Nebraska Antibiotic Stewardship Summit
August 12, 2022

Relationship between Non-Localizing Signs/Symptoms and Infection in Nursing Homes

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Disclosures

- None

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Objectives

- Review the individual and population-level consequences of inappropriate antibiotic use in nursing homes
- Factors contributing to sub-optimal antibiotic decision-making
- Non-localizing symptoms as an indicator of infection
- Wisconsin UTI Toolkit

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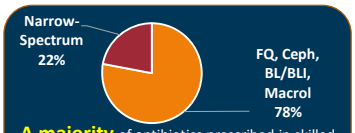
Antibiotic overuse is a major problem in NHs

Up to **70%** of skilled nursing facility residents will receive **one or more** courses of systemic antibiotics in a year

~50% of antibiotics started in skilled nursing facilities are **unnecessary**



A majority of antibiotics prescribed in skilled nursing facilities **are broad-spectrum**

50% < 7d > 50%

Half of antibiotic course for treatment of common infections are prescribed for **more than a week.**

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Antibiotic overuse is a major problem in NHs

HARMS AT INDIVIDUAL LEVEL

ADE
- 20% of all adverse drug events (ADEs) in nursing homes caused by antibiotics
- Antibiotic-associated ADEs are one of the most common reasons for transfer to ER

CDI
- *C. difficile* infection (CDI) is a life-threatening intestinal disease caused by antibiotics
- 12% of nursing home residents treated inappropriately for UTI develop CDI

ARO
- ~50% of nursing residents are colonized with antibiotic-resistant organisms (AROs)
- Antibiotic exposure is the single most important risk factor for ARO colonization

HARMS AT FACILITY LEVEL

Residents in nursing homes with higher antibiotic use have a **24% increased risk** of antibiotic-related harm

Antibiotics account for **1/3 of all survey penalties** for inappropriate medication use in Wisconsin nursing homes

HARMS AT POPULATION LEVEL

- Half of the residents transferred to the hospital are colonized with *C. difficile* and/or antibiotic-resistant bacteria which may be spread to others
- Nursing homes have been repeatedly implicated in the regional spread of resistance
- Mathematical models suggest that antibiotic resistance cannot be controlled in hospitals without controlling resistance in nursing homes

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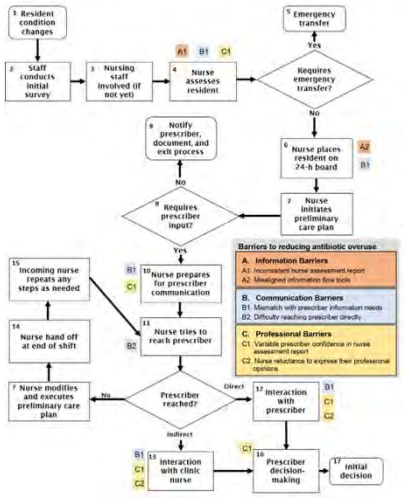
Antibiotic Prescribing in Nursing Homes



Ramly et al. *J Am Geratr Soc* 2020; 68: 2222-31

- A process with multiple steps
- Nursing staff play a central role
- Involves multiple decisions
- Post-prescriptive review is uncommon
- Levels of diagnostic uncertainty are high

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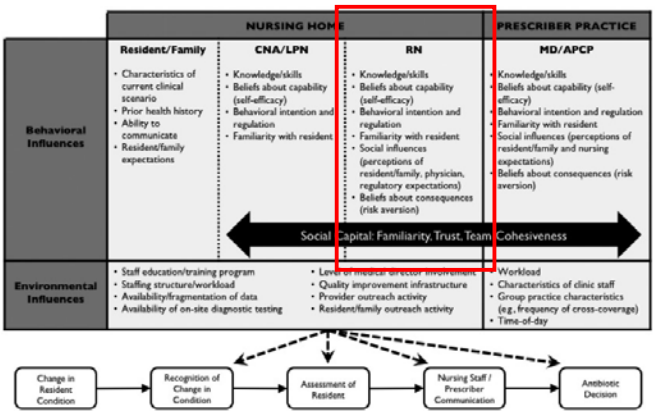
Antibiotic Prescribing in Nursing Homes



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McElligott et al. *Infect Dis Clin N Am* 2017; 31(4): 619-38
Fleming et al. *BMJ Open* 2014; 4(11): e006442
Schweizer *Pharm World Sci* 2005; 27(3): 159-65
Walker et al. *CMAJ* 2000; 163(3): 273-77

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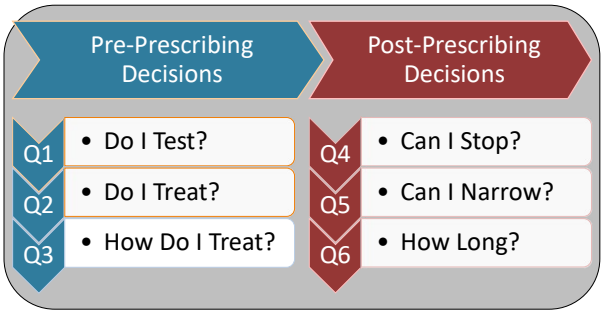

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Tamma et al. *JAMA* 2019; 321(2): 139-40

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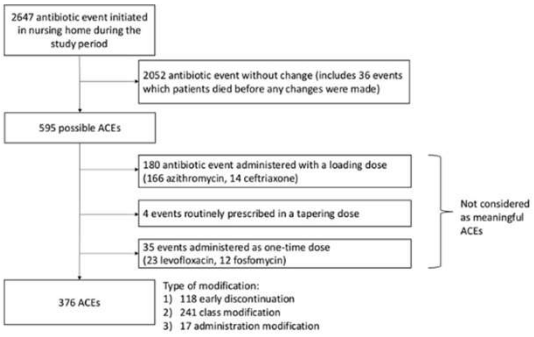
Antibiotic Prescribing in Nursing Homes



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Liao et al. *Infect Control Hosp Epidemiol* 2020; 41: 635-40
Lagenstroer et al. *Infect Control Hosp Epidemiol* 2022 (accepted for publication)

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Antibiotic Prescribing in Nursing Homes

Infection Control & Hospital Epidemiology (2022), **43**, 417-426
doi:10.1017/ice.2020.1282

SHEA

SHEA Document

Reliability of nonlocalizing signs and symptoms as indicators of the presence of infection in nursing-home residents

Theresa A. Rowe DO, MS[1], Robin L.P. Jump MD, PhD[2,3], Bjørg Marit Andersen MD, PhD[4], David B. Banach MD, MPH, MS[5], Kristina A. Bryant MD[6], Sarah B. Doernberg MD, MAS[7], Mark Loeb MD, MSc[8], Daniel J. Morgan MD, MS[9], Andrew M. Morris MD, SM(Epi)[10], Rekha K. Murthy MD[11], David A. Nace MD, MPH[12] and Christopher J. Crnich MD, PhD[13,14]

Presenting Clinical Feature	Responses/Total Respondents (%)
Noncatheterized patients	
Change in mental status*	57/63 (90)
Fever	48/63 (76)
Change in mental status and fever	44/63 (70)
Change in voiding pattern†	41/63 (65)
Dysuria	40/63 (63)
Change in character of urine‡	37/63 (59)
Change in mental status, fever, and change in voiding pattern	28/63 (48)
Catheterized patients	
Change in character of urine‡	50/63 (79)
Fever	49/63 (78)
Change in mental status*	48/63 (76)

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Rowe et al. *Infect Control Hosp Epidemiol* 2022; 43: 417-26
Juthani-Mehta et al. *J Am Geriatr Soc* 2005; 53: 1986-90
D'Agata et al. *J Am Geriatr Soc* 2013; 61: 62-66

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Problem: Non-localizing signs/symptoms are not specific for infection

Medications (e.g., opiates)	Sleep deprivation	Low oxygen (CHF, COPD)
Dehydration	Hypoglycemia	High carbon dioxide (COPD)
Pain	Electrolyte imbalance	Stroke
Constipation	Depression	Seizure

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Developmental Timeline

- Q2_16: Society for Healthcare Epidemiology of America (SHEA) Long-Term Care Special Interest Group (LTC-SIG) recommend an update to the Loeb Minimum Criteria.
- Q3_17: SHEA Guidelines Committee approval
- Q1_18: Expert panel convened
- Q2/3_18: **Expert panel decides to conduct an evaluation of the reliability of non-localizing signs and symptoms before revising individual syndromic criteria (e.g., UTI)**

  Expert panel identifies nine non-localizing signs/symptoms to be included in the review

  Literature search (01/01/1990 to 06/30/2018) conducted
- Q4_18-Q2_19 Expert panel meets six times to review literature and grade reliability of the nine non-localizing signs/symptoms
- Q3/4_19 Manuscript writing
- Q1/3_20 Expert guidance endorsed by AMDA, AMMI Canada, IDSA and SIDP
- Q4_20 Manuscript accepted for publication

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Methodological Approach

- Literature search
  - Articles selected based on affirmative review of abstracts by two panelists
  - Third reviewer adjudicated any discrepancies
- Two types of PICO (population, intervention, control and outcomes)-like questions were developed at applied to the specified non-localizing signs/symptoms:
  - Q1: "*What criteria should clinicians use to identify the presence of [non-localizing sign/symptom]?*"
  - Q2: "*Should identification of [non-localizing sign/symptom] prompt further evaluation for infection?*"
- Development of expert guidance
  - Step 1: Two panelists developed draft answers based on review and interpretation of published manuscripts recovered from the literature search
  - Step 2: Full panel met to discuss and revise the proposed criteria during 6 one-hour meetings
  - Step 3: Panelists voted anonymously accept criteria (Q1) and whether their presence justified a search for infection (Q2)
  - Step 4: Signs/symptoms that did not achieve unanimous agreement were discussed and further revised during additional meetings
  - Step 5: Guidance document written by chair (CJC) and the two co-chairs (TAR & RLPJ)
  - Step 6: Panel reviewed and provided additional edits
  - Step 7: Final draft sent out to societies for review and endorsement (AMDA, AMMI Canada, IDSA, NADONA, SHEA, SIDP
  - Step 8: Endorsed final draft published in *Infect Control Hosp Epidemiol*

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Intended Use

- Is a guidance document and not a guideline that should be used for survey deficiency application purposes
- Use limited to the adult skilled nursing facility population (may have some utility in ALFs)
- Serve as a foundation for an update to the Loeb Minimum Criteria which will assist clinicians with antibiotic initiation decision-making
- Establish which non-localizing signs/symptoms justify further evaluation for infection, <u>when present in isolation</u>
  - **Higher Likelihood:** further evaluation for infection recommended
  - **Lower Likelihood:** active monitoring recommended

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Approach to Higher Likelihood Presentation

- Obtain full set of vital signs
- Perform a careful primary assessment looking for localizing signs/symptoms (e.g., dysuria) suggestive of a common infection ("PUS")
- Consider non-infectious origin for the non-localizing sign/symptom when present in isolation
- Obtain a CBC with differential
- Order additional diagnostic tests based on the findings of the primary assessment (avoid reflexive chest x-ray and pan-culture)

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Approach to Lower Likelihood Presentation

- Obtain full set of vital signs
- Perform a careful primary assessment looking for localizing signs/symptoms (e.g., dysuria) of common infections ("PUS")
- Initiate active monitoring if the lower likelihood sign/symptom is present in isolation
  - More frequent vital sign measurements
  - More frequent nursing assessments
  - Encourage increased oral fluid intake
- Do not perform additional testing or initiate antibiotic treatment unless additional findings emerge during active monitoring

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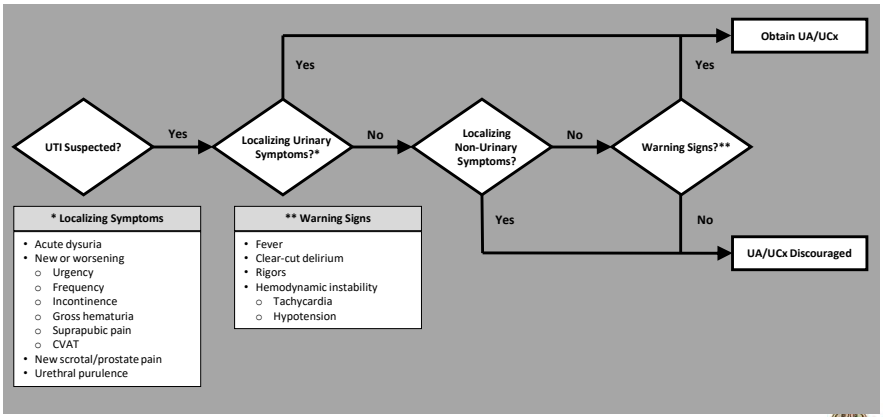
Example of Conceptual Approach

- Reduce reflexive use of dipstick
- Limit UA/Ucx to situations were UTI reasonably likely



Drinka & Crnich, *Ann Long Term Care* 2014; 22(9)

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Signs/Symptoms that should prompt further evaluation for infection - 1

New-Onset Symptom, Presenting in Isolation	Evaluate Further for Infection?	Potential Non-Infectious Causes	Next Steps and/or Active Monitoring	Components of Evaluation for Infection
Fever • A single temperature of >100°F (>37.8°C) or • Repeated temperatures of >99°F (>37.2°C) or • An increase in temperature of >2°F (>1.1°C) over the resident's baseline non-illness temperature.	Yes	• High environmental temperature, including clothing/blankets • Medications that trigger febrile episode (e.g. selective serotonin reuptake inhibitors)	• Take temperature again using the same method • Avoid indiscriminate diagnostic testing • Offer increased hydration and, when possible, antipyretics	• Complete blood count (CBC) and differential • Diagnostic testing based on whether resident has additional signs and symptoms that support a diagnosis at a particular anatomic location (e.g. urine, blood, and chest images) • Broader diagnostic evaluation in residents with isolated fever, and particularly those with advanced dementia

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Signs/Symptoms that should prompt further evaluation for infection - 2

New-Onset Symptom, Presenting in Isolation	Evaluate Further for Infection?	Potential Non-Infectious Causes	Next Steps and/or Active Monitoring	Components of Evaluation for Infection
Hypothermia • Two or more temperature measurements ≤95.9°F (≤36.0°C)[47] or • Two or more temperature measurements documenting a decrease in temperature of >2°F (>1.1°C) from the resident's baseline non-illness temperature.	**Yes**	• Low environmental temperature • Diabetes • Hypothyroidism • Head injury • Drug ingestions	Take temperature again using the same method within several hours	Sepsis is a commonly identified trigger of hypothermia. Clinicians should perform a diagnostic evaluation to identify the cause of hypothermia.
Hypotension • Systolic blood pressure of <90 mmHg or <100 mmHg or • Decrease in systolic blood pressure of 40 mmHg or 50% from baseline or • Mean arterial pressure or <60, <65, or <70 mmHg.[55]	**Yes**	• Post-prandial orthostatic hypotension • Medication-induced orthostatic hypotension	Assess if hypotension may be post-prandial or medication-induced	Several studies associate low-blood pressure with poor outcomes. Clinicians should perform a diagnostic evaluation to identify the cause of hypotension.

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Signs/Symptoms that <u>should</u> prompt further evaluation for infection - 3

New-Onset Symptom, Presenting in Isolation	Evaluate Further for Infection?	Potential Non-Infectious Causes	Next Steps and/or Active Monitoring	Components of Evaluation for Infection
Hyperglycemia	**Yes**	• Changes to medication • Changes to diet • Baseline pattern of glycemic control	Individualized approach to assess whether hyperglycemia is abnormal, including assessing medication regimen, recent dietary patterns, and baseline pattern of glycemic control	Because a relationship exists between physiological stress and hyperglycemia in patients with known diabetes and critically ill patients with relative underlying insulin-resistance, evaluate for infection if non-infectious causes are not otherwise explained by medication and diet
• No Recommendation				
Delirium	**Yes**	• Medications • Metabolic disorders	Not applicable to delirium identified by CAM	Residents who develop delirium have higher risk of loss of functional status, hospitalization, and death; therefore, evaluate for infection especially if another trigger for delirium is not readily identified
• The presence of acute change in mental status with fluctuating discourse and • Inattention and either of the following: • Disorganized thinking or • Altered level of consciousness.				

Signs/Symptoms that <u>should not</u> prompt further evaluation for infection - 1

New-Onset Symptom, Presenting in Isolation	Evaluate Further for Infection?	Potential Non-Infectious Causes	Next Steps and/or Active Monitoring
Behavior Changes Exclusive of Delirium	**No**	Numerous possible infectious and non-infectious causes for myriad potential manifestations, e.g. functional decline, loss of appetite, "not being one's self," agitation, weight loss, weakness, lethargy, apathy, etc. A change in behavior in and of itself is not specific enough to trigger a work-up for infection.	• CAM to rule out delirium • Active monitoring for hemodynamically stable patients • Attempt hydration • Evaluate medications for possible interactions or adverse effects • Further evaluation if additional, more specific signs and symptoms develop
Functional Decline	**No**	Decline in activities of daily living (ADLs) can be both risk factors and consequences of infection. Non-infectious reasons for functional decline include stroke, hip fracture, and congestive heart failure.	Actively monitor residents with abrupt functional decline

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Signs/Symptoms that should not prompt further evaluation for infection - 2

New-Onset Symptom, Presenting in Isolation	Evaluate Further for Infection?	Potential Non-Infectious Causes	Next Steps and/or Active Monitoring
Falls	No	Insufficient evidence exists to link infectious conditions, e.g. pneumonia, to falls. Patients cultured for UTI following a fall are as likely to have positive urine as those who did not experience a fall.	Not applicable
Anorexia	No	Medication	Actively monitor residents with new-onset anorexia

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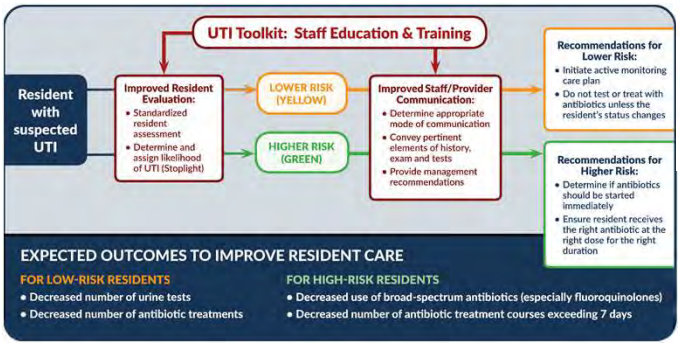
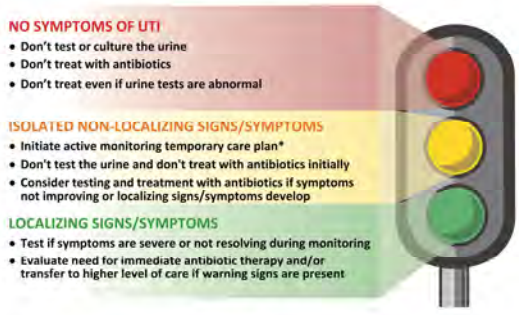
The Wisconsin Long-Term UTI Toolkit





R2. Monitoring and Supportive Care Orders

- ☐ Monitor vital signs every ____ hours
- ☐ Oral fluids for hydration: ____ cc ____ hr.
- ☐ IV fluids for hydration ____ cc ____ hr.
- ☐ Monitor fluid intake/urine output every ___ hours
- ☐ Notify provider if symptoms worsen or if unresolved in ____ hours / days
- ☐ Other orders: _____

Wisconsin Long-Term Care Urinary Tract Infection Toolkit

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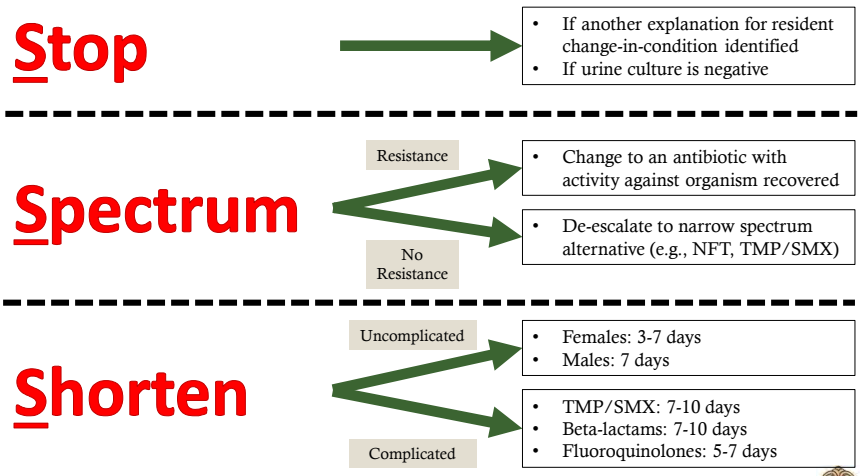
The 3 "S's" of the Antibiotic Timeout



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IMUNIFI Study Results

- Aggregate reductions in urine culture orders (0.84), antibiotic starts (0.82), antibiotic days (0.83), fluoroquinolone starts (0.73) and fluoroquinolone days (0.69) observed across the study sites.
- No significant difference between facilities receiving standard versus enhanced implementation approaches

Post-Implementation Periods

	Period 1 (before COVID-19)			Period 2 (after COVID-19)		
	Control (Mean)	Intervention (Mean)	*P*-value	Control (Mean)	Intervention (Mean)	*P*-value
Urine Cultures (per 1,000 rdays)	1.17	1.03	0.33	1.25	0.88	0.02
Antibiotic Starts (per 1,000 rdays)	0.97	0.93	0.75	1.12	0.86	0.08
Days of Therapy (per 1,000 rdays)	8.92	7.48	0.25	9.57	7.54	0.16

Ford et al. *IDWeek 2021*

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Questions?

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