Surveillance Practices and Monitoring in Long-term Care Facilities

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INFECTION PREVENTION IN AGING RESEARCH GROUP

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Objectives

- What, why and how of conducting surveillance
- Essentials of surveillance and considerations
  - Examples/case studies
- Discuss PRECEDE Model and CAUTI National Collaborative
- CDC NHSN System

What is Surveillance?

Ongoing, systematic collection, analyses and interpretation of health data essential to the planning, implementation, and evaluation of public health practice

&

Closely integrated with timely dissemination of these data to those who need to know

Horan and Gaynes in Mayhall et all, 4th ed.

Why is Surveillance Important?

- To define trends, e.g. in my facility:
  - What are the 3 most common infections?
  - Are CAUTIs increasing in my facility?
  - Does Unit A have more skin infections than unit B?
- To help identify new types of infections or outbreaks
- **To assess the impact of new prevention strategies**

Essentials of Surveillance

1. Assess the population
2. Select the outcome or process for surveillance
3. Use appropriate surveillance definitions
4. Collect data (keep it simple, if you can)
5. Calculate and analyze surveillance rates
6. Apply appropriate risk stratification methods
7. Report and use surveillance information

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

1. Assessing the Population

- Nursing homes are evolving
- Risk of infection differs in different populations
- Performing a “risk assessment” of the residents in a facility may help determine which infections are most important to track

Pearl Liu/The Straits Times 2013

Flanagan E, et al. Infect Dis Clin North Am 2011
Smith PW, et al. Infect Control Hosp Epidemiol 2008

Prevalence of Infections in NHs in US

- 1.8-13.5 per 1,000 patient-care days
- Wide range reflects diversity of population
  - Devices vs. no devices?
  - Short-stay vs. long-stay?
  - Functionally disabled vs. functionally independent?

Indwelling Devices: Added Risk of Infection

	No. of residents with infection	Follow-up time (resident-days)	Rate (per 1000 resident-days)
No Device (n=88)	50	19320	2.6
Feeding tube (n=30)	17	3000	5.7
Urinary catheter (n=48)	34	3840	8.9
Feeding tube and urinary catheter (n=12)	10	1050	9.5

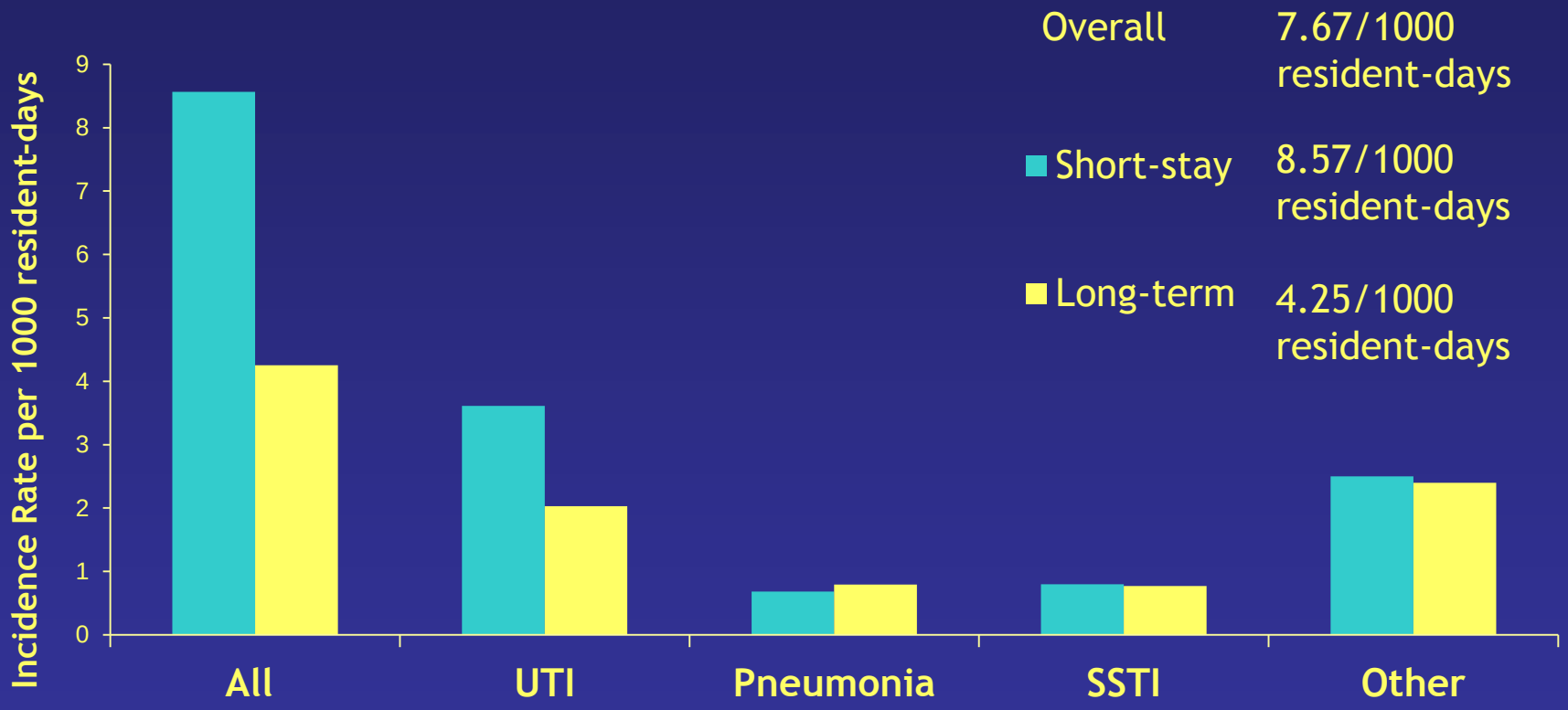
Wang et al. Eur J Clin Microbiol Infect Dis 2012; 31:1797-804.

Indwelling Devices: Added risk of MDROs

	Number of Organisms Isolated (per 1000 days of f/u)			
	Total MDROs	MRSA	VRE	R-GNB
No Device	29	7.4	1.2	20
Feeding Tube	63	25	4.3	33.7
Urinary Catheter	68	19.8	3.6	44.8
Feeding Tube & Urinary Catheter	91	28.5	14.3	48.6

Wang et al. Eur J Clin Microbiol Infect Dis 2012; 31:1797-804.

Infection Rates in NH: Short-stay vs. Long-term Residents



Mody, L. Pathways Study, 2015-current

2. Selecting the Process or Outcome

Outcomes: *events we want to prevent*

- New MRSA infections
- UTIs
- *C. difficile* infections

- Tracking events that occur in your facility

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

Selecting the Process or Outcome

Process measures: *ways we can prevent events from happening*

- Hand hygiene
  - Compliance monitoring
  - Evaluate hand hygiene technique
- Wearing gowns/gloves
  - Compliance monitoring
  - Donning/doffing technique evaluation
- Tracking the way catheters are used
  - Catheter utilization ratio
  - Documentation of indication for use

Mody L, et al. JAMA Intern Med 2015;175(5):714-723.
Lee TB, et al. AJIC 2007; 35: 427-40

Facility-wide Surveillance: all infections

Pros	Cons
• Tells the complete picture of all events	• Very time consuming
• Easier to do in a small facility, or one which provides care to a specialized population	• May limit your ability to “drill-down” to specific risks
	• May limit time to identify opportunities for prevention

Targeted Surveillance: some infections

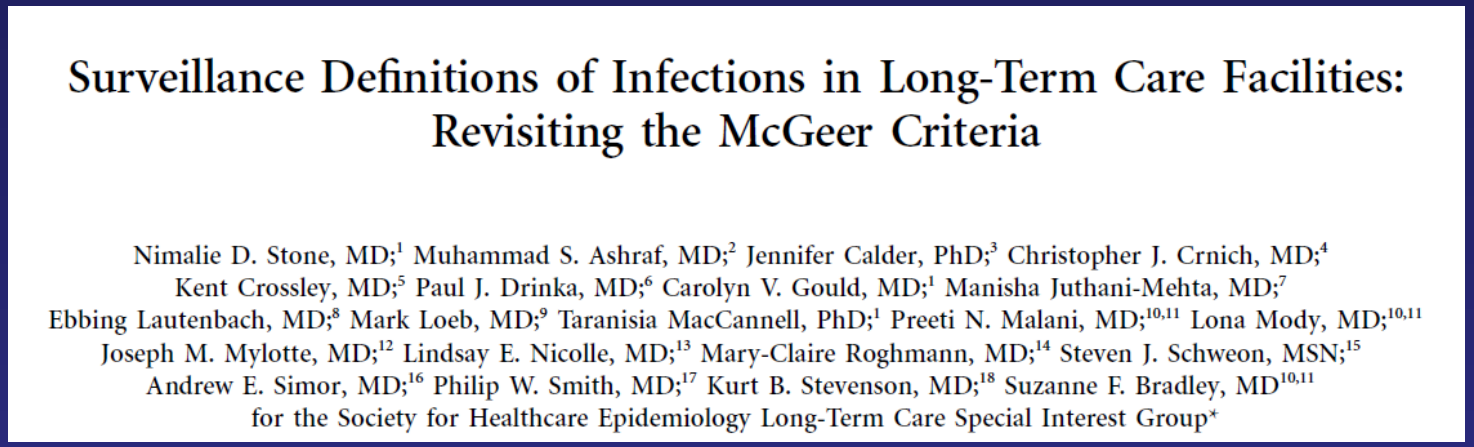
Pros	Cons
• Focuses your time and resources on only a few key problem areas	• Limits your knowledge of the scope of infections in your facility
• Increases time to explore causes and implement prevention activities	• Will need to be reviewed at least every year and updated
• Makes surveillance more time efficient	• If focus is too narrow, you may miss important events

3. Using Surveillance Definitions

- All data elements must be well defined and applied in a consistent way
- Using standard criteria will ensure accuracy, reproducibility, and the ability to compare data over time

Smith PW, et al. Infect Control Hosp Epidemiol 2008;29:785-814.
Lee TB, et al. AJIC 2007; 35: 427-40

Updated Surveillance Definitions for LTC



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

Nimalie D. Stone, MD;[1] Muhammad S. Ashraf, MD;[2] Jennifer Calder, PhD;[3] Christopher J. Crnich, MD;[4] Kent Crossley, MD;[5] Paul J. Drinka, MD;[6] Carolyn V. Gould, MD;[1] Manisha Juthani-Mehta, MD;[7] Ebbing Lautenbach, MD;[8] Mark Loeb, MD;[9] Taranisia MacCannell, PhD;[1] Preeti N. Malani, MD;[10,11] Lona Mody, MD;[10,11] Joseph M. Mylotte, MD;[12] Lindsay E. Nicolle, MD;[13] Mary-Claire Roghmann, MD;[14] Steven J. Schweon, MSN;[15] Andrew E. Simor, MD;[16] Philip W. Smith, MD;[17] Kurt B. Stevenson, MD;[18] Suzanne F. Bradley, MD[10,11] for the Society for Healthcare Epidemiology Long-Term Care Special Interest Group*

- Updated co-led by CDC and SHEA Long-term care interest group, endorsed by APIC, AMDA, others
- Revisions based on a structured review of evidence and consensus opinion of experts in the field
- Significant changes to criteria for UTI and Respiratory tract infection
- Added new definitions for norovirus gastroenteritis and *C. difficile* infection

Stone et al. ICHE 2012;33(10):965-977

Surveillance Definition for Urinary Tract Infection (UTI)

For Residents Without an Indwelling Catheter
Both criteria 1 and 2 must be present:
1. Sign or symptom (at least one):
a. Acute dysuria or pain, swelling or tenderness of the testes, epididymis, or prostate
b. Fever, or leukocytosis and 1 of the following:
i. Acute costovertebral angle pain or tenderness
ii. Suprapubic pain
iii. Gross hematuria
iv. New or marked increase in incontinence, urgency, or frequency
c. No fever or leukocytosis, and 2 or more of criteria bii-iv
2. Positive urine culture (need one):
a. At least 10^5 cfu/ml of no more than 2 organisms in a voided sample
b. At least 10^2 cfu/ml of any organisms from in-and-out catheter sample

Stone et al. ICHE 2012;33(10):965-977

Surveillance Definition for Catheter-associated Urinary Tract Infection (CAUTI)

For Residents With an Indwelling Catheter
Both criteria 1 and 2 must be present:
1. Sign or symptom (at least one):
a. Fever, rigors, or new-onset hypotension
b. Either acute change in mental status or acute functional decline
c. New-onset suprapubic pain or costovertebral angle pain or tenderness
d. Purulent discharge from around the catheter, or acute pain, swelling or tenderness of the testes, epididymis or prostate
2. Urinary catheter specimen with at least 10^5 cfu/ml of any organism

Stone et al. ICHE 2012;33(10):965-977

Surveillance Definition for Pneumonia

Pneumonia
All **3** criteria must be present:
1. Interpretation of chest radiograph as demonstrating pneumonia or new infiltrate
2. One or more symptom/sign:
a. New or increased cough
b. New or increased sputum production
c. O2 sat <94% RA or a reduction in O2 sat of 3% from baseline
d. New or changed lung examination abnormalities
e. Pleuritic chest pain
f. Respiratory rate >25 breaths/min
3. One or more constitutional criteria

Stone et al. ICHE 2012;33(10):965-977

Surveillance Definition for Skin, Soft Tissue Infection

Cellulitis, soft tissue, wound infection
At least 1 criteria must be present:
1. Pus present at a wound, skin, or soft tissue site.
2. New or increasing presence of at least 4 of the following sign/symptom sub-criteria:
a. Heat at the affected site
b. Redness at the affected site
c. Swelling at the affected site
d. Tenderness or pain at the affected site
e. Serous drainage at the affected site
f. One or more constitutional criteria

Stone et al. ICHE 2012;33(10):965-977

Surveillance Definition for *Clostridium difficile* Infection

Clostridium difficile infection
Both criteria 1 and 2 must be present:
1. One GI criteria:
a. Diarrhea: 3 or more liquid or watery stools within 24-hrs
b. Presence of toxic megacolon
2. One diagnostic criteria:
a. Positive laboratory test result for *C. difficile* toxin A or B, toxin-producing *C. diff* organism, or by a molecular test (e.g. PCR)
b. Pseudomembranous colitis by endoscopy, surgery, or biopsy

Stone et al. ICHE 2012;33(10):965-977

Other Guidelines for Diagnosing and Managing Infections in LTC

Clin Infect Dis 2009; 48:149-171

Clinical Practice Guideline for the Evaluation of Fever and Infection in Older Adult Residents of Long-Term Care Facilities: 2008 Update by the Infectious Diseases Society of America

Kevin P. High, MD, MS,[a] Suzanne F. Bradley, MD,[bcd] Stefan Gravenstein, MD,[efgh] David R. Mehr, MD,[i] Vincent J. Quagliarello, MD,[j] Chesley Richards, MD,[kl] and Thomas T. Yoshikawa, MD[mn]

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

Clinical vs. McGeer (1991) vs. Minimum Criteria

	Number of Infections	
	Device (7890 f/u-days)	Non-Device (19320 f/u-days)
Total infections (Clinical)	87	110
McGeer's 1991 Definitions	8	15
Minimum Criteria	12	10
McGeer's or Minimum	15 (17%)	18 (16%)

[a] Includes skin and soft tissue infections, *Clostridium difficile* colitis, conjunctivitis, upper respiratory and lower respiratory tract infections.

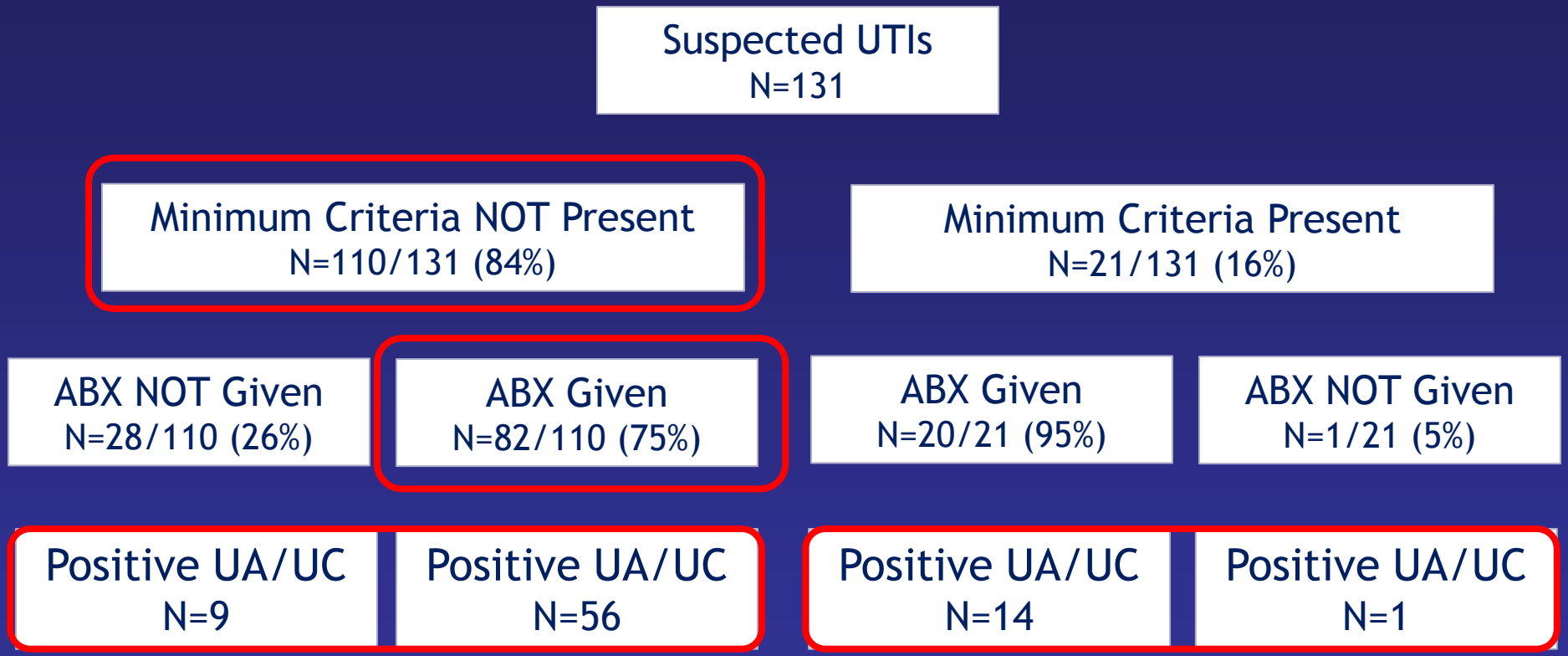
Wang et al. Eur J Clin Microbiol Infect Dis 2012; 31:1797-804.

Characteristics of Suspected UTIs in NH Residents with Advanced Dementia

Characteristic	All Episodes N=131	Foley Catheter n=15	No Catheter n=116
Symptom or Signs			
Fever	27 (20.6)	5 (33.3)	22 (19.0)
Dysuria	5 (3.8)	1 (6.7)	4 (3.4)
Frequency	2 (1.5)	0 (0)	2 (1.7)
Urgency	0 (0)	0 (0)	0 (0)
Hematuria	9 (6.9)	3 (13.3)	6 (5.2)
Costovertebral tenderness	3 (2.3)	1 (6.7)	2 (1.7)
Suprapubic pain	0 (0)	0 (0)	0 (0)
Mental status change	58 (44.3)	3 (13.3)	56 (48.3)
Rigors	2 (1.5)	1 (6.7)	1 (0.9)
Minimum S/S to support antibiotic	21 (16.0)	6 (40.0)	15 (12.9)

D'Agata et al. J Am Geriatr Soc 2013;61:62-66.

Episodes of Suspected UTI in NH Residents with Advanced Dementia



78% not meeting but with + cultures

83% not meeting but with + cultures

D'Agata et al. J Am Geriatr Soc 2013;61:62-66.

Prescribing Rates and Minimum Criteria Adherence in 12 NH

	Total prescribing rate/1000 resident-days		% prescriptions adhering to minimum criteria	
	Mean	Range across NH	Mean %	Range across NH
All indications	11.5	5.4-25.9	12.7	4.8-22.0
UTI	4.8	1.2-10.9	10.2	0.0-38.9
Respiratory infection	4.5	1.8-10.9	1.9	0.0-6.9
Skin & soft tissue infection	2.2	0.7-4.1	42.7	33.3-100.0

Olsho et al. JAMDA 2013;14:309.e1-e7

Engaging Physicians & Clinical Leadership

- Share the evidence-based information
  - CDC: Get Smart About Antibiotics
  - CDC: Fact Sheet—Antibiotic Use in Nursing Homes
  - FDA: Know when Antibiotics Work
- Use Infection Definitions Pocket Cards
  - NHSN/Revised McGeer's Definitions
  - Loeb's Minimum Criteria for Initiation of Antibiotics
- Highlight why surveillance is important to reduce unnecessary antibiotics and antibiotic resistance
- Discuss alternatives to antibiotics
- Train staff on internal communication strategies

Stone ND, et al. Infect Control Hosp Epidemiol 2012; 33:965-77.
Loeb M, et al. Infect Control Hosp Epidemiol 2001; 22:120-24.

4. Collecting Surveillance Data

- Performed by trained individuals who understand the definitions and process measures
- Develop a data collection tool to fit a given objective (process vs. outcome)
- Collaborate with IT and use IT resources to support surveillance activities when possible

Smith PW, et al. Infect Control Hosp Epidemiol 2008;29:785-814.
Lee TB, et al. AJIC 2007; 35: 427-40

Tips on Collecting Data

- Maintain a line listing
  - Should be monitored, updated regularly to identify outbreaks, clusters, unusual patterns
  - Cues: antibiotic starts, resident symptoms
- Clear descriptive documentation

Vague	Clear
Fever	Specific temp reading e.g. 100.1 F
Shortness of breath	Respirator rate, oxygen saturation
Cough	Dry cough, cough with sputum

Tips on Collecting Data

- If multiple symptoms present, *document date of onset for each*
- Many definitions require documenting change from baseline: *Establish a baseline!*
- Need to use multiple sources: *EMR, paper charts, pharmacy records, 24 hr logs*
- Clearly document *device* use
- Note *different microbial parameters* used for UTI, CAUTI based on method of collection

NHSN National Healthcare Safety Network

Form Approved
OMB No. 0920-0666
Exp. Date: 12/31/2017
www.cdc.gov/nhsn

Urinary Tract Infection (UTI) for LTCF

*required for saving

*Facility ID:	Event #:
*Resident ID:	*Social Security #:
Medicare number (or comparable railroad insurance number):	
Resident Name, Last: First: Middle:	
*Gender: M F Other	*Date of Birth: ___/___/____
Ethnicity (specify):	Race (specify):

*Resident type: ☐ Short-stay ☐ Long-stay

*Date of First Admission to Facility: __/__/____ *Date of Current Admission to Facility: __/__/____

*Event Type: UTI *Date of Event: __/__/____

*Resident Care Location: _____

*Primary Resident Service Type: (check one)

☐ Long-term general nursing ☐ Long-term dementia ☐ Long-term psychiatric

☐ Skilled nursing/Short-term rehab (subacute) ☐ Ventilator ☐ Bariatric ☐ Hospice/Palliative

*Has resident been transferred from an acute care facility to your facility in the past 3 months? ☐ Yes ☐ No

If Yes, date of last transfer from acute care to your facility: __/__/____

If Yes, did the resident have an indwelling urinary catheter at the time of transfer to your facility? ☐ Yes ☐ No

*Indwelling Urinary Catheter status at time of event onset (check one):

☐ In place ☐ Removed within last 2 calendar days ☐ Not in place

If indwelling urinary catheter status in place or removed within last 2 calendar days:

Site where indwelling urinary catheter Inserted (check one): ☐ Your facility ☐ Acute care hospital ☐ Other ☐ Unknown

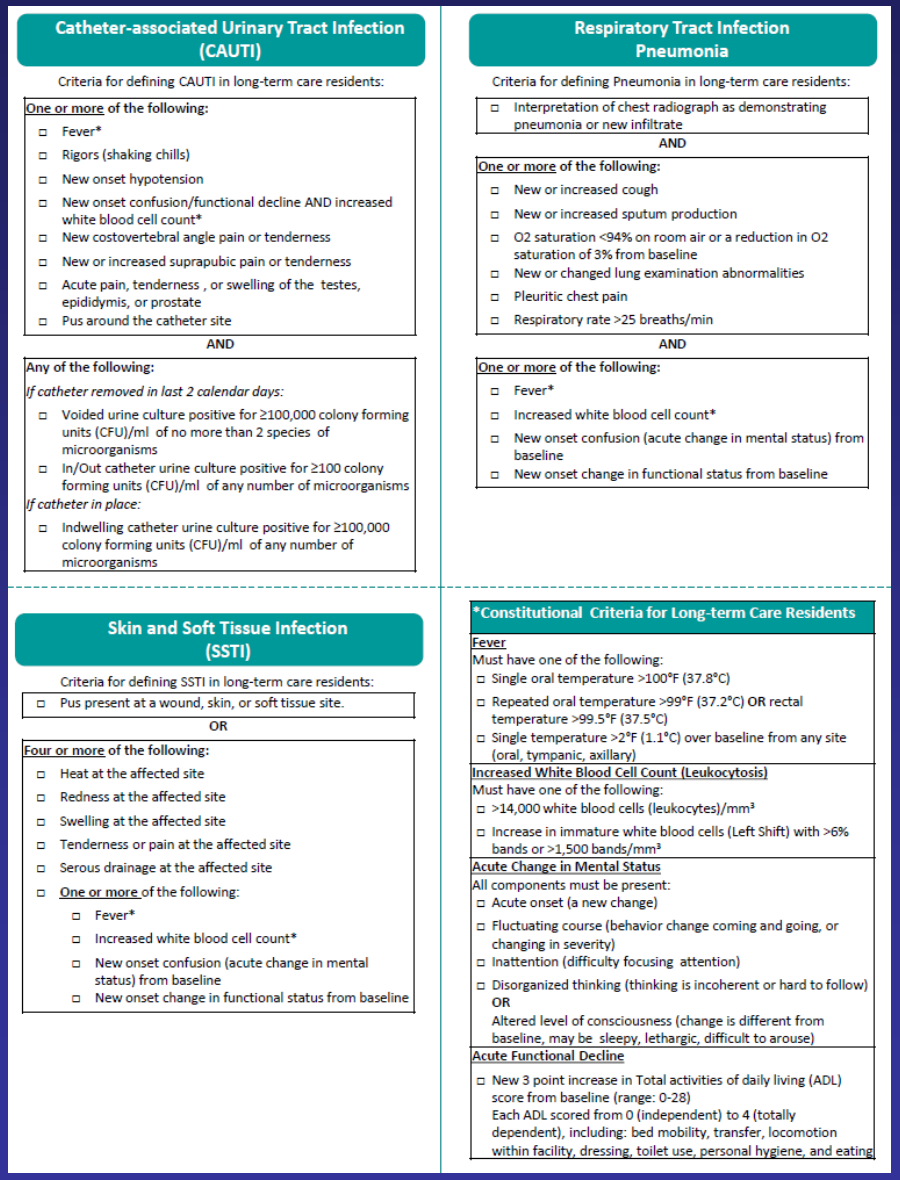
Date of indwelling urinary catheter Insertion: ___/___/____

If indwelling urinary catheter not in place, was another urinary device type present at the time of event onset? ☐ Yes ☐ No

If Yes, other device type: ☐ Suprapubic ☐ Condom (males only) ☐ Intermittent straight catheter

http://www.cdc.gov/nhsn/forms/57.140_uti_ltcf_blank.pdf

Infection Definition Pocket Cards



Catheter-associated Urinary Tract Infection (CAUTI)

Criteria for defining CAUTI in long-term care residents:

One or more of the following:

- ☐ Fever*
- ☐ Rigors (shaking chills)
- ☐ New onset hypotension
- ☐ New onset confusion/functional decline AND increased white blood cell count*
- ☐ New costovertebral angle pain or tenderness
- ☐ New or increased suprapubic pain or tenderness
- ☐ Acute pain, tenderness , or swelling of the testes, epididymis, or prostate
- ☐ Pus around the catheter site

AND

Any of the following:

If catheter removed in last 2 calendar days:

- ☐ Voided urine culture positive for ≥100,000 colony forming units (CFU)/ml of no more than 2 species of microorganisms
- ☐ In/Out catheter urine culture positive for ≥100 colony forming units (CFU)/ml of any number of microorganisms

If catheter in place:

- ☐ Indwelling catheter urine culture positive for ≥100,000 colony forming units (CFU)/ml of any number of microorganisms

Respiratory Tract Infection Pneumonia

Criteria for defining Pneumonia in long-term care residents:

- ☐ Interpretation of chest radiograph as demonstrating pneumonia or new infiltrate

AND

One or more of the following:

- ☐ New or increased cough
- ☐ New or increased sputum production
- ☐ O2 saturation <94% on room air or a reduction in O2 saturation of 3% from baseline
- ☐ New or changed lung examination abnormalities
- ☐ Pleuritic chest pain
- ☐ Respiratory rate >25 breaths/min

AND

One or more of the following:

- ☐ Fever*
- ☐ Increased white blood cell count*
- ☐ New onset confusion (acute change in mental status) from baseline
- ☐ New onset change in functional status from baseline

Skin and Soft Tissue Infection (SSTI)

Criteria for defining SSTI in long-term care residents:

- ☐ Pus present at a wound, skin, or soft tissue site.

OR

Four or more of the following:

- ☐ Heat at the affected site
- ☐ Redness at the affected site
- ☐ Swelling at the affected site
- ☐ Tenderness or pain at the affected site
- ☐ Serous drainage at the affected site
- ☐ One or more of the following:
  - ☐ Fever*
  - ☐ Increased white blood cell count*
  - ☐ New onset confusion (acute change in mental status) from baseline
  - ☐ New onset change in functional status from baseline

***Constitutional Criteria for Long-term Care Residents**

Fever

Must have one of the following:

- ☐ Single oral temperature >100°F (37.8°C)
- ☐ Repeated oral temperature >99°F (37.2°C) OR rectal temperature >99.5°F (37.5°C)
- ☐ Single temperature >2°F (1.1°C) over baseline from any site (oral, tympanic, axillary)

Increased White Blood Cell Count (Leukocytosis)

Must have one of the following:

- ☐ >14,000 white blood cells (leukocytes)/mm³
- ☐ Increase in immature white blood cells (Left Shift) with >6% bands or >1,500 bands/mm³

Acute Change in Mental Status

All components must be present:

- ☐ Acute onset (a new change)
- ☐ Fluctuating course (behavior change coming and going, or changing in severity)
- ☐ Inattention (difficulty focusing attention)
- ☐ Disorganized thinking (thinking is incoherent or hard to follow) OR Altered level of consciousness (change is different from baseline, may be sleepy, lethargic, difficult to arouse)

Acute Functional Decline

- ☐ New 3 point increase in Total activities of daily living (ADL) score from baseline (range: 0-28) Each ADL scored from 0 (independent) to 4 (totally dependent), including: bed mobility, transfer, locomotion within facility, dressing, toilet use, personal hygiene, and eating

Criteria for:

- UTIs
- Pneumonia
- Skin & Soft Tissue Infection

Distribution Strategy:

- Nurse
- Nurse Aide
- Physician
- Director of Nursing
- Administrator

TIP Toolkit, page 137
http://inventions.umich.edu/technologies/6949_targeted-infection-prevention-tip-study-toolkit-implementation-guide

Process Surveillance: Hand Hygiene & PPE Use

Facility:_____

HCW Type Key:
1 = Physician
2 = Physician Assistant/Nurse Practitioner
3 = Registered nurse
4 = Licensed practical nurse
5 = Nurse aide
6 = Physical, occupational, speech therapy
7 = Dietitian
8 = Dietary staff
9 = Environmental services/maintenance
10 = Social worker
11 = Administor/manager

Observation Key:
HR = alcohol hand rub
HW = hand washing
Y = Yes
N = No
NA = not applicable

#	Date	Shift	HCW Type	Hand Hygiene BEFORE Touching Resident				Hand Hygiene AFTER touching resident, environment, or equip.				On Contact Precautions		Glove Worn			Gown Worn		
	(MM/DD/YY)	Day, Eve, Night	See Key	YES HR	YES HW	NO	NA	YES HR	YES HW	NO	N/A	Y	N	Y	N	NA	Y	N	NA
1																			
	Reason for Entry:																		
2																			
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	Reason for Entry:																		

TIP Toolkit, page 154

http://inventions.umich.edu/technologies/6949_targeted-infection-prevention-tip-study-toolkit-implementation-guide

Process Surveillance: Indwelling Urinary Catheter Care

Long-Term Care: Daily Urinary Catheter Maintenance Checklist

Resident Name (print)_____Med Rec #_____Unit _____Date/Time_____

Date of insertion (if known):_____

Inserted by whom: _____ Floor/Unit: _____

I. ROUTINELY ASSESS INDWELLING URINARY CATHETER APPROPRIATENESS/NEED	✓	COMMENTS
1. Is the need for the catheter assessed on a routine basis (e.g. weekly, monthly, etc?) Date Last assessed:__/__/_____		Note Frequency:_____
II. BEFORE CATHETER MAINTENANCE	**✓**	**COMMENTS**
1. Identify the resident per facility policy. Explain the procedure to the resident		
2. Assemble and verify supplies (e.g. wash cloth, soap, basin, clean gloves and consider wearing a gown to protect clothing from contamination or Multi-drug resistant organisms (MDROs)).		
3. Perform hand hygiene using an alcohol-based sanitizer or soap and water immediately before donning gloves to handle catheter and provide care		
III. MAINTENANCE OF INDWELLING CATHETER	**✓**	**COMMENTS**
1. Ensure the order for the catheter and balloon size matches the inserted catheter.		
2. A sterile continuously closed drainage system is intact.		
3. A catheter securement device is in place to prevent catheter movement and urethral traction. Ensure the catheter is inserted into the device.		
4. The catheter and urine collecting tubing is free of obstruction and kinks to maintain an unobstructed urine flow.		
5. Staff practices Standard Precautions, performs hand hygiene and wears clean gloves when handling the catheter, tubing and drainage bag; the wearing a gown can also be used to reduce MDRO clothing contamination.		
6. Assess the resident for any pain or discomfort.		
7. Inspect the meatus for redness, irritation, and drainage.		
8. Assess the catheter where it enters the meatus for encrusted material and drainage.		
9. Clean the meatus with soap and water during daily bathing (do not clean with antiseptics). Remove any encrusted materials on the tubing. Ensure the tubing does not go in and out of the urethra during cleaning.		
10. Ensure that the collecting bag is secured below the level of the bladder at all times and not resting on the floor. Place a cover over the drainage bag to maintain resident dignity.		
11. Assess, if applicable, if the leg bag urine collection device is cleaned/disinfected and stored per policy.		
12. Use a dedicated urine collection device with a resident identifier and date. Avoid splashing, and prevent contact of the drainage spigot with the non-		

AHRQ Safety Program for Long-term Care: HAIs/CAUTI
Mody L, Saint S et al. Clin Infect Dis 2015;61:86-94

5. Analyzing Surveillance Data

- Surveillance data should be presented in standard numerical measures of the outcomes or processes
- Usually these are fractions (numerator/denominator)
  - Numerator=event
  - Denominator=measurement of the population in which the event may occur
  - A constant, “k”, is used to standardize the fractions

Smith PW, et al. Infect Control Hosp Epidemiol 2008;29:785-814.
Lee TB, et al. AJIC 2007;35:427-40

Surveillance Math 101

- Most surveillance data are presented as percentages, rates, or ratios
- When you have snapshots of information you use percentages/ratios (e.g. prevalence data)
- When you want to describe events during a time period at risk, you use a rate (e.g. incidence data)

Surveillance Math 101 (cont.)

- Proportions are calculated by
  - # events (numerator)/ number of residents at risk or opportunities (denominator)
- A percentage is the same calculation x 100 (the standard constant, “k”)
- *Time at risk is not captured in a percent or proportion*

$$= \frac{\text{x (number of infxs)}}{\text{y (residents at risk)}} \times \text{k (constant)}$$

Surveillance Math 101 (cont.)

Calculating percentages

- Example: Hand hygiene compliance
  - 40 instances of performing HH appropriately in 50 total observations
  - 40/50 x 100 = 80% compliance
- Example: Prevalence of urinary catheters among new admissions
  - 3 admits with a urinary catheter in 30 new admissions
  - 3/30 x 100 = 10% catheter prevalence among new admits

Surveillance Math 101 (cont.)

- Rates are calculated for a specific window of time
  - # events (numerator)/ number of resident days at risk (denominator)
- Using a standard constant allows us to compare rates even when the days at risk changes
  - For most infections, k = 1000, so the rate is expressed as events per 1,000 resident days
  - For *C. difficile* infection, k=10,000; CDI events/10,000 resident days

$$= \frac{\text{x (number of infxs)}}{\text{y (“resident days”)}} \times \text{k (constant)}$$

CAUTI Incidence Rate

Example: In your facility, 3 CAUTIs were identified in March. From your data collection efforts, you have identified 3,441 resident days and 186 indwelling urinary catheter days.

CAUTI incidence rate per 1,000 catheter-days

$$\text{CAUTI rate} = \frac{\text{\# CAUTIs identified}}{\text{urinary catheter days}} \times 1{,}000$$

$$\text{CAUTI rate} = \frac{3}{186} \times 1{,}000$$

CAUTI rate = 16.1/1,000 catheter days

CAUTI Population Rate

Example: In your facility, 3 CAUTIs were identified in March. From your data collection efforts, you have identified 3,441 resident days and 186 indwelling urinary catheter days.

CAUTI population incidence rate per 1,000 catheter-days

$$\text{CAUTI pop. rate} = \frac{\text{\# CAUTIs identified}}{\text{urinary catheter days}} \times 1{,}000$$

$$\text{CAUTI pop. rate} = \frac{3}{3{,}441} \times 1{,}000$$

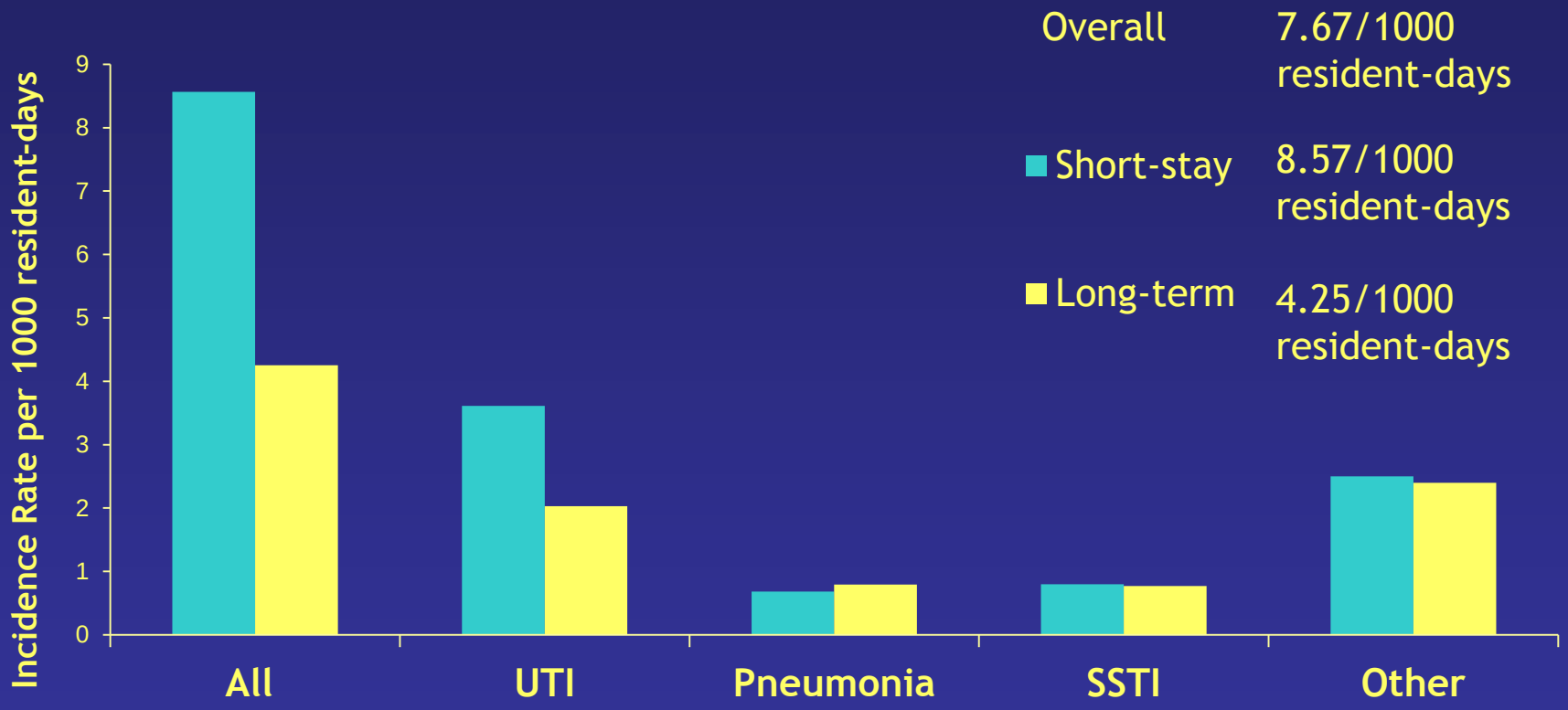
CAUTI Population Rate = 8.7/ 1,000 resident-days

6. Applying Risk Stratification

- Within a facility, residents with certain characteristics may impact their likelihood of developing an infection
  - e.g. post-acute care patient vs. long-stay resident
- When you stratify, the resident population is divided into groups with similar risk factors, and you can calculate infection rates for each group separately

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

Infection Rates in NH: Short-stay vs. Long-term Residents



Mody, L. Pathways Study, 2015-current

Applying Risk Stratification (cont)

- Risk of a UTI is different for residents with an indwelling urinary catheter vs. those without
- Instead of reporting one total rate of UTIs for the facility/unit you might report two rates:
  - UTI in residents with a urinary catheter
  - UTI in residents without a catheter

Indwelling Devices: added risk of infection

	No. of residents with UTI	Follow-up time (resident-days)	Rate (per 1000 resident-days)
No Catheter (n=88)	54	19320	2.8
Urinary catheter (n=48)	35	3840	9.1

Nicolle L, Antimicrobial resistance and Infection Control 2014
Wang et al. Eur J Clin Microbiol Infect Dis 2012; 31:1797-804.

7. Reporting and Using Data

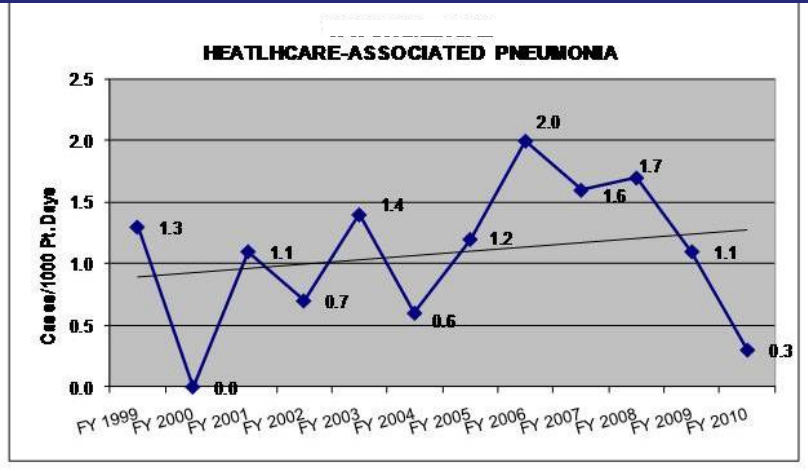
Goal of HAI and process surveillance is to impact staff behavior to improve outcomes

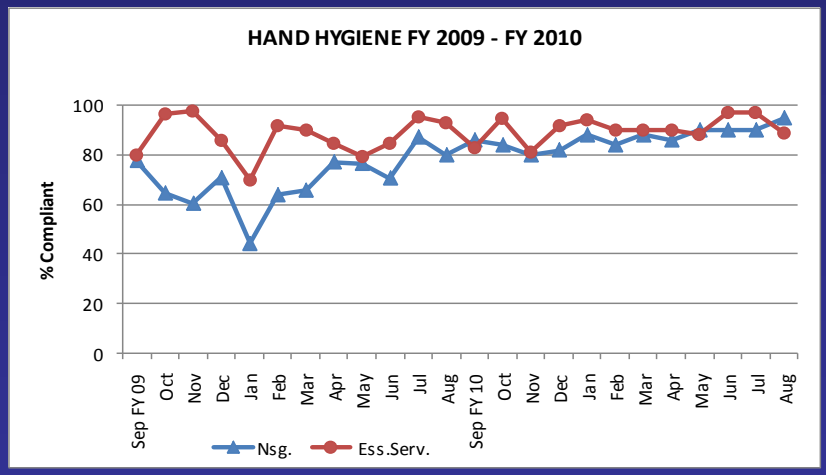
- Change won't happen unless you share your data with staff/providers and leadership
- Have a strategy for providing monthly or quarterly surveillance results for your facility staff/providers
  - Present it in a way that is easily understood
  - Highlight the processes of care that will improve outcomes
  - Sharing data in a timely manner will increase awareness and highlight teaching opportunities for staff/providers

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

Strategies for Sharing Information

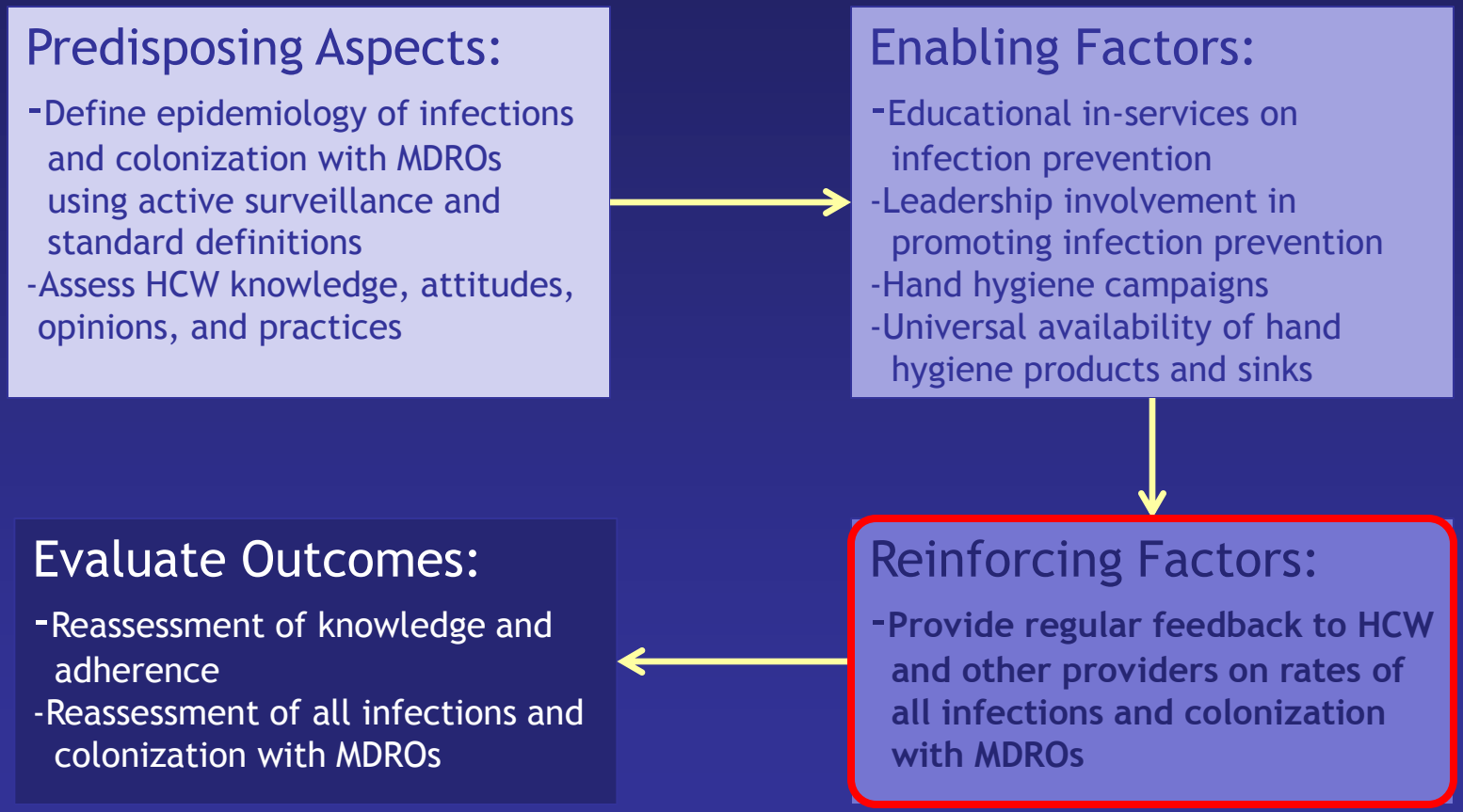
- Keeping infection surveillance data in an electronic spreadsheet enables you to create graphs
- Can provide rates for specific infections or trends in process measure compliance





- Can provide a mixture of unit-specific information or facility-wide data depending on the infection or process

PRECEDE Model to conduct surveillance in High Risk Groups



Mody L, et al. Clin Infect Dis 2011;52:654-661.

AHRQ Safety Program for Long-term Care: HAIs/CAUTI

QUALITY IMPROVEMENT INVITED ARTICLE

Trish M. Perl, Section Editor

Enhancing Resident Safety by Preventing Healthcare-Associated Infection: A National Initiative to Reduce Catheter-Associated Urinary Tract Infections in Nursing Homes

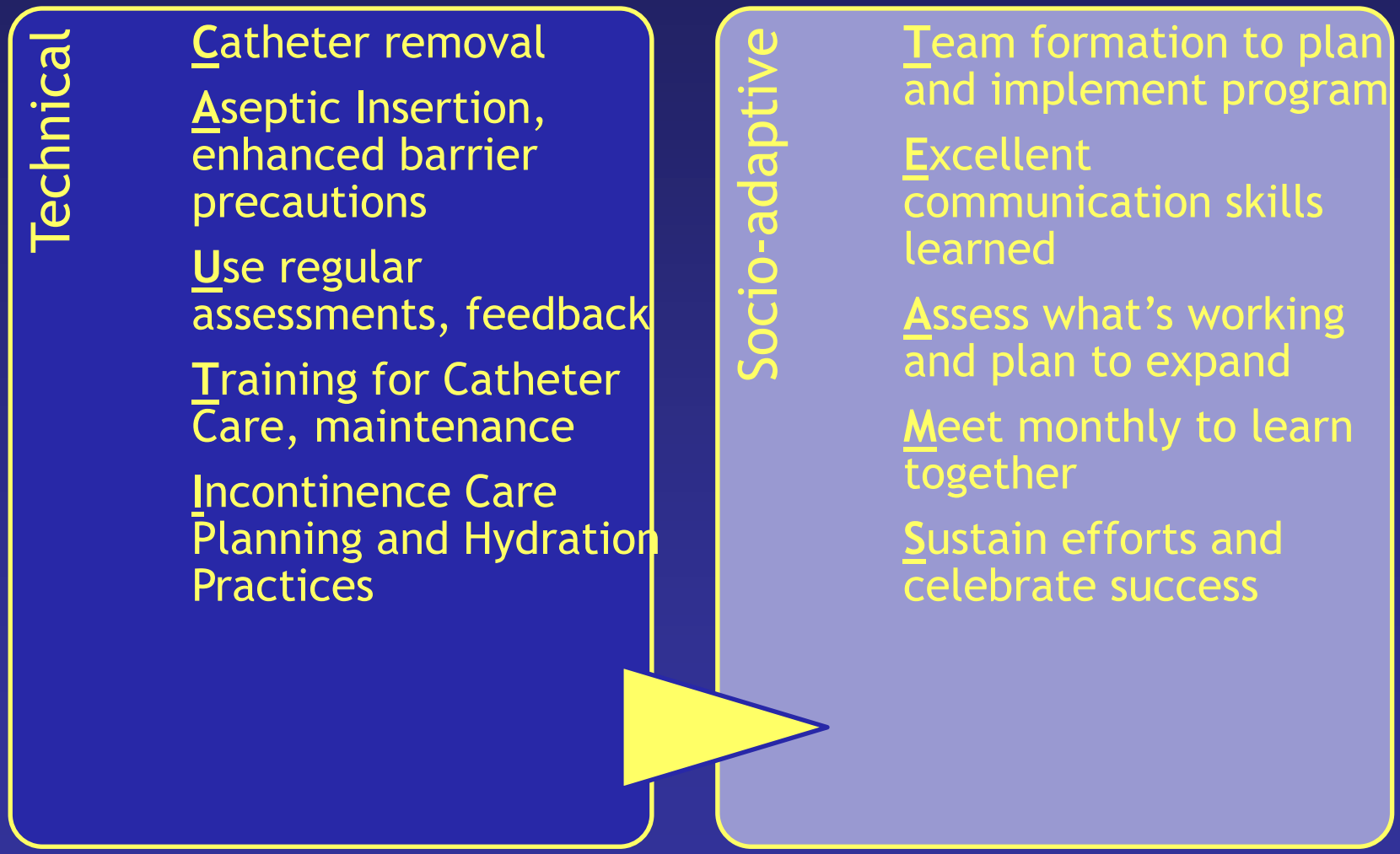
Lona Mody,[1,2] Jennifer Meddings,[3,4] Barbara S. Edson,[5] Sara E. McNamara,[2] Barbara W. Trautner,[6,7] Nimalie D. Stone,[8] Sarah L. Krein,[3,9] and Sanjay Saint[3,9,10]

Program Goals:

- Reduce CAUTI
- Enhance knowledge
- Improve safety culture

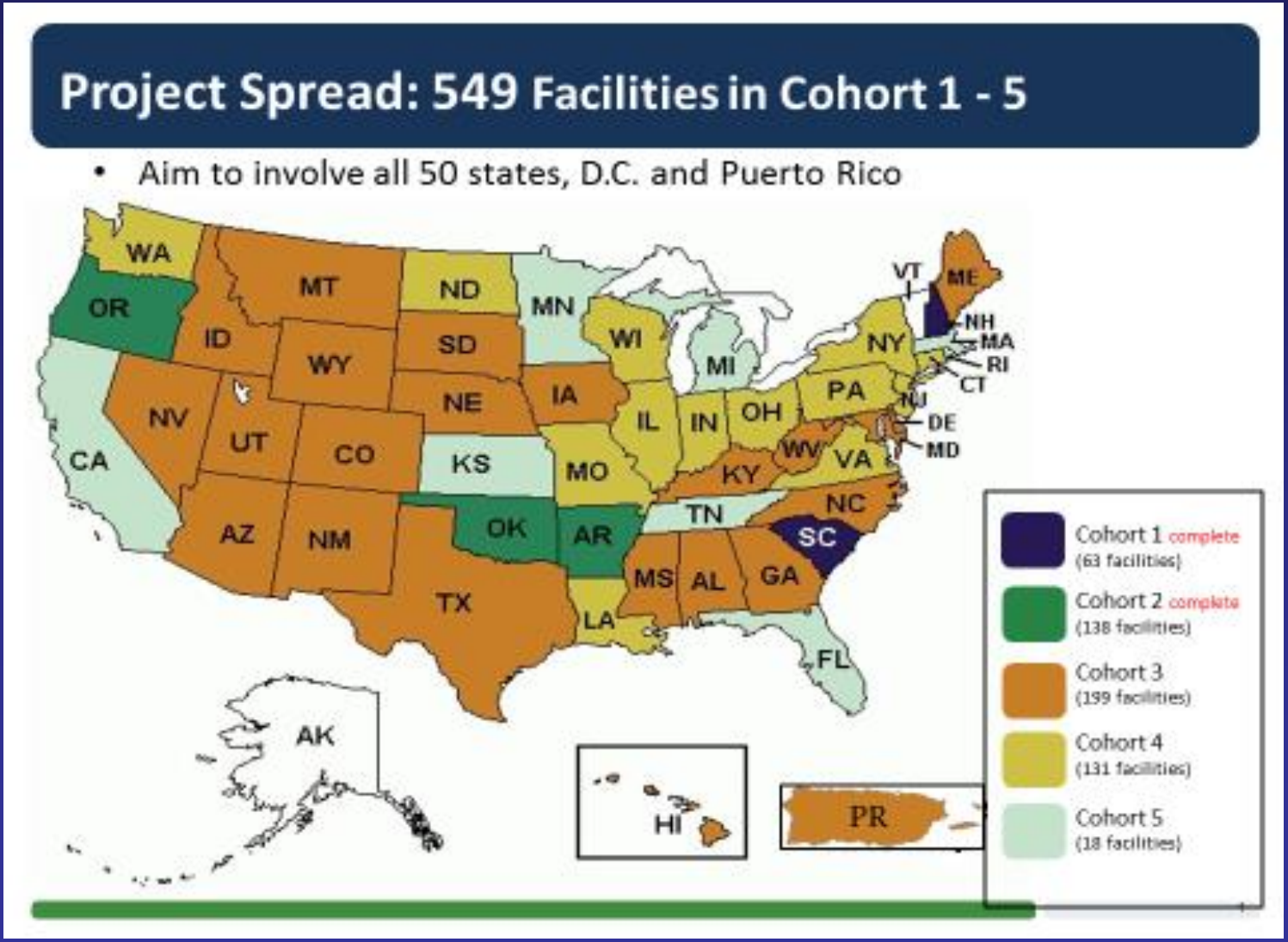
Mody L, Saint S et al. Clin Infect Dis 2015;61:86-94

Merging Technical and Socio-adaptive Interventions



Mody L, et al. Clin Infect Dis 2015;61:86-94

Project Spread



Operationalizing our Intervention

- **Educational events**
  - 4 Onboarding Webinars
  - 4 Training Module Webinars
  - Monthly Content Webinars
  - 3 Learning Sessions (in-person or web-based)
  - Site visits
- **Monthly Coaching support:** Project implementation experts and faculty on web conferences
- **Data:** Secure, online data collection and reporting of clinical and cultural outcome measures, user's manual
- **Data feedback**

Mody L, et al. Clin Infect Dis 2015;61:86-94

Outcome Measures

- Facility collects the following outcome measures
  - Daily # residents
  - Daily # residents with an indwelling catheter
  - # residents with a CAUTI (per NHSN definition)
  - Monthly # of urine cultures ordered
- Enters the data [at a minimum] monthly
- Skills questionnaire
- Facility culture assessment
- Results coming soon!: Project period, 2013-2016

Mody L, et al. Clin Infect Dis 2015;61:86-94

National Infection Reporting System

- CDC managed web-based data system designed for healthcare facility reporting of infections
- Developed over long-history of surveillance activity with partner hospitals
  - Standardized infection definitions
  - Focused primarily on high-risk situations
    - Device exposure, MDROs
- Recently, have been tailoring reporting tools for distinct healthcare providers (e.g. dialysis, long-term care)

Impact of a national System

- Standardizes and validates surveillance definitions
- Allows for fair comparison of rates by facility characteristics and/or resident characteristics
- Provides national rates for facilities to use as a benchmark for assessing their own rates and prevention efforts
- Over time will demonstrate trends in improvements and/or areas of new need

Summary

- Infection surveillance in NHs is critical to understanding the burden of infections, trends in rates over time, and the impact of prevention programs
- Conducting surveillance in NH can be challenging
  - Use appropriate, standardized infection definitions
  - Proper training for IPs
  - Dedicated time for surveillance activities
- NHSN provides a national collaborative for standardized definitions, benchmarking for infections