Frequency,
2c) Superapubic pain,
2d) Gross hematuria,
2e) Costovertbral angle tenderness, **OR**
2f) Urinary incontinence.

CDC/SHEA, 2012

A. For Residents Without an Indwelling Catheter

Both criteria 1 and 2 must be present:

1. At least 1 of the following sign or symptom:
   a. Acute dysuria or acute pain, swelling or tenderness of the testes, epididymis, or prostate
   b. Fever or leukocytosis **And** at least 1 of the following localizing urinary tract criteria:
      i. Acute costovertebral angle pain or tenderness
      ii. Suprapubic pain
      iii. Gross hematuria
      iv. New or marked increase in incontinence
      v. New or marked increase in urgency
      vi. New or marked increase in frequency
   c. In the absence of fever or leukocytosis, **2** or more of the localizing urinary tract criteria listed in b i-vi.
2. **One** of the following microbiology criteria:
   a. At least 10^5 cfu/ml of no more than 2 organisms in a voided urine sample
   b. At least 10^2 cfu/ml of any number of organisms in a specimen collected by in-and-out catheter

McGeer et al. AJIC 1991; 19: 1-6, Loeb et al. ICHE 2001; 22:120-124, Stone et al. ICHE. 2012; 33: 965-977

2012 updates to UTI surveillance criteria

NEW ADDITIONS

- Acute dysuria now a stand alone criteria defining symptomatic infection
- Presence of elevated white blood cell count incorporated into criteria
- Urine culture is required to define UTI

KEY DELETIONS

- Mental status change/functional decline removed as criteria for UTI in residents without a catheter
- Change in character of urine (e.g., foul smell) removed as criteria

Implementing criteria: Case #1

- Patient JH is a 60 y/o female
  - Past medical history of diabetes mellitus, hemiplegia, vancomycin-resistant enterococcus, Clostridium difficile, and infection of spinal hardware.
  - Requires extensive assistance with mobility.
- A foley catheter was present prior to admission to the facility
  - In place "a few months"
  - The catheter remained in place after her admission to the facility.
- Three weeks post-admission, a CNA noted that the patient's urine had become increasingly cloudy and foul-smelling. The patient had also complained of new suprapubic pain.
- Vitals were not recorded in the nursing notes, so whether or not the patient was febrile is unclear.

Case scenarios courtesy of Dr. Lona Mody, University of Michigan, Ann Arbor

Implementing criteria: Case #1 (cont.)

Lab Results:

- Urine Analysis: pyuria, +nitrites
- Urine Culture: preliminary results yielded growth of a gram-negative bacteria, >100,000 cfu/ml. A final microbiology report with identification of the causative organism was never recorded in the patient's chart.
- Course of action taken: Bactrim DS x 7 days for presumed UTI.

Case scenarios courtesy of Dr. Lona Mody, University of Michigan, Ann Arbor

Case #1: Comparing criteria

McGeer's criteria	CDC/SHEA criteria	Minimum Criteria
Change in character of urine – foul-smelling	New onset of suprapubic pain	None- it is possible that she has a significant fever or CVA tenderness, but vitals or a record of checking for CVA tenderness was not recorded.
New flank/suprapubic pain	UC > 100,000 CFU/ml gram negative bacteria	
+ Urine culture		

Case #1: Comparing criteria (cont.)

McGeer's criteria	CDC/SHEA criteria	Minimum Criteria
Change in character of urine – foul-smelling	New onset of suprapubic pain	None- it is possible that she has a significant fever or CVA tenderness, but vitals or a record of checking for CVA tenderness was not recorded.
New flank/suprapubic pain	UC > 100,000 CFU/ml gram negative bacteria	
+ Urine culture		
This patient meets the McGeer's criteria for CA-UTI	**This patient meets the CDC/SHEA criteria for CA-UTI**	**This patient does NOT meet the Minimum criteria to initiate antibiotics.**

Implementing criteria: Case #2

- RP is an 82 y/o male admitted to the facility to recover from a hip replacement.
  - In the months prior to the surgery, the patient had multiple falls.
  - A foley catheter was inserted prior to the surgery and remained in place upon admission to the nursing facility.
  - His past medical history includes congestive heart failure and diabetes mellitus, but is otherwise unremarkable.
- Two weeks post-admission to the facility, a "fever" was reported in the patient's chart.
  - Exact temperature was not recorded.
  - No other vitals were recorded.
- For a week prior to this, a few CNAs had noted that the patient had been complaining of a stomach ache
  - Not documented in chart if MD aware or if received any treatment
- Of note, the patient's roommate has a recent history of C. diff infection.

Case scenarios courtesy of Dr. Lona Mody, University of Michigan, Ann Arbor

Implementing criteria: Case #2 (cont.)

Lab Results:

- Urine Analysis: pyuria, proteinuria, hematuria
- Serum WBC: 12
-
- Course of action: The patient was treated with cephalexin for presumed UTI.

- What other information might you have wanted to know?

Case scenarios courtesy of Dr. Lona Mody, University of Michigan, Ann Arbor

Case #2: Comparing criteria

McGeer's criteria	CDC/SHEA criteria	Minimum Criteria
Potential "fever" or flank pain- (*i.e.* "stomach ache") not recorded in the chart.	Leukocytosis – WBC = 12K, does not meet threshold, no differential available	Potential "fever"- but exact temperature is unknown (*i.e.,* is it > 100F?)
	Potential "fever"- but exact temperature is unknown	

Case #2: Comparing criteria (cont.)

McGeer's criteria	CDC/SHEA criteria	Minimum Criteria
Potential "fever" or flank pain- (*i.e.* "stomach ache") not recorded in the chart.	Leukocytosis – WBC = 12K, does not meet threshold, no differential available	Potential "fever"- but exact temperature is unknown (*i.e.,* is it > 100F?)
	Potential "fever"- but exact temperature is unknown	
This patient does NOT meet the McGeer's criteria.	**This patient does NOT meet the CDC/SHEA criteria.**	**This patient does NOT meet the Minimum criteria to Initiate Antibiotics.**

Important points about surveillance definitions

- Surveillance definitions may not be the same as clinical criteria used to make treatment decisions
  - Sometimes diagnosis/treatment decisions are made before all the data is available
  - Sometimes insufficient documentation is available to demonstrate that surveillance criteria have been met
- Events defined by surveillance criteria may not match events reported in MDS
- An important quality improvement exercise should be evaluating the discrepancies between surveillance data and clinical/MDS data

MDS data vs. surveillance criteria

- Study comparing UTI events identified by applying McGeer definitions compared to events reported into MDS 2.0
  - 16 LTCFs – July 2001 – June 2002
  - Assumes McGeer events are "gold standard"
- 6,947 charts reviewed
  - 1,051 had UTI in MDS
    - 137/386 confirmed by McGeer
    - 665 unable to apply McGeer criteria because of inadequate documentation
- Only 14% of residents with UTI in MDS, met evidence-based criteria for symptomatic UTI

Table 4. Summary Statistical Estimates of Minimum Data Set Performance and the Presence or Absence of UTI

Statistical Analysis	%	95% Confidence Interval
Sensitivity	57.9	51.6–64.1
Specificity	86.5	85.6–87.3
Positive predictive value	13.9	11.9–16.1
Negative predictive value	98.2	97.8–98.5

Stevenson K. Infection. 2004 ;52: 707-711

Clinical diagnosis vs. surveillance criteria

Table 2 Incidence and attributable risk of infection

	Number of infections		Incidence rate (infections/1,000 resident-months)		Relative risk (95%)	*p*-value
	Device (263 f/u-mon)	Non-device (644 f/u-mon)	Device (IRe)	No-device (IRu)		
Total infections[a]	87	110	331	171	1.9 (1.4–2.6)	<0.001
Urinary tract infections[a]	49	54	186	84	2.2 (1.5–3.3)	<0.001
Pneumonia[a]	23	20	87	31	2.8 (1.5–5.4)	0.0004
Other infections[b]	15	36	57	56	1.0 (0.5–1.9)	0.47
McGeer's criteria[c]	8	15	30	23	1.3 (0.5–3.3)	0.27
Minimum criteria[d]	12	10	46	16	2.9 (1.2–7.6)	0.007
McGeer's or minimum criteria[e]	15	18	57	28	2.0 (1.0–4.3)	0.02

[a] Clinical definition
[b] Includes skin and soft tissue infections, *Clostridium difficile* colitis, conjunctivitis, upper respiratory, and
[c] Includes pneumonia and/or urinary tract infections

- 146 infections, UTI or pneumonia were diagnosed and treated by clinicians
- 33/146 (23%) were also identified by applying either McGeer or Loeb minimum criteria

Wang L. et al. Eur J Clin Microbiol Infect Dis. 2012. 31(8):1797-804

Using surveillance definitions to explore the gap

- What are explanations for events not meeting criteria?
  - Incomplete assessment (e.g., physical exam not performed or culture not obtained)
  - Inadequate documentation
  - Inappropriate diagnostic testing (e.g., cultures obtained when local signs/symptoms are not present)
  - Poor specimen collection techniques/contaminated results
- What happens when a physician diagnoses and treats a UTI event that doesn't meet criteria?

Applying diagnostic criteria to residents suspected of UTI

- Prospectively followed a group of 340 nursing home residents in 3 LTCFs for 12 months (5/05-4/06)
  - Excluded residents with urinary devices, short-stay(<30d), receiving antibiotics for UTI prevention, or on dialysis
  - All had baseline assessment of mental status and functional status used questions from Minimum Data Set
- Reviewed charts of residents "clinically suspected of UTI"
- Laboratory confirmation for UTI was defined as :
  - Definite when >100K CFU in culture + pyuria (>10 WBC)
  - Possible if >100K CFU+ <10WBC or 10-100K CFU
  - None if <10K CFU

Juthani-Mehta M et al. JAGS 2007; 55: 1072-77

Triggers for nursing home staff to suspect UTI

Table 1. Triggers Causing Suspicion of Urinary Tract Infection

Trigger	Number of Responses*
Change in mental status†	40
Change in behavior‡	27
Change in character of urine§	16
Evaluation of other infection‖	11
Fever or shaking chills	11
Family or patient request	8
Change in gait or new fall	8
Change in voiding pattern#	7
Flank, abdominal, or pelvic pain	6
Serum laboratory abnormalities**	6
Dysuria	6
Change in functional status	3
Malaise	2
Dehydration/syncope	2

- 107/340 (31%) suspected of UTI
- UTI rate: 1.6/1,000 resident days
- >40% had non-specific changes
- Top 3 triggers:
  - Mental status,
  - Behavior
  - Character of urine

Juthani-Mehta M et al. JAGS 2007; 55: 1072-77

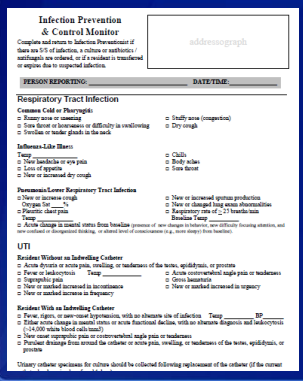
Disconnect between suspicion of UTI and meeting criteria

- Antibiotics were given to 62 of the 100 residents with suspected UTI
  - 41/43 (95%) with positive laboratory evidence of UTI
  - 21/57 (37%) with no laboratory evidence of UTI
- <30% met any criteria-based definitions for UTI
  - 23% met McGeer 1991; 14% met Loeb minimum, 2001
- If urine testing was based on Loeb algorithm, 75% of residents would not have had urine specimens sent
  - 45 had negative UTI laboratory results
  - 30 had positive UTI testing, without clear documentation of signs/symptoms

Juthani-Mehta M et al. JAGS 2007; 55: 1072-77

Using surveillance criteria for improving antibiotic use

- Standardize the process for assessing a resident when concern about new infection
  - Ensure all pieces of history and physical exam are assessed
  - Improve quality/documentation of assessments of change in condition
- Standardize communication of change in condition to medical providers
- Standardize the laboratory data obtained prior to antibiotic start
  - Review existing protocols which might drive inappropriate diagnostic testing (e.g., send a UA for every resident who falls)
- Ensure that clinical staff understand the surveillance criteria used to identify an infection



Infection Prevention & Control Monitor

Complete and return to Infection Preventionist if there are 5/5 of infection, a culture or antibiotics / antifungals are ordered, or if a resident is transferred or expires due to suspected infection.

addressograph

PERSON REPORTING: _____ DATE/TIME: _____

Respiratory Tract Infection

Common Cold or Pharyngitis
- Runny nose or sneezing
- Sore throat or hoarseness or difficulty in swallowing
- Swollen or tender glands in the neck
- Stuffy nose (congestion)
- Dry cough

Influenza-Like Illness
Temp _____
- New headache or eye pain
- Loss of appetite
- New or increased dry cough
- Chills
- Body aches
- Sore throat

Pneumonia/Lower Respiratory Tract Infection
- New or increase cough
  Oxygen Sat ____%
- Pleuritic chest pain
  Temp _____
- New or increased sputum production
- New or changed lung exam abnormalities
- Respiratory rate of ≥ 25 breaths/min
  Baseline Temp _____
- Acute change in mental status from baseline (presence of new changes in behavior, new difficulty focusing attention, and new confused or disorganized thinking, or altered level of consciousness (e.g., more sleepy) from baseline).

UTI

Resident Without an Indwelling Catheter
- Acute dysuria or acute pain, swelling, or tenderness of the testes, epididymis, or prostate
- Fever or leukocytosis Temp _____
- Suprapubic pain
- New or marked increased in incontinence
- New or marked increase in frequency
- Acute costovertebral angle pain or tenderness
- Gross hematuria
- New or marked increased in urgency

Resident With an Indwelling Catheter
- Fever, rigors, or new-onset hypotension, with no alternate site of infection Temp _____ BP _____
- Either acute change in mental status or acute functional decline, with no alternate diagnosis and leukocytosis (>14,000 white blood cells/mm3)
- New onset suprapubic pain or costovertebral angle pain or tenderness
- Purulent drainage from around the catheter or acute pain, swelling, or tenderness of the testes, epididymis, or prostate

Urinary catheter specimens for culture should be collected following replacement of the catheter (if the current

- This form was developed for front-line staff to record findings when an infection was suspected
- Tools can be used for documentation and/or communication
- Could be educational materials or become part of the resident medical record

Form courtesy of Ellen Bartlett, Houlton Regional Hospital, Maine

Take away points

- Infections are a serious cause of harm in SNF/NHs
- Many infections could be prevented with better identification and appropriate management
- NHSN is a resource available to support and improve infection surveillance and prevention activities in NHs
- Applying criteria to monitor infections will raise awareness of the problem and highlight quality improvement opportunities
  - Comparing surveillance events to events treated with antibiotics could identify opportunities for practice improvement
  - Integrating surveillance criteria into the assessments by front-line staff and clinicians could improve the quality of care when infections are suspected

Thank you!!

Email: nstone@cdc.gov with questions/comments

For more information please contact Centers for Disease Control and Prevention

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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.

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Division of Healthcare Quality Promotion