ASK AN IP: December 2025

Urinary Tract Infections

Diagnostic Stewardship

Antibiotic Stewardship

Antibiograms

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Outline of Discussion

Diagnostic Stewardship (DS) and Antibiotic Stewardship (AS)

- Review general principles
- Review steps in performing DS and AS for UTIs in LTCF
  - LA County resource for IPs and Nurses

Antibiograms

- Culture processing
- Development and challenges
- How to use for determining empiric therapy

Diagnostic Stewardship

Diagnostic stewardship is the term for efforts aimed at improving clinicians' testing choices and interpretation of test results to improve accuracy and reduce the risk of unnecessary testing and subsequent treatment

Infection Control & Hospital Epidemiology (2025), 1–28
JAMA 2017;318;(7):607-608. doi:10.1001/jama.2017.8531
CID 2022 Mar 1;74(4):723-728. doi: 10.1093/cid/ciab672.

For urinary tract infections the focus of diagnostic stewardship is to reduce the treatment of asymptomatic bacteriuria (urinary colonization with bacteria without an infection) – BIG MISUSE of ANTIBIOTICS!

Diagnostic Stewardship vs Antibiotic Stewardship for ASB

JAMA Internal Medicine September 2023 Volume 183, Number 9

County of Los Angeles Public Health

Michigan three-year statewide hospital initiative

Implemented best practices for diagnostic stewardship and antibiotic stewardship to reduce treatment of ASymptomatic Bacteriuria (ASB): 50/92 hospitals participated

Aim: compare the relative impact of diagnostic stewardship vs antibiotic stewardship on treatment for ASB

Results:

- Overall:
  - Among all ASB cases, **treatment for ASB decreased**: 29.1% to 17.1% (P < .001)
  - Avoidance of 3540 antibiotic days-of-therapy (DOTs)

- **Antibiotic Stewardship best practices: <u>minimal impact</u>**
  - Among cases diagnosed with ASB:
    - # of antibiotic treatment courses didn't decrease: 82.0% to 76.3% (P = .09)
    - treatment duration didn't decrease: 6.4 days to 5.9 days (P = .045)

- **Diagnostic Stewardship best practices: <u>significant impact</u>**
  - ASB diagnosis declined from 34.1% to 22.5% (P < .001)

Diagnostic Stewardship was associated with <u>better</u> outcomes in reducing antibiotic use for ASB than Antimicrobial Stewardship.

Diagnostic Stewardship Best Practices: ASB

County of Los Angeles Public Health

DIAGNOSTIC STEWARDSHIP: hospital

Prescriber UC ordering plays a key role

- Remove UC: pre-op order set
- Remove UC: ED order sets
- Remove UC: admission order sets
- Added or removed Reflex UA to UC
- UC microbiology lab messaging

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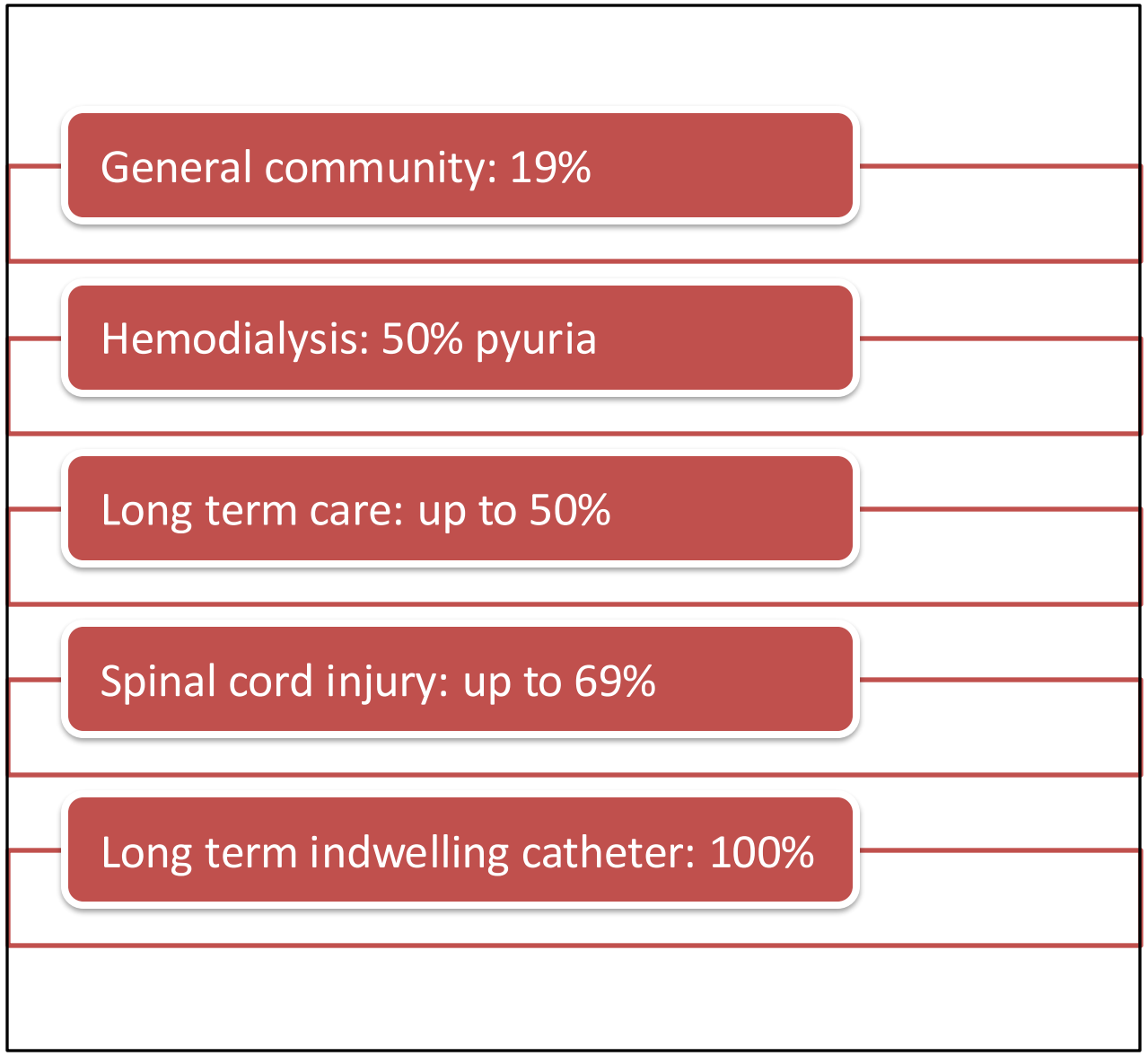
DIAGNOSTIC STEWARDSHIP Long term care

Nurses play a key role

- Patient assessments by nurses for UTI symptoms and identifying other causes for non-specific symptoms
- Familiarize staff with the **Loeb Criteria**
- Improve prescriber communication using an SBAR form

Courtesy CDPH, SDHD

Prevalence of bacterial colonization in urine is high



- Bacteria live on the skin, GI tract and urinary tract without producing any signs of illness or infection.
- In the urinary tract, 50% of long-term care residents and up to 100% of residents with chronic indwelling catheters are colonized with bacteria in the urine.
- **Because colonization is so common in elderly and LTC patients, a positive urine culture does not confirm that the resident has a UTI.**
- **LTC and elderly patients are at high risk for overtreatment with antibiotics and, experience more adverse events, and antibiotic resistance**

eIDSA 2019 Clinical Practice Guideline for the Management of Asymptomatic Bacteriuria 2019:68 (15 May); AJKD Volume 21, Issue 2, February 1993, Pages 180-183

Preferred criteria for treatment: Loeb criteria

Loeb Criteria

Preferred criteria in LTC for making a clinical decision to test and treat for UTI per IDSA, AMDA, SHEA

Suspected Urinary Tract Infection (UTI) in Long-Term Care Residents

AHRQ Agency for Healthcare Research and Quality

Signs & Symptoms of a UTI

For Residents Without a Urinary Catheter

- ☐ Dysuria

OR

- ☐ Fever (>100°F or >2°F above baseline)

AND at least one of the following symptoms that is new or worsening:

- ☐ Urgency
- ☐ Frequency
- ☐ Suprapubic pain
- ☐ Gross hematuria
- ☐ Costovertebral angle tenderness

For Residents With a Urinary Catheter or if Nonverbal

One or more of the following ***without another recognized cause***:

- ☐ Fever (>100°F or a 2°F increase from baseline)
- ☐ New costovertebral angle tenderness
- ☐ Rigors
- ☐ New-onset delirium*

**If adequate workup for other causes of delirium has been performed and no other cause for delirium is identified*

Loeb M, Bentley DW, Bradley S, et al. Development of minimum criteria for the initiation of antibiotics in residents of long-term-care facilities: Results of a consensus conference. Infect Control Hosp Epidemiol 2001;22:120-4. https://www.ahrq.gov/sites/default/files/wysiwyg/antibiotic-use/long-term-care/poster-4x6-UTI.pdf

McGeer vs Loeb Criteria (preferred for clinical decision)

County of Los Angeles Public Health

Feature	McGeer Criteria	Loeb Criteria
Purpose	Infection surveillance: To count and track the actual incidence of infections.	Clinical decision-making: To help clinicians decide when to initiate antibiotic therapy.
Application	Retrospective: Used after the fact, often with diagnostic confirmation like positive lab cultures.	Prospective: Used at the point of care, even before lab results are available.
Requirements	Often requires specific signs, symptoms, and diagnostic test results to confirm an infection.	Requires a minimum set of signs and symptoms, but may not need lab confirmation to indicate a likely infection.
Goal	To increase the likelihood that all reported infections are true infections.	To err on the side of caution and treat likely infections, even if not definitively confirmed by a lab.

Infection Control and Hospital Epidemiology2022 Jul;43(7):860-863. doi: 10.1017/ice.2021.221. 2021 Jun 21.

Myth 1: Urine is cloudy and smells bad = UTI
Myth 2: Urine has bacteria = UTI
Myth 3: Bacteria in a catheterized urine sample = UTI
Myth 4: Urine has a positive leukocyte esterase = UTI
Myth 5: Urine has pyuria (WBC) = UTI
Myth 6: Urine has nitrites present = UTI
Myth 7: Urine has > 5 squamous epithelial cells/hpf with a positive urine culture → Disregard the epithelial cell count and treat the UTI
Myth 8: Asymptomatic bacteriuria will progress to UTI
Myth 9: Falls and acute altered mental status changes in the elderly = UTI
Myth 10: Yeast or *Candida spp.* in the urine (especially in patients with indwelling urinary catheters) = *Candida* UTI

Myths: findings suggestive of a UTI

- May be positive or present for other reasons instead of UTI
- Presence should not replace UTI symptoms for a decision to test and treat

Schulz L. Top Ten Myths Regarding the Diagnosis and Treatment of Urinary Tract Infections. J Emerg Med 2016;51:25-30 (Adapted by SDHD)

Antibiotic Stewardship

Antimicrobial stewardship is the term used for efforts to mitigate the development of antimicrobial resistance to improve outcomes through selection of appropriate antimicrobial treatments and durations for treatment.

Multisociety guidance for infection prevention and control in nursing homes
Infection Control & Hospital Epidemiology (2025), 1–28 doi:10.1017/ice.2025.10252

How Are Antibiotics Misused by Prescribers?

County of Los Angeles Public Health

No Infection or "just-in-case" of infection

- Colonization vs Infection (e.g., asymptomatic bacteriuria)
- Use for fear of missing something despite limited evidence of infection

Treatment duration too long

- A few extra days won't hurt (not evidence-based)
- Need to complete a course to be effective and prevent resistance (UTI: 3-7 days, exception: pyelo)

Treatment is overly broad-spectrum
(use of an antibiotic or combinations that kill too many bacteria)

- Over-estimating risk of MDRO (e.g. *Pseudomonas aeruginosa*)
- Over-estimating immune compromise
- Not consistent with antibiogram or local susceptibility rates

Antibiotic Stewardship Actions to Address Misuse

- Daily, near daily review of antibiotics (targeted or all antibiotics)
  - *Prospective audit and feedback (PAF)*
    - Time-out after 48-72 hours: re-evaluate the patient (symptoms, lab/culture) make sure antibiotics are needed still and appropriately selected, tailored to culture results
    - Time-out after 5-7 days: confirm there is a plan to discontinue by 5-7 days
  - *Pre-authorization* – "restricted" antibiotics
    - MD or PharmD gives approval to "start" the antibiotic
  - Track and report PAF and Pre-authorization work

- Maintain facility "empiric" treatment guidelines for use of antibiotics
  - Disease state based: UTI
  - Updated annually per facility antibiogram
  - Periodic (annual) assessment of prescriber adherence to guidelines

- Adding antibiotic stewardship to existing processes
  - **Nurse and IP infection tracking** , Micro lab reports, allergy assessments, time outs

LACDPH Resources about ASB and UTI

Approach to Evaluation and Monitoring of Urinary Tract Infections in Skilled Nursing Facility Residents: A Resource for Infection Preventionists and Nurses

More than half of all antibiotics prescribed in skilled nursing facilities (SNFs) are either unnecessary or inappropriate. Overuse of antibiotics is a major contributor to the emergence of multi-drug-resistant organisms (MDROs [i.e. ESBLs, CROs, resistant *Pseudomonas* sp.]), resulting in worse outcomes and eventual inability to treat some infections. This includes broad spectrum antibiotics used for suspected urinary tract infections (UTIs). A large portion of inappropriate antibiotics in SNFs are prescribed for the treatment of asymptomatic bacteriuria.

An effective approach to preventing unnecessary treatment of asymptomatic bacteriuria is through "Diagnostic Stewardship". Bacteria live on human skin surfaces or other sites without producing any signs of illness or infection. In the urinary tract, 50% of long-term care residents and up to 100% of residents with chronic indwelling catheters are colonized with bacteria in the urine. Urinary colonization can be brief or chronic, persisting for years. Because colonization is so common, the presence of bacteria in a urine culture does not confirm that the resident has a UTI, even when there is presence of acute delirium or mental status changes. A urinalysis (UA) and urine culture (UC) should not be obtained routinely in residents who are clinically stable without symptoms of UTI and do not meet Loeb criteria for UTI. Other contributing factors to mental status changes should be considered and modified where possible. This approach can avoid unnecessary treatment for asymptomatic bacteriuria. *The goal of Diagnostic Stewardship is to carefully select residents who meet clinical criteria for a UTI before ordering a UA and UC.*

Antimicrobial stewardship is the practice of assuring appropriate antibiotic prescribing and use, which is critical to effectively treat infections, protect residents from the harm of unnecessary antimicrobial use, and combat antimicrobial resistance.

Antimicrobial stewardship and diagnostic stewardship work together to prevent antibiotic resistance.

Useful References

Articles:

- Diagnostic Stewardship vs Antibiotic Stewardship
- Top 10 Myths Regarding the Diagnosis and Treatment of Urinary Tract Infections
- Why are Urine Tests Ordered in the Emergency Department?

Recommendations:

- Diagnosis, Treatment and Prevention of Urinary Tract Infections in Post-Acute Care and Long-Term Care Settings: AMDA Consensus Statement
- IDSA Clinical Practice Guideline for the Management of Asymptomatic Bacteriuria
- Development of Minimum Criteria for the Initiation of Antibiotics in Residents of Long-Term Care Facilities: Results of a Consensus Conference (Loeb et. al.)
- SHEA Principles of Diagnostic Stewardship

Acknowledgment

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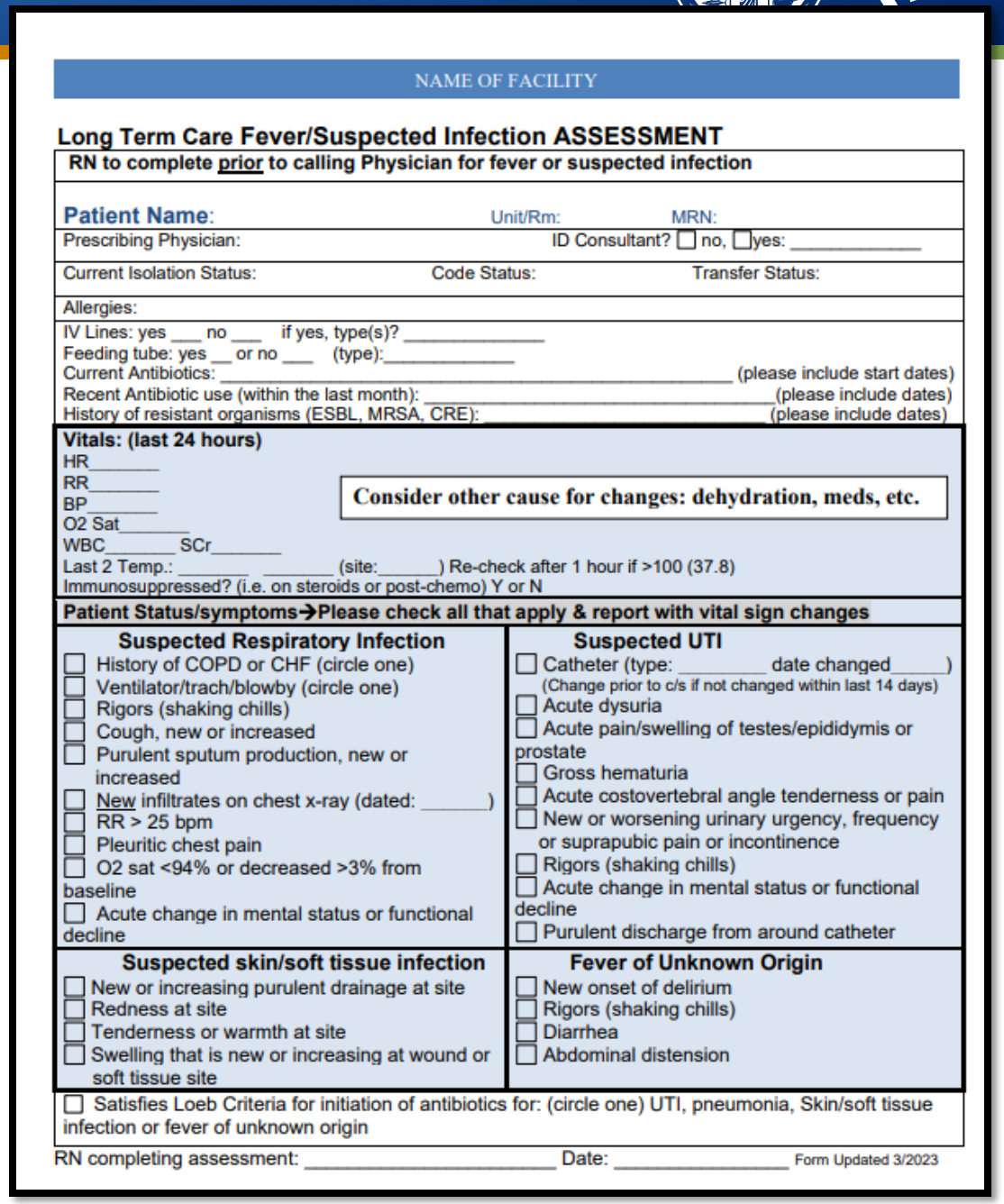
Applying Diagnostic Stewardship and Antimicrobial Stewardship Steps and useful resources for RN or IP evaluation of residents with suspected UTI		
Diagnostic Stewardship	***Step 1:*** *Perform an assessment*	• Long Term Care Fever/Suspected Infection Assessment • AHRQ Suspected UTI Assessment Tool • AHRQ Suspected UTI Assessment and SBAR Document
	Step 2: *Create and track new cases and record the symptoms of suspected UTI.* *NOTE: For transfer patients, include antibiotic history from other facilities. MDRO history may be available through the LA County Patient Safety Information Exchange (PSIE)*	• Sample tracking form • Patient Safety Information Exchange (PSIE)
	Step 3: *Use Loeb criteria to assess need for urine testing and treatment with antibiotics.* *Ideal for the evaluating nurse to initiate this!*	• Loeb Criteria Checklist • Loeb Criteria for the Initiation of Antibiotics for UTIs • AHRQ Minimum Criteria Decision Support for Treatment with Antibiotics
	Step 4: *Assess and treat other causes of delirium when Loeb criteria are NOT met*	• AHRQ Identifying, Treating and Preventing Delirium • SD County DPH: ABCs of Identifying Delirium • SD County DPH: Causes of Delirium in the Elderly • SD County DPH: Treating and Preventing Delirium
	Step 5: *Use SBAR Reporting to physician, nurse practitioner or physician assistant*	• AHRQ Suspected UTI SBAR Training • AHRQ Suspected UTI Assessment and SBAR Document
	Step 6: *Decision to obtain labs (UA and UC) and begin empiric treatment for UTI* ***NOTE: Lab testing is not done until there is a decision to treat with antibiotics***	• Algorithm for obtaining labs and starting antibiotics • SD County DPH: Suspected Urinary Tract Infection Algorithm • Asymptomatic Bacteriuria vs Urinary Tract Infection in Patients with Altered Mental Status
Antimicrobial Stewardship	***Step 7:*** *Selection of appropriate empiric treatment based on facility-specific treatment guidelines.*	***NOTE: Recommended empiric treatment should be based on facility-specific annual antibiogram*** • AHRQ UTI Treatment Guideline Template for SNFs
	Step 8: *Reassess the resident on day 3 of therapy for continued need for antibiotics*	• MN Time out template
	Step 9: *Provide resident education about UTIs*	• What to Know about UTIs for Residents and Family • When does a resident have a UTI
	Step 10: *Track, monitor and report UTI cases and outcomes to QAPI committee. Include intervention acceptance (or decline) rate by provider.*	• AHRQ Antibiotic Monitoring Sheet • AHRQ Track and Monitor Antibiotic Use Report Template

http://publichealth.lacounty.gov/acd/docs/UTI-Evaluationmonitoring-in-SNFs.pdf

Diagnostic Stewardship Step 1

Perform a complete assessment using a checklist



NAME OF FACILITY

Long Term Care Fever/Suspected Infection ASSESSMENT

RN to complete prior to calling Physician for fever or suspected infection

Patient Name: Unit/Rm: MRN:

Prescribing Physician: ID Consultant? ☐ no, ☐ yes: _____

Current Isolation Status: Code Status: Transfer Status:

Allergies:

IV Lines: yes ___ no ___ if yes, type(s)? _____

Feeding tube: yes __ or no ___ (type):_____

Current Antibiotics: _____ (please include start dates)

Recent Antibiotic use (within the last month): _____(please include dates)

History of resistant organisms (ESBL, MRSA, CRE): _____ (please include dates)

Vitals: (last 24 hours)

HR_____

RR_____

BP_____

O2 Sat_____

WBC_____ SCr_____

Last 2 Temp.: _____ _____ (site:_____) Re-check after 1 hour if >100 (37.8)

Immunosuppressed? (i.e. on steroids or post-chemo) Y or N

Consider other cause for changes: dehydration, meds, etc.

Patient Status/symptoms→Please check all that apply & report with vital sign changes

Suspected Respiratory Infection

- ☐ History of COPD or CHF (circle one)
- ☐ Ventilator/trach/blowby (circle one)
- ☐ Rigors (shaking chills)
- ☐ Cough, new or increased
- ☐ Purulent sputum production, new or increased
- ☐ New infiltrates on chest x-ray (dated: _____)
- ☐ RR > 25 bpm
- ☐ Pleuritic chest pain
- ☐ O2 sat <94% or decreased >3% from baseline
- ☐ Acute change in mental status or functional decline

Suspected UTI

- ☐ Catheter (type: _____ date changed_____)
  (Change prior to c/s if not changed within last 14 days)
- ☐ Acute dysuria
- ☐ Acute pain/swelling of testes/epididymis or prostate
- ☐ Gross hematuria
- ☐ Acute costovertebral angle tenderness or pain
- ☐ New or worsening urinary urgency, frequency or suprapubic pain or incontinence
- ☐ Rigors (shaking chills)
- ☐ Acute change in mental status or functional decline
- ☐ Purulent discharge from around catheter

Suspected skin/soft tissue infection

- ☐ New or increasing purulent drainage at site
- ☐ Redness at site
- ☐ Tenderness or warmth at site
- ☐ Swelling that is new or increasing at wound or soft tissue site

Fever of Unknown Origin

- ☐ New onset of delirium
- ☐ Rigors (shaking chills)
- ☐ Diarrhea
- ☐ Abdominal distension

☐ Satisfies Loeb Criteria for initiation of antibiotics for: (circle one) UTI, pneumonia, Skin/soft tissue infection or fever of unknown origin

RN completing assessment: _____ Date: _____ Form Updated 3/2023

Diagnostic Stewardship Step 2

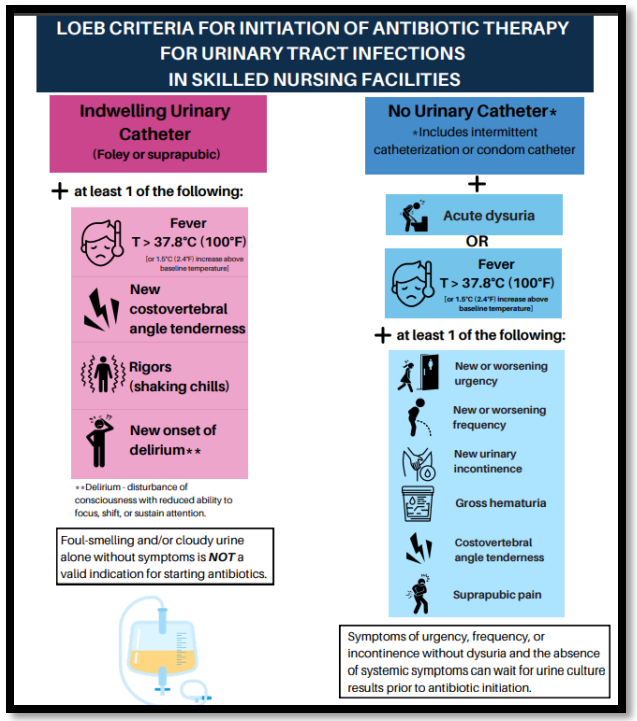
Track cases and monitor symptoms (nurses can start the documentation and IP can complete later)

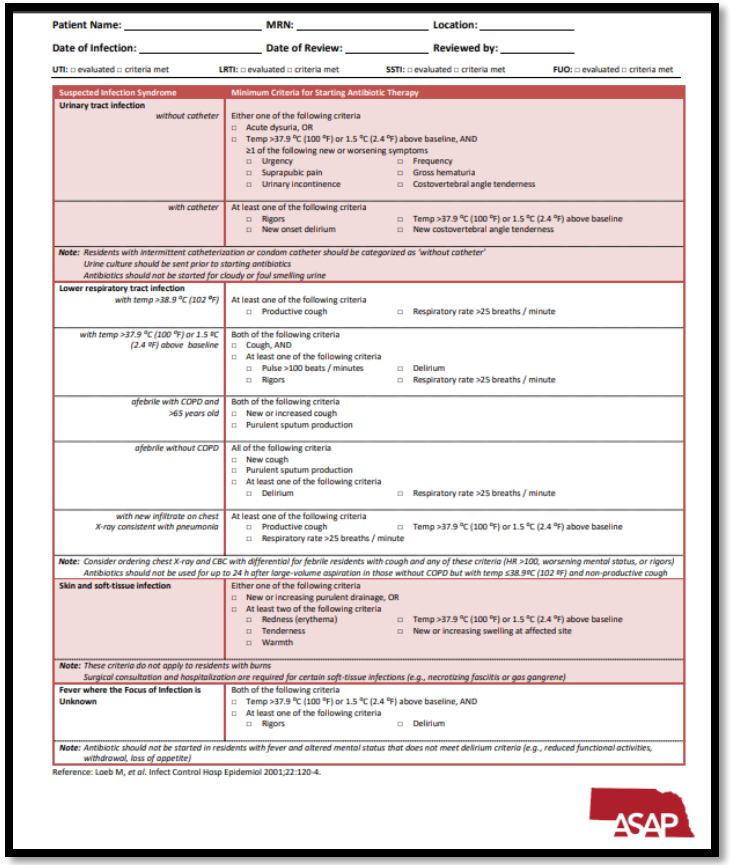
Date	Admiss. Date	Patient name	MRN	Room	Age	Prescribing MD/NP	Symptoms exhibited	Temp x2 1 hr apart	vital signs (HR,RR, bp,O2)	WBC	UA WBC	serum creat	orgs (MRSA, ESBL, CRE, MDRO)	Antibiotic ordered	Antibiotic dose/route	Prior facility start date	DOT	Indication or site of inf	Urinary Catheter?	Interventions	Therapy changed?	Transferred to acute care?	Initials
12/8/24	12/7/22	Doe, Jane		202	75	D. Smith	dysuria, frequency, AMS, diaphoretic	100.6 101.0	HR 126, RR 20 bp 149/89, O2 96	14.1	>100	0.8	MRSA + nares	Cipro	400mg iv q12h x 7d	n/a	7	UTI	suprapubic, changed	change to Rocephin 2g IV q24h	yes preferred therapy	no	cc RN
12/9/24	########	Doe, John		207	48	D. Smith	c/o burning pain with urination	98.6 97.8	HR 80, RR 19, bp 134/77	7.6	50-100	0.9	Hx ESBL E.coli in Urine	Cipro	500mg po bid x 7d	n/a	5	UTI	none	1) NFT for better coverage 2)reduce duration to 5 days for cystitis	yes, Macrobid CR 100mg po bid x 5d DOT changed	no	cc RN

Day 3 (48-72hr) follow-up date	Patient status	Site(s) cultured	Organism(s) cultured	Culture review/ Sensitivity	xrays/scans/ other diagnostics	Interventions	New orders	Initials
12/11/2022	Fever resolved, vs stabilized	Blood Urine	negative P. mirabilis	S ceftr, S cefu, R cip	CT: neg for pyelo or stones	De-escalation to po abx	Changed to po Cefuroxime 500mg bid x 4d (7d total abx)	dh RN
12/11/2022	no complaints	urine	ESBL E.coli	s NFT	none	n/a	n/a	dh RN

Diagnostic Stewardship Step 3

Use Loeb criteria to assess need for testing and treatment with antibiotics





Patient Name: _____ MRN: _____ Location: _____

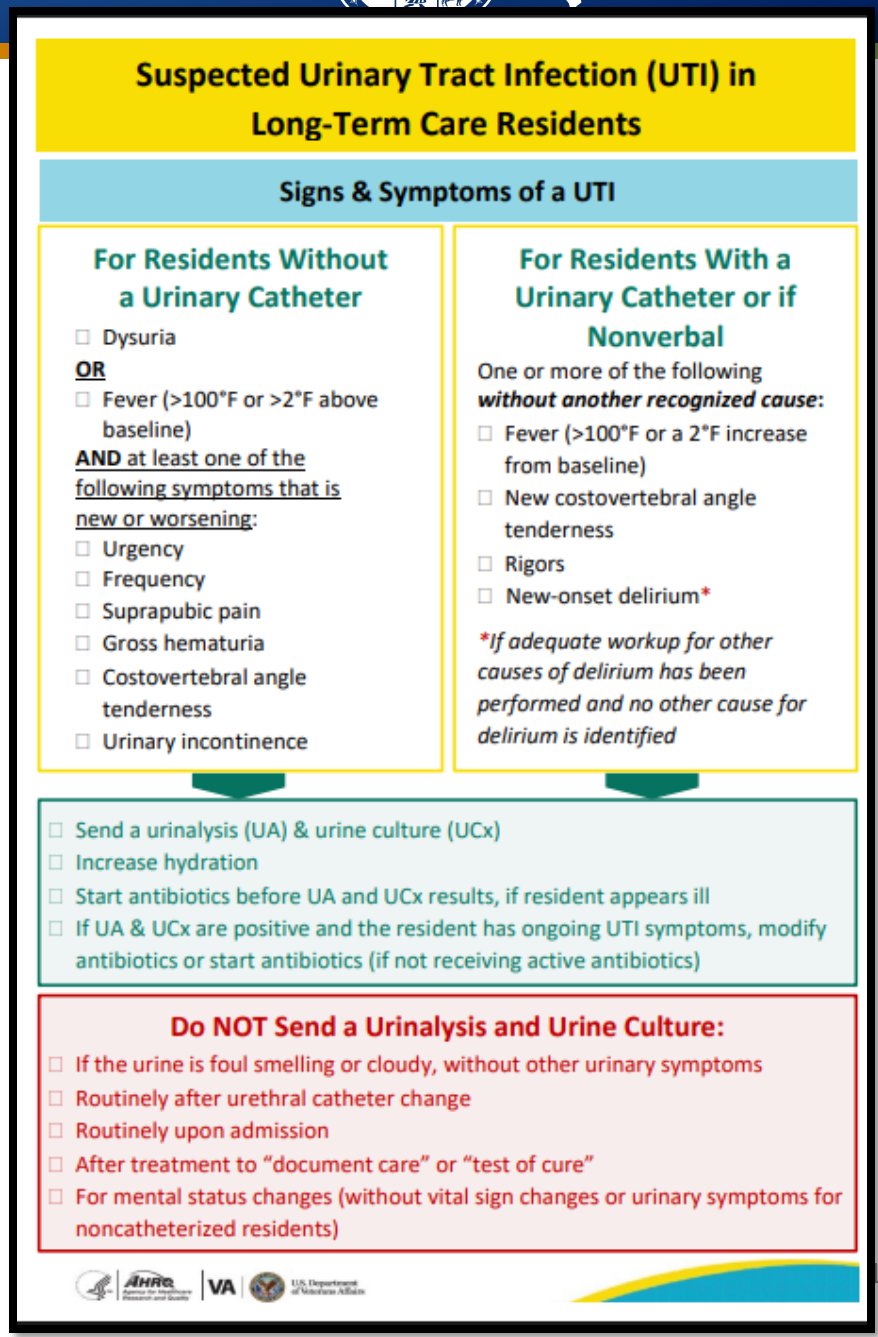
Date of Infection: _____ Date of Review: _____ Reviewed by: _____

UTI: □ evaluated □ criteria met LRTI: □ evaluated □ criteria met SSTI: □ evaluated □ criteria met FUO: □ evaluated □ criteria met

Suspected Infection Syndrome	Minimum Criteria for Starting Antibiotic Therapy
Urinary tract infection *without catheter*	Either one of the following criteria □ Acute dysuria, OR □ Temp >37.9 °C (100 °F) or 1.5 °C (2.4 °F) above baseline, AND ≥1 of the following new or worsening symptoms □ Urgency □ Frequency □ Suprapubic pain □ Gross hematuria □ Urinary incontinence □ Costovertebral angle tenderness
with catheter	At least one of the following criteria □ Rigors □ Temp >37.9 °C (100 °F) or 1.5 °C (2.4 °F) above baseline □ New onset delirium □ New costovertebral angle tenderness
Note: *Residents with intermittent catheterization or condom catheter should be categorized as 'without catheter' Urine culture should be sent prior to starting antibiotics Antibiotics should not be started for cloudy or foul smelling urine*	
Lower respiratory tract infection *with temp >38.9 °C (102 °F)*	At least one of the following criteria □ Productive cough □ Respiratory rate >25 breaths / minute
with temp >37.9 °C (100 °F) or 1.5 °C (2.4 °F) above baseline	Both of the following criteria □ Cough, AND □ At least one of the following criteria □ Pulse >100 beats / minutes □ Delirium □ Rigors □ Respiratory rate >25 breaths / minute
afebrile with COPD and >65 years old	Both of the following criteria □ New or increased cough □ Purulent sputum production
afebrile without COPD	All of the following criteria □ New cough □ Purulent sputum production □ At least one of the following criteria □ Delirium □ Respiratory rate >25 breaths / minute
with new infiltrate on chest X-ray consistent with pneumonia	At least one of the following criteria □ Productive cough □ Temp >37.9 °C (100 °F) or 1.5 °C (2.4 °F) above baseline □ Respiratory rate >25 breaths / minute
Note: *Consider ordering chest X-ray and CBC with differential for febrile residents with cough and any of these criteria (HR >100, worsening mental status, or rigors) Antibiotics should not be used for up to 24 h after large-volume aspiration in those without COPD but with temp ≤38.9°C (102 °F) and non-productive cough*	
Skin and soft-tissue infection	Either one of the following criteria □ New or increasing purulent drainage, OR □ At least two of the following criteria □ Redness (erythema) □ Temp >37.9 °C (100 °F) or 1.5 °C (2.4 °F) above baseline □ Tenderness □ New or increasing swelling at affected site □ Warmth
Note: *These criteria do not apply to residents with burns Surgical consultation and hospitalization are required for certain soft-tissue infections (e.g., necrotizing fasciitis or gas gangrene)*	
Fever where the Focus of Infection is Unknown	Both of the following criteria □ Temp >37.9 °C (100 °F) or 1.5 °C (2.4 °F) above baseline, AND □ At least one of the following criteria □ Rigors □ Delirium
Note: *Antibiotic should not be started in residents with fever and altered mental status that does not meet delirium criteria (e.g., reduced functional activities, withdrawal, loss of appetite)*	

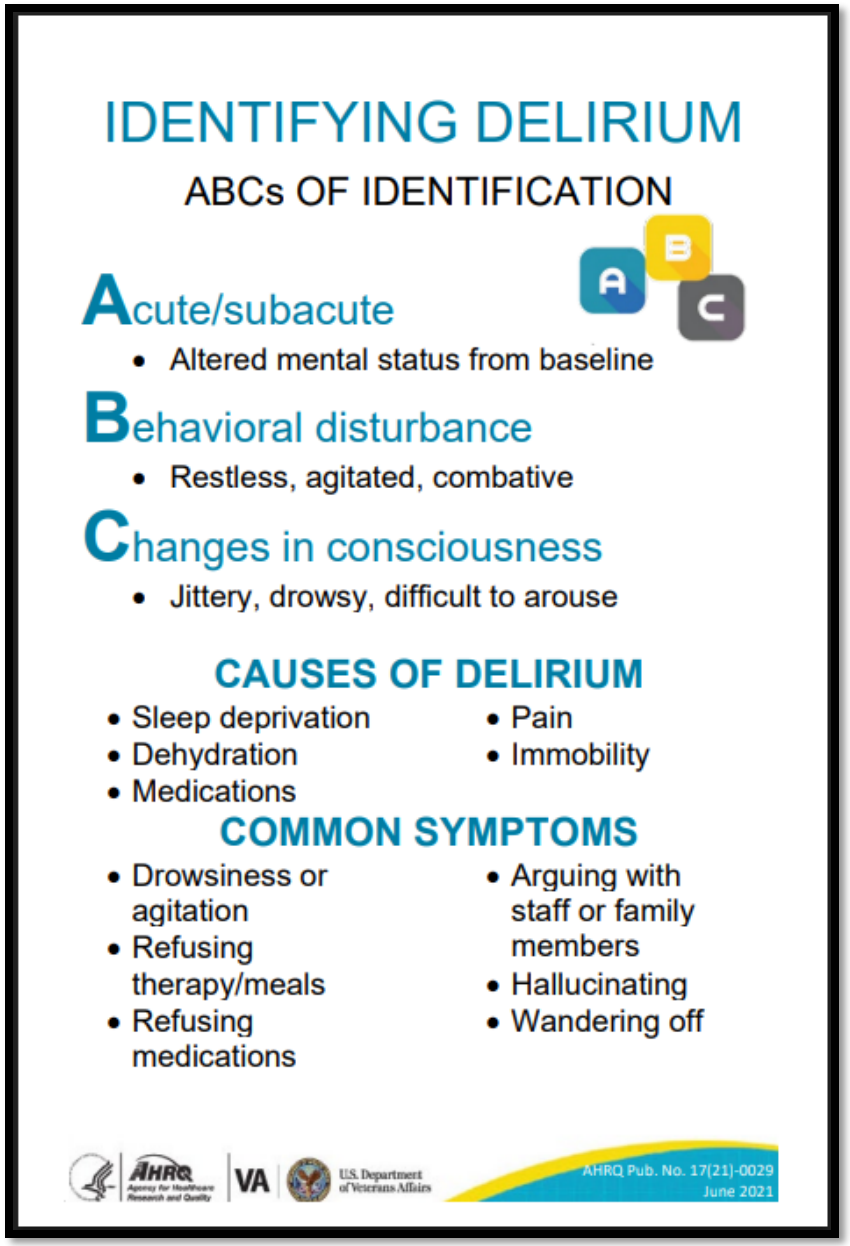
Reference: Loeb M, *et al.* Infect Control Hosp Epidemiol 2001;22:120-4.

ASAP



Diagnostic Stewardship Step 4

Assess and treat other causes of delirium when Loeb criteria are NOT met



IDENTIFYING DELIRIUM

ABCs OF IDENTIFICATION

Acute/subacute
- Altered mental status from baseline

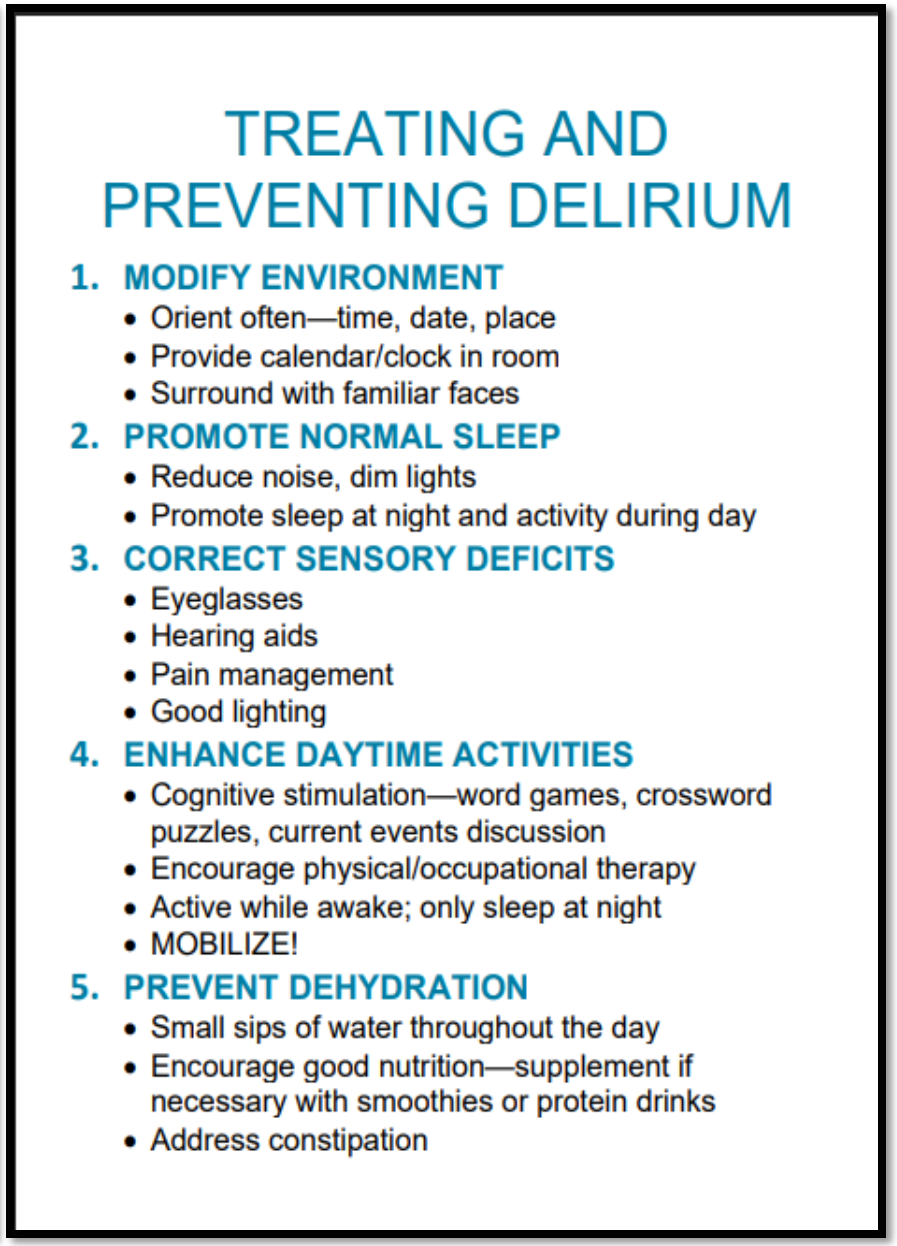
Behavioral disturbance
- Restless, agitated, combative

Changes in consciousness
- Jittery, drowsy, difficult to arouse

CAUSES OF DELIRIUM
- Sleep deprivation
- Dehydration
- Medications
- Pain
- Immobility

COMMON SYMPTOMS
- Drowsiness or agitation
- Refusing therapy/meals
- Refusing medications
- Arguing with staff or family members
- Hallucinating
- Wandering off

AHRQ Pub. No. 17(21)-0029
June 2021



TREATING AND PREVENTING DELIRIUM

1. **MODIFY ENVIRONMENT**
   - Orient often—time, date, place
   - Provide calendar/clock in room
   - Surround with familiar faces
2. **PROMOTE NORMAL SLEEP**
   - Reduce noise, dim lights
   - Promote sleep at night and activity during day
3. **CORRECT SENSORY DEFICITS**
   - Eyeglasses
   - Hearing aids
   - Pain management
   - Good lighting
4. **ENHANCE DAYTIME ACTIVITIES**
   - Cognitive stimulation—word games, crossword puzzles, current events discussion
   - Encourage physical/occupational therapy
   - Active while awake; only sleep at night
   - MOBILIZE!
5. **PREVENT DEHYDRATION**
   - Small sips of water throughout the day
   - Encourage good nutrition—supplement if necessary with smoothies or protein drinks
   - Address constipation

Diagnostic Stewardship Step 4 cont.

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Assess and treat other causes of delirium when Loeb criteria are NOT met

CAUSES OF DELIRIUM IN THE ELDERLY

for clinical staff

Delirium is one possible symptom of a urinary tract infection (UTI), but may be due to many other causes than infection.

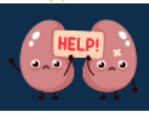
D Dehydration; Depression; Drugs (new drug, increased dose, or drug interaction).

E Electrolyte abnormalities (hypo-/hypernatremia, hypo-/hypercalcemia); Endocrine disorders (e.g., thyroid or adrenal dysfunction); EtOH (alcohol) and other drug withdrawal.

L Liver failure

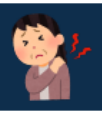
I Infections (especially respiratory, skin, urinary tract); Impaired oxygenation (e.g., from exacerbations of chronic obstructive pulmonary disease, congestive heart failure, myocardial infarction).

R Renal failure; Retention of urine or stool (constipation); Recent change in surroundings or emotional stress.



I Immobilization (catheters or restraints); Injuries; Increased pressure in the brain (intracranial).

U Untreated/undertreated pain.



M Metabolic disorders (e.g., hypo-/hyperglycemia, hypo-/hyperthermia); Malnutrition (thiamine, folate or B12 deficiencies).

TREATING AND PREVENTING DELIRIUM

1. Modify Environment

- Orient often - time, date, place
- Provide calendar/clock in room
- Surround with familiar faces

2. Promote Normal Sleep

- Reduce noise, dim lights
- Promote sleep at night and activity during the day

3. Correct Sensory Deficits

- Eyeglasses
- Hearing aids
- Pain management
- Good lighting

4. Enhance Daytime Activities

- Cognitive stimulation - word games, crossword puzzles, current events discussion
- Encourage physical/occupational therapy
- Active while awake; only sleep at night
- Mobilize

5. Prevent Dehydration

- Small sips of water throughout the day
- Encourage good nutrition - supplement if

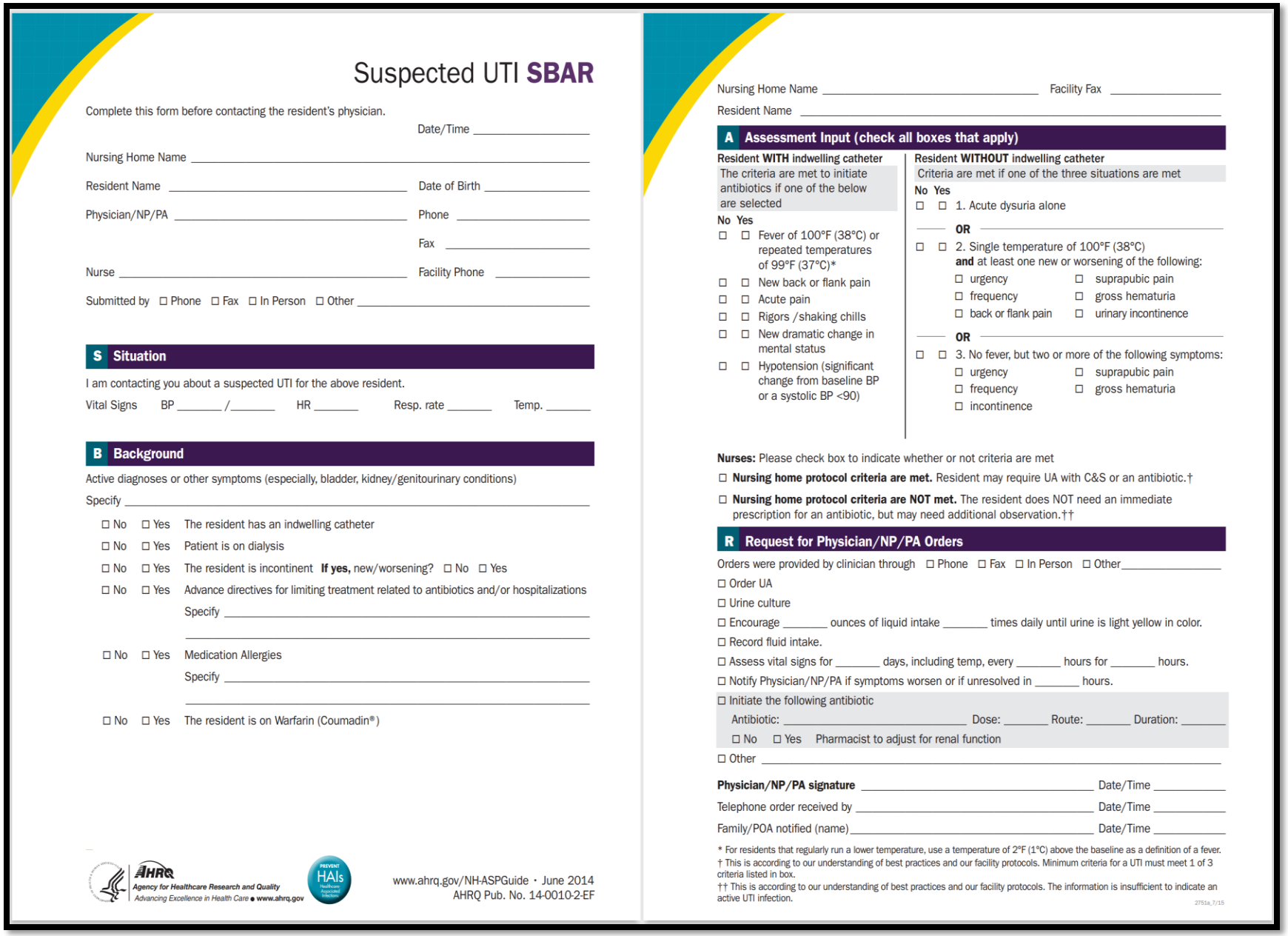
Diagnostic Stewardship Step 5

County of Los Angeles Public Health

Use SBAR Reporting to physician, nurse practitioner or physician assistant

Nursing Home Antimicrobial Stewardship Guide
Determine Whether To Treat

Toolkit 1. Suspected UTI SBAR Toolkit



Suspected UTI **SBAR**

Complete this form before contacting the resident's physician.

Date/Time _____

Nursing Home Name _____

Resident Name _____ Date of Birth _____

Physician/NP/PA _____ Phone _____

Fax _____

Nurse _____ Facility Phone _____

Submitted by ☐ Phone ☐ Fax ☐ In Person ☐ Other _____

S Situation

I am contacting you about a suspected UTI for the above resident.

Vital Signs BP _____/_____ HR _____ Resp. rate _____ Temp. _____

B Background

Active diagnoses or other symptoms (especially, bladder, kidney/genitourinary conditions)

Specify _____

☐ No ☐ Yes The resident has an indwelling catheter

☐ No ☐ Yes Patient is on dialysis

☐ No ☐ Yes The resident is incontinent **If yes,** new/worsening? ☐ No ☐ Yes

☐ No ☐ Yes Advance directives for limiting treatment related to antibiotics and/or hospitalizations

Specify _____

☐ No ☐ Yes Medication Allergies

Specify _____

☐ No ☐ Yes The resident is on Warfarin (Coumadin®)

AHRQ Agency for Healthcare Research and Quality
Advancing Excellence in Health Care • www.ahrq.gov

www.ahrq.gov/NH-ASPGuide • June 2014
AHRQ Pub. No. 14-0010-2-EF

Nursing Home Name _____ Facility Fax _____

Resident Name _____

A Assessment Input (check all boxes that apply)

Resident WITH indwelling catheter
The criteria are met to initiate antibiotics if one of the below are selected

No Yes
- ☐ ☐ Fever of 100°F (38°C) or repeated temperatures of 99°F (37°C)*
- ☐ ☐ New back or flank pain
- ☐ ☐ Acute pain
- ☐ ☐ Rigors /shaking chills
- ☐ ☐ New dramatic change in mental status
- ☐ ☐ Hypotension (significant change from baseline BP or a systolic BP <90)

Resident WITHOUT indwelling catheter
Criteria are met if one of the three situations are met

No Yes
- ☐ ☐ 1. Acute dysuria alone

OR

- ☐ ☐ 2. Single temperature of 100°F (38°C) **and** at least one new or worsening of the following:
  - ☐ urgency ☐ suprapubic pain
  - ☐ frequency ☐ gross hematuria
  - ☐ back or flank pain ☐ urinary incontinence

OR

- ☐ ☐ 3. No fever, but two or more of the following symptoms:
  - ☐ urgency ☐ suprapubic pain
  - ☐ frequency ☐ gross hematuria
  - ☐ incontinence

Nurses: Please check box to indicate whether or not criteria are met

☐ **Nursing home protocol criteria are met.** Resident may require UA with C&S or an antibiotic.†

☐ **Nursing home protocol criteria are NOT met.** The resident does NOT need an immediate prescription for an antibiotic, but may need additional observation.††

R Request for Physician/NP/PA Orders

Orders were provided by clinician through ☐ Phone ☐ Fax ☐ In Person ☐ Other_____

☐ Order UA

☐ Urine culture

☐ Encourage _____ ounces of liquid intake _____ times daily until urine is light yellow in color.

☐ Record fluid intake.

☐ Assess vital signs for _____ days, including temp, every _____ hours for _____ hours.

☐ Notify Physician/NP/PA if symptoms worsen or if unresolved in _____ hours.

☐ Initiate the following antibiotic

Antibiotic: _____ Dose: _____ Route: _____ Duration: _____

☐ No ☐ Yes Pharmacist to adjust for renal function

☐ Other _____

Physician/NP/PA signature _____ Date/Time _____

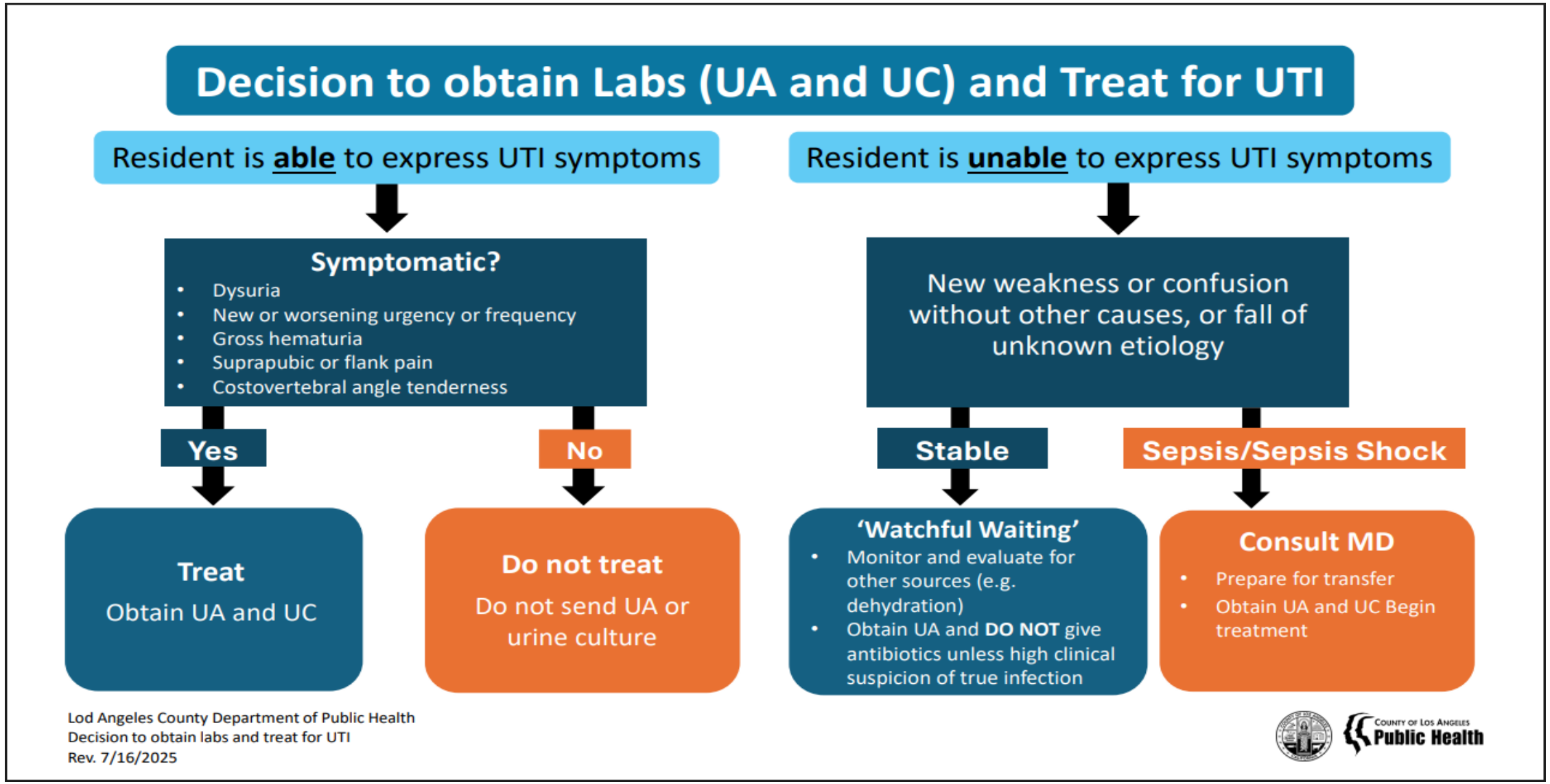
Telephone order received by _____ Date/Time _____

Family/POA notified (name) _____ Date/Time _____

* For residents that regularly run a lower temperature, use a temperature of 2°F (1°C) above the baseline as a definition of a fever.
† This is according to our understanding of best practices and our facility protocols. Minimum criteria for a UTI must meet 1 of 3 criteria listed in box.
†† This is according to our understanding of best practices and our facility protocols. The information is insufficient to indicate an active UTI infection.

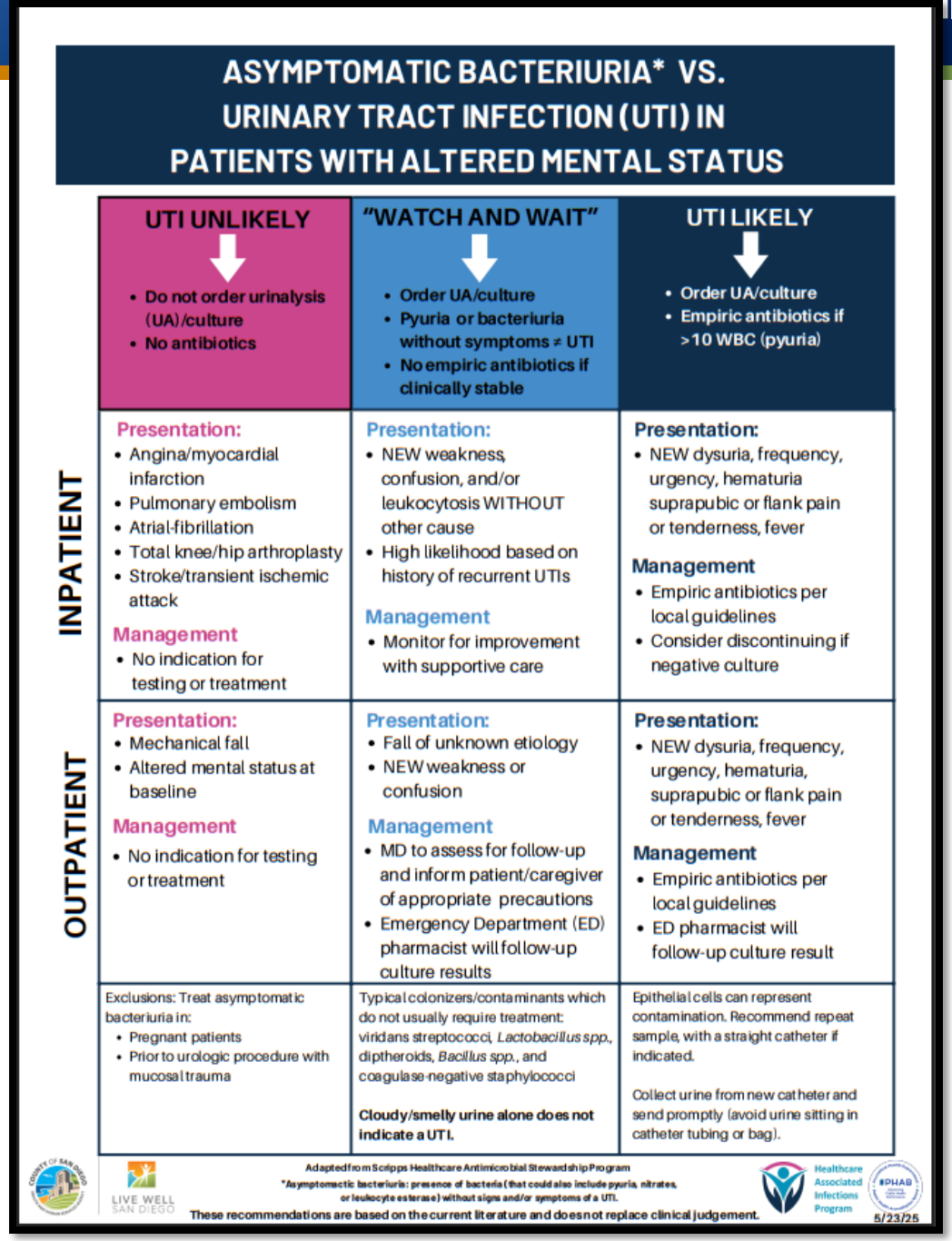
2751a_7/15

Decision to obtain labs (UA and UC) and begin empiric treatment for UTI



Diagnostic Stewardship Step 6 cont.

Decision to obtain labs (UA and UC) and begin empiric treatment for UTI



ASYMPTOMATIC BACTERIURIA* VS. URINARY TRACT INFECTION (UTI) IN PATIENTS WITH ALTERED MENTAL STATUS

	UTI UNLIKELY	"WATCH AND WAIT"	UTI LIKELY
	• Do not order urinalysis (UA)/culture • No antibiotics	• Order UA/culture • Pyuria or bacteriuria without symptoms ≠ UTI • No empiric antibiotics if clinically stable	• Order UA/culture • Empiric antibiotics if >10 WBC (pyuria)
INPATIENT	**Presentation:** • Angina/myocardial infarction • Pulmonary embolism • Atrial-fibrillation • Total knee/hip arthroplasty • Stroke/transient ischemic attack **Management** • No indication for testing or treatment	**Presentation:** • NEW weakness, confusion, and/or leukocytosis WITHOUT other cause • High likelihood based on history of recurrent UTIs **Management** • Monitor for improvement with supportive care	**Presentation:** • NEW dysuria, frequency, urgency, hematuria suprapubic or flank pain or tenderness, fever **Management** • Empiric antibiotics per local guidelines • Consider discontinuing if negative culture
OUTPATIENT	**Presentation:** • Mechanical fall • Altered mental status at baseline **Management** • No indication for testing or treatment	**Presentation:** • Fall of unknown etiology • NEW weakness or confusion **Management** • MD to assess for follow-up and inform patient/caregiver of appropriate precautions • Emergency Department (ED) pharmacist will follow-up culture results	**Presentation:** • NEW dysuria, frequency, urgency, hematuria, suprapubic or flank pain or tenderness, fever **Management** • Empiric antibiotics per local guidelines • ED pharmacist will follow-up culture result
	Exclusions: Treat asymptomatic bacteriuria in: • Pregnant patients • Prior to urologic procedure with mucosal trauma	Typical colonizers/contaminants which do not usually require treatment: viridans streptococci, *Lactobacillus spp.*, diptheroids, *Bacillus spp.*, and coagulase-negative staphylococci **Cloudy/smelly urine alone does not indicate a UTI.**	Epithelial cells can represent contamination. Recommend repeat sample, with a straight catheter if indicated. Collect urine from new catheter and send promptly (avoid urine sitting in catheter tubing or bag).

Adapted from Scripps Healthcare Antimicrobial Stewardship Program
*Asymptomatic bacteriuria: presence of bacteria (that could also include pyuria, nitrates, or leukocyte esterase) without signs and/or symptoms of a UTI.
These recommendations are based on the current literature and does not replace clinical judgement.
5/23/25

Diagnostic Stewardship Step 6

County of Los Angeles Public Health

Decision to obtain labs (UA and UC) and begin empiric treatment for UTI

Minimum Criteria for Antibiotics On-Line Decision Tool

AHRQ Agency for Healthcare Research and Quality

CHOOSE POTENTIAL INFECTION (CHOOSE ONE):

Urinary Tract Infection | Skin and Soft Tissue Infection | Lower Respiratory Tract Infection

Does the resident have:

No indwelling catheter

Indwelling catheter

Does the resident have acute dysuria?

Yes

No

Fever (temperature > 100°F [37.9°C] or two repeated temperatures of 99°F [37°C])

Yes

No

Does the resident have any of these additional symptoms? Check all that apply.

- [ ] Urgency
- [ ] Frequency
- [ ] Suprapubic pain
- [ ] Gross hematuria
- [ ] Costovertebral angle tenderness
- [ ] Urinary incontinence
- [x] None of the above

Continue

Minimum criteria for initiating antibiotics are NOT MET

Consider initiating the following:

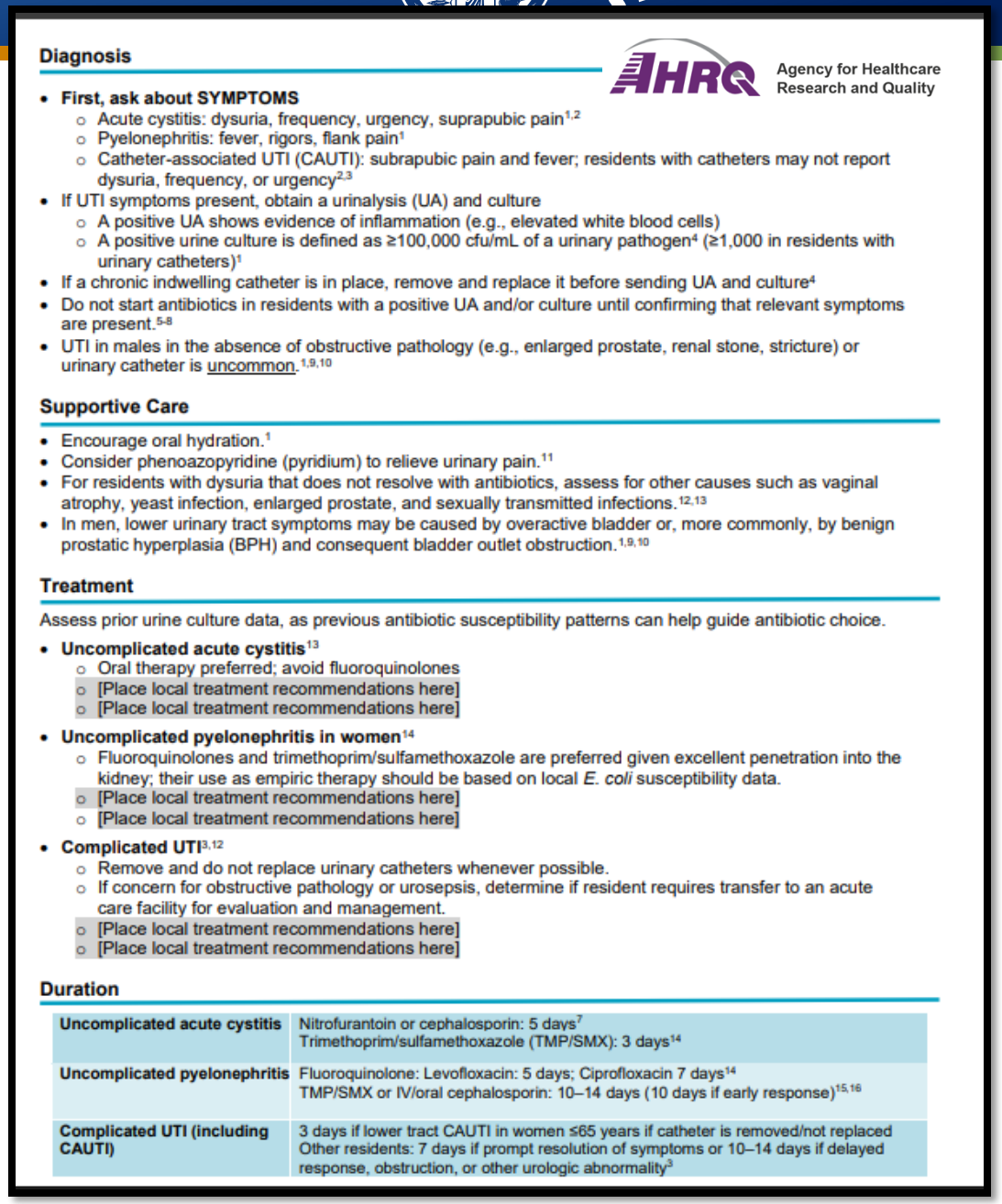
- Encourage liquid intake daily until urine is light yellow in color (suggest an amount and duration).
- Record fluid intake (suggest frequency and duration).
- Assess vital signs, including temp (suggest frequency and duration).
- Request notification if symptoms worsen or if unresolved (suggest duration).

Antibiotic Stewardship Step 7

County of Los Angeles Public Health

Selection of appropriate empiric treatment (day 1 of treatment) - based on facility-specific treatment guidelines.

- ✓ Fluoroquinolones should be avoided and addressed in the guideline
  - Often prescribers are unaware that *E. coli* resistance is high
  - High risk for severe side effects and DDI
    - Agitation/confusion
    - Arrhythmias
    - CDAD
    - Tendon rupture (months after D/C)
- ✓ Consult society guidelines (IDSA) for evidence-based treatment options (not a replacement)
- ✓ Use a facility specific antibiogram to select treatment options whenever possible



Diagnosis

AHRQ Agency for Healthcare Research and Quality

- **First, ask about SYMPTOMS**
  - Acute cystitis: dysuria, frequency, urgency, suprapubic pain[1,2]
  - Pyelonephritis: fever, rigors, flank pain[1]
  - Catheter-associated UTI (CAUTI): subrapubic pain and fever; residents with catheters may not report dysuria, frequency, or urgency[2,3]
- If UTI symptoms present, obtain a urinalysis (UA) and culture
  - A positive UA shows evidence of inflammation (e.g., elevated white blood cells)
  - A positive urine culture is defined as ≥100,000 cfu/mL of a urinary pathogen[4] (≥1,000 in residents with urinary catheters)[1]
- If a chronic indwelling catheter is in place, remove and replace it before sending UA and culture[4]
- Do not start antibiotics in residents with a positive UA and/or culture until confirming that relevant symptoms are present.[5-8]
- UTI in males in the absence of obstructive pathology (e.g., enlarged prostate, renal stone, stricture) or urinary catheter is uncommon.[1,9,10]

Supportive Care

- Encourage oral hydration.[1]
- Consider phenoazopyridine (pyridium) to relieve urinary pain.[11]
- For residents with dysuria that does not resolve with antibiotics, assess for other causes such as vaginal atrophy, yeast infection, enlarged prostate, and sexually transmitted infections.[12,13]
- In men, lower urinary tract symptoms may be caused by overactive bladder or, more commonly, by benign prostatic hyperplasia (BPH) and consequent bladder outlet obstruction.[1,9,10]

Treatment

Assess prior urine culture data, as previous antibiotic susceptibility patterns can help guide antibiotic choice.

- **Uncomplicated acute cystitis**[13]
  - Oral therapy preferred; avoid fluoroquinolones
  - [Place local treatment recommendations here]
  - [Place local treatment recommendations here]
- **Uncomplicated pyelonephritis in women**[14]
  - Fluoroquinolones and trimethoprim/sulfamethoxazole are preferred given excellent penetration into the kidney; their use as empiric therapy should be based on local *E. coli* susceptibility data.
  - [Place local treatment recommendations here]
  - [Place local treatment recommendations here]
- **Complicated UTI**[3,12]
  - Remove and do not replace urinary catheters whenever possible.
  - If concern for obstructive pathology or urosepsis, determine if resident requires transfer to an acute care facility for evaluation and management.
  - [Place local treatment recommendations here]
  - [Place local treatment recommendations here]

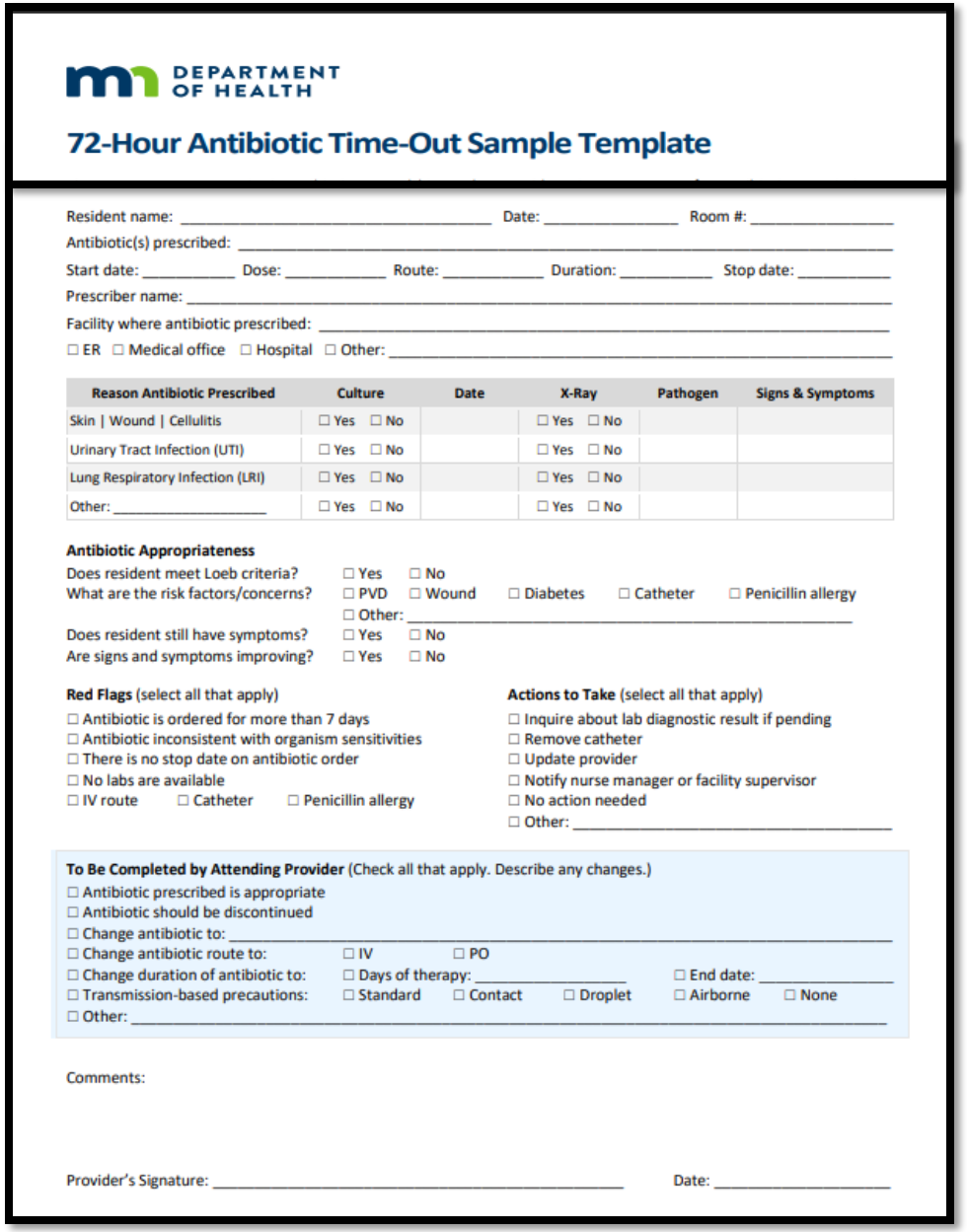
Duration

Uncomplicated acute cystitis	Nitrofurantoin or cephalosporin: 5 days[7] Trimethoprim/sulfamethoxazole (TMP/SMX): 3 days[14]
Uncomplicated pyelonephritis	Fluoroquinolone: Levofloxacin: 5 days; Ciprofloxacin 7 days[14] TMP/SMX or IV/oral cephalosporin: 10–14 days (10 days if early response)[15,16]
Complicated UTI (including CAUTI)	3 days if lower tract CAUTI in women ≤65 years if catheter is removed/not replaced Other residents: 7 days if prompt resolution of symptoms or 10–14 days if delayed response, obstruction, or other urologic abnormality[3]

http://publichealth.lacounty.gov/acd/docs/UTIFacilityGuideline.pdf

Antibiotic Stewardship Step 8

Reassess the resident on day 3 of therapy for continued need for antibiotics



DEPARTMENT OF HEALTH

72-Hour Antibiotic Time-Out Sample Template

Resident name: _____ Date: _____ Room #: _____

Antibiotic(s) prescribed: _____

Start date: _____ Dose: _____ Route: _____ Duration: _____ Stop date: _____

Prescriber name: _____

Facility where antibiotic prescribed: _____

☐ ER ☐ Medical office ☐ Hospital ☐ Other: _____

Reason Antibiotic Prescribed	Culture	Date	X-Ray	Pathogen	Signs & Symptoms
Skin | Wound | Cellulitis	☐ Yes ☐ No		☐ Yes ☐ No		
Urinary Tract Infection (UTI)	☐ Yes ☐ No		☐ Yes ☐ No		
Lung Respiratory Infection (LRI)	☐ Yes ☐ No		☐ Yes ☐ No		
Other: _____	☐ Yes ☐ No		☐ Yes ☐ No		

Antibiotic Appropriateness

Does resident meet Loeb criteria? ☐ Yes ☐ No

What are the risk factors/concerns? ☐ PVD ☐ Wound ☐ Diabetes ☐ Catheter ☐ Penicillin allergy ☐ Other: _____

Does resident still have symptoms? ☐ Yes ☐ No

Are signs and symptoms improving? ☐ Yes ☐ No

Red Flags (select all that apply)

☐ Antibiotic is ordered for more than 7 days
☐ Antibiotic inconsistent with organism sensitivities
☐ There is no stop date on antibiotic order
☐ No labs are available
☐ IV route ☐ Catheter ☐ Penicillin allergy

Actions to Take (select all that apply)

☐ Inquire about lab diagnostic result if pending
☐ Remove catheter
☐ Update provider
☐ Notify nurse manager or facility supervisor
☐ No action needed
☐ Other: _____

To Be Completed by Attending Provider (Check all that apply. Describe any changes.)

☐ Antibiotic prescribed is appropriate
☐ Antibiotic should be discontinued
☐ Change antibiotic to: _____
☐ Change antibiotic route to: ☐ IV ☐ PO
☐ Change duration of antibiotic to: ☐ Days of therapy: _____ ☐ End date: _____
☐ Transmission-based precautions: ☐ Standard ☐ Contact ☐ Droplet ☐ Airborne ☐ None
☐ Other: _____

Comments:

Provider's Signature: _____ Date: _____

Antibiotic Stewardship Step 9

Provide resident and family education about UTIs

Understanding Asymptomatic Bacteriuria (ASB) and Urinary Tract Infections (UTI)

What is a UTI?

A urinary tract infection (UTI) means you have bacteria in the urine **AND** one or more UTI symptoms:

Burning or pain when urinating (this is the **most common** symptom)

A strong, frequent urge to urinate; urinating more often

Blood in the urine

If you have these symptoms, you may need testing and treatment.

What is ASB?

Asymptomatic bacteriuria (ASB) means there are bacteria in the urine, but you don't have UTI symptoms like burning or pain.

- ASB is very common, especially in people living in long-term care facilities.
- ASB does not cause harm.
- ASB does not need antibiotics.

A change in mental status, fatigue, or falls are symptoms that are associated with many causes such as, depression, constipation, dehydration, poor sleep, or medication side effects. These are not UTI symptoms (even if bacteria are found in the urine) and should be evaluated by a health care provider. Current research shows that prescribing antibiotics for bacteria in the urine without UTI symptoms is not correct and may be harmful.

If you do not have UTI symptoms then you should not be tested or treated with antibiotics.

Why Should You Avoid Antibiotics If You Don't Have an Infection?

Many people get antibiotics when they don't need them. A common reason for this is ASB (bacteria in the urine without UTI symptoms).

Antibiotics should only be taken when necessary, because they can cause the following serious problems:

- **Antibiotic resistance:** bacteria in your body can get stronger and harder to treat in the future.
- ***C. difficile* infection:** a dangerous illness that can cause severe or life-threatening diarrhea.
- **Side effects:** antibiotics can sometimes cause bad reactions.

Los Angeles County Department of Public Health
ph.lacounty.gov/acd/antibioticstewardshipprogram/index.htm
Understanding ASB and UTI, Rev. 10-3-25

County of Los Angeles Public Health

What You Should Know about Urinary Tract Infections (UTIs

What is a UTI?

A UTI is an infection caused by bacteria that occurs in any part of the urinary system, such as the urethra, bladder, ureters and kidneys.

What are the symptoms of a UTI?

- Burning or pain when urinating (the strongest sign of a UTI)
- Pain in the lower stomach or back
- Increase in how often one needs to urinate
- Frequent urges to urinate
- Blood in the urine

Fever may or may not be present in addition to these symptoms.

Note: dark, foul-smelling, and cloudy urine are not enough to decide if someone has a UTI.

Should a urine specimen be collected to check if you have a UTI if you do not have symptoms?

No. The symptoms listed above should be present before collecting a urine specimen.

Is a change in mental status, fatigue, or a fall a symptom of a UTI?

No. A change in mental status (i.e. confusion), fatigue (i.e. more tired), or a fall may be due to other causes, such as dehydration, pain, depression, constipation, poor sleep, or medication side effects. Antibiotics should not be taken while other possible causes are being investigated.

I was given antibiotics before, but why not now?

In the past, doctors were taught to prescribe antibiotics for a positive urine specimen, even when symptoms of infection were not present. However, current research shows this is not correct. You should not receive antibiotics when you have no symptoms of a UTI.

What is asymptomatic bacteriuria?

Asymptomatic bacteriuria is when there are bacteria in your urine without any symptoms of a UTI. Asymptomatic bacteriuria is found in up to half of long-term care residents.

Why are there bacteria in my urine, but they are not causing an infection?

We have bacteria throughout our body, such as on our skin and in our colon, that is there to provide a healthy balance in our body's environment and will not cause an infection.

What is the treatment for asymptomatic bacteriuria?

None. Research has shown that there is no need to take antibiotics for asymptomatic bacteriuria. You should drink plenty of fluids and make sure you empty your bladder completely to lower your risk of getting a UTI.

Why are antibiotics harmful if you take them whe you do not have an infection?

If you use antibiotics when you don't need them, the may not work when you get sick as the bacteria can mutate and become resistant. Other problems that can occur from taking antibiotics are allergic reactions, side effects (e.g. upset stomach), drug interactions, and an infection called *C. difficile* that can cause diarrhea and inflammation of your colon.

Asymptomatic bacteriuria is frequently mistaken for a urinary tract infection. It is important to understand the differences to avoid unnecessary use of antibiotics and potential harm.

Adapted from Scripps Healthcare Antimicrobial Stewardship Program and the Florida Department of Health.

This information is based on current literature and does not replace clinical judgement.

LIVE WELL SAN DIEGO

Healthcare Associated Infections Program

WHEN DOES A RESIDENT HAVE AN URINARY TRACT INFECTION (UTI)?

An abnormal appearing or smelly urine without symptoms of an UTI should not be treated with antibiotics.

My family member's urine is dark and smells bad. Do they have a UTI?

- Dark, cloudy, or foul-smelling urine alone is not suggestive of a UTI.
- The diagnosis of a UTI is dependent on symptoms such as pain or burning while urinating, frequent urination, and feeling the need to urinate despite having an empty bladder.
- Dehydration can cause abnormal appearing urine. Increasing hydration may be helpful while continuing to observe the resident.

Just to be sure, can you check my family member's urine?

- Many nursing home residents have bacteria with abnormal appearing or smelling urine, especially those with indwelling urinary catheters. This condition is called asymptomatic bacteriuria.
- Asymptomatic bacteriuria does not need to be treated with antibiotic because it is not an infection.
- Treatment of asymptomatic bacteriuria will NOT prevent UTIs in the future.

Last time this happened a doctor prescribed an antibiotic and my family member felt better.

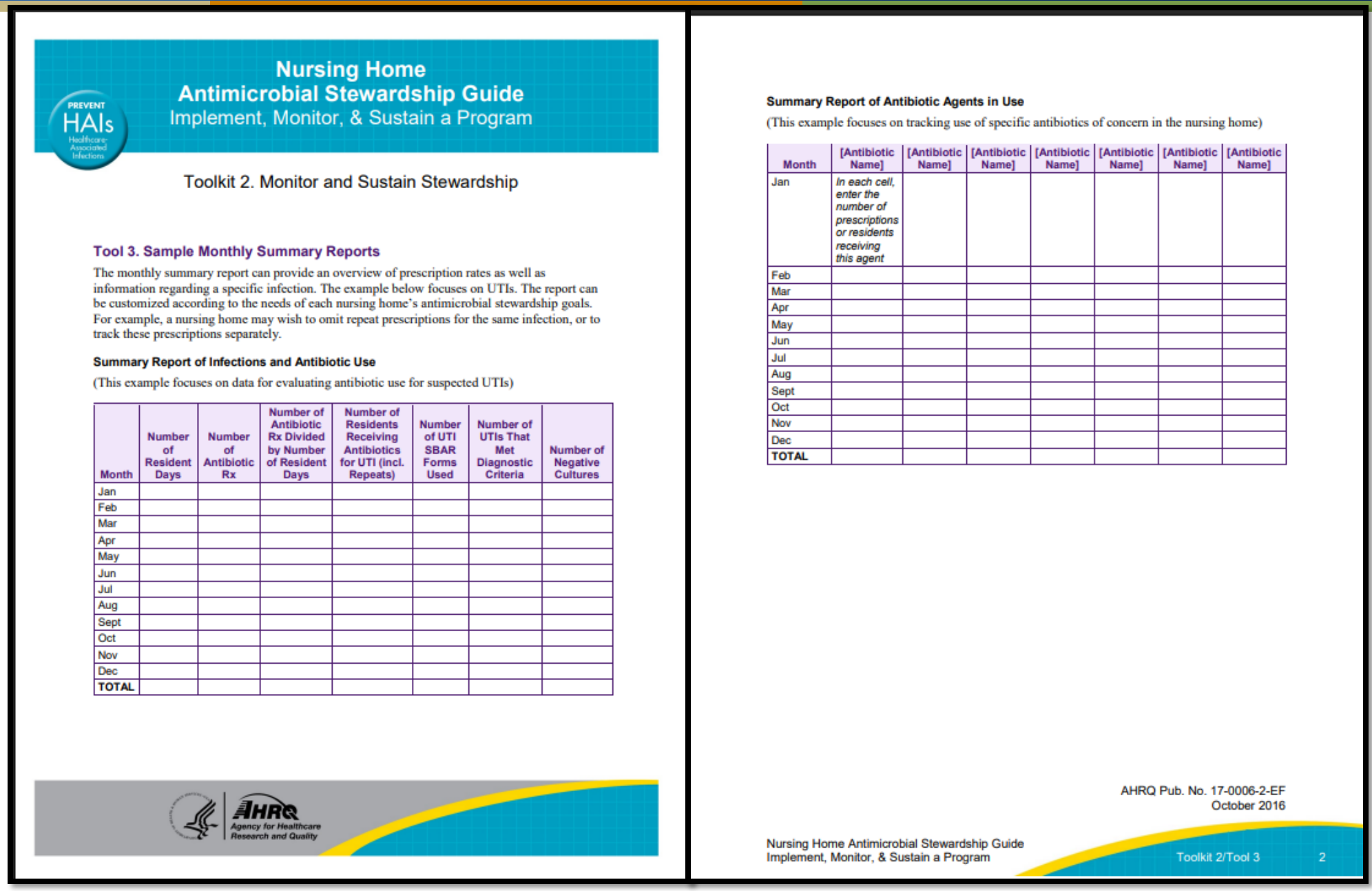
- Residents may be given antibiotics even though they do not have symptoms of a UTI.
- Antibiotics do not help when there are no symptoms of a UTI and may cause unwanted side effects and allergic reactions.
- Residents who are given unnecessary antibiotics may develop a more difficult to treat infection in the future.
- Overuse of antibiotics can result in a change from the "good" to the "bad" bacteria in the gut.
- Sometimes feeling better after taking an antibiotic may be due to improved hydration, adjustment of medications, or other treatments.

I'm still worried about my family member. What can we do for them?

- Healthcare team can review medications and maintain hydration.
- Resident can be monitored closely to assess for changes in condition, such as symptoms of infection.
- Please notify the healthcare team for additional concerns.

Antibiotic Stewardship Step 10

Track and report UTI cases and outcomes to QAPI committee.



Nursing Home
Antimicrobial Stewardship Guide
Implement, Monitor, & Sustain a Program

Toolkit 2. Monitor and Sustain Stewardship

Tool 3. Sample Monthly Summary Reports

The monthly summary report can provide an overview of prescription rates as well as information regarding a specific infection. The example below focuses on UTIs. The report can be customized according to the needs of each nursing home's antimicrobial stewardship goals. For example, a nursing home may wish to omit repeat prescriptions for the same infection, or to track these prescriptions separately.

Summary Report of Infections and Antibiotic Use

(This example focuses on data for evaluating antibiotic use for suspected UTIs)

Month	Number of Resident Days	Number of Antibiotic Rx	Number of Antibiotic Rx Divided by Number of Resident Days	Number of Residents Receiving Antibiotics for UTI (incl. Repeats)	Number of UTI SBAR Forms Used	Number of UTIs That Met Diagnostic Criteria	Number of Negative Cultures
Jan							
Feb							
Mar							
Apr							
May							
Jun							
Jul							
Aug							
Sept							
Oct							
Nov							
Dec							
TOTAL							

AHRQ Agency for Healthcare Research and Quality

Summary Report of Antibiotic Agents in Use

(This example focuses on tracking use of specific antibiotics of concern in the nursing home)

Month	[Antibiotic Name]	[Antibiotic Name]	[Antibiotic Name]	[Antibiotic Name]	[Antibiotic Name]	[Antibiotic Name]	[Antibiotic Name]
Jan	*In each cell, enter the number of prescriptions or residents receiving this agent*						
Feb							
Mar							
Apr							
May							
Jun							
Jul							
Aug							
Sept							
Oct							
Nov							
Dec							
TOTAL							

AHRQ Pub. No. 17-0006-2-EF
October 2016

Antibiograms

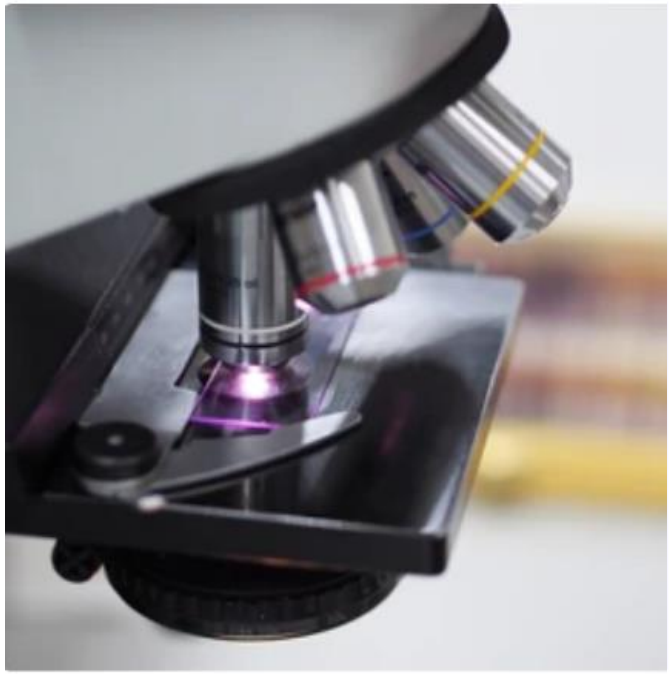
Microbiology Lab

Collect sample

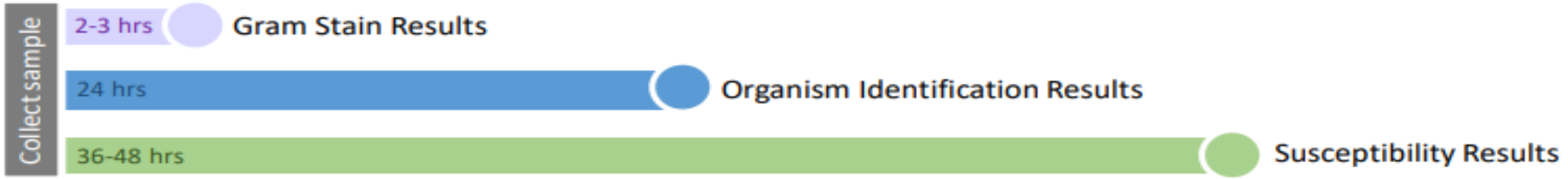
- 2-3 hrs — Gram Stain Results
- 24 hrs — Organism Identification Results
- 36-48 hrs — Susceptibility Results

Biochemical/Microscopy Identification

Gram-Positive	Gram-Negative
Cocci	**Bacilli**
Clusters	Glucose Fermenters
Staphylococcus spp.	***Enterobacterales spp.***
Pairs and Chains	Non-Glucose Fermenters
Streptococcus spp.	*Pseudomonas spp.*
Enterococcus spp.	*Stenotrophomonas spp.*
Bacilli	**Cocci/Coccobacilli**
Listeria spp.	*Acinetobacter spp.*
Bacillus spp.	*Neisseria spp.*
Corynebacterium spp.	*Haemophilus spp.*
Clostridium spp.	*Brucella spp.*



Microbiology Lab



Incubate first

MALDI-TOF

Identify organism

VITEK® 2

Incubate and identify the organism

Microbiology Lab

Collect sample

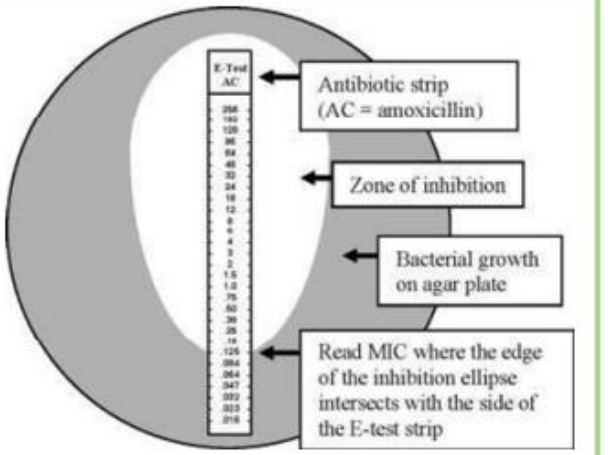
- 2-3 hrs — Gram Stain Results
- 24 hrs — Organism Identification Results
- 36-48 hrs — Susceptibility Results

VITEK® 2

Susceptibility results

Disc Diffusion

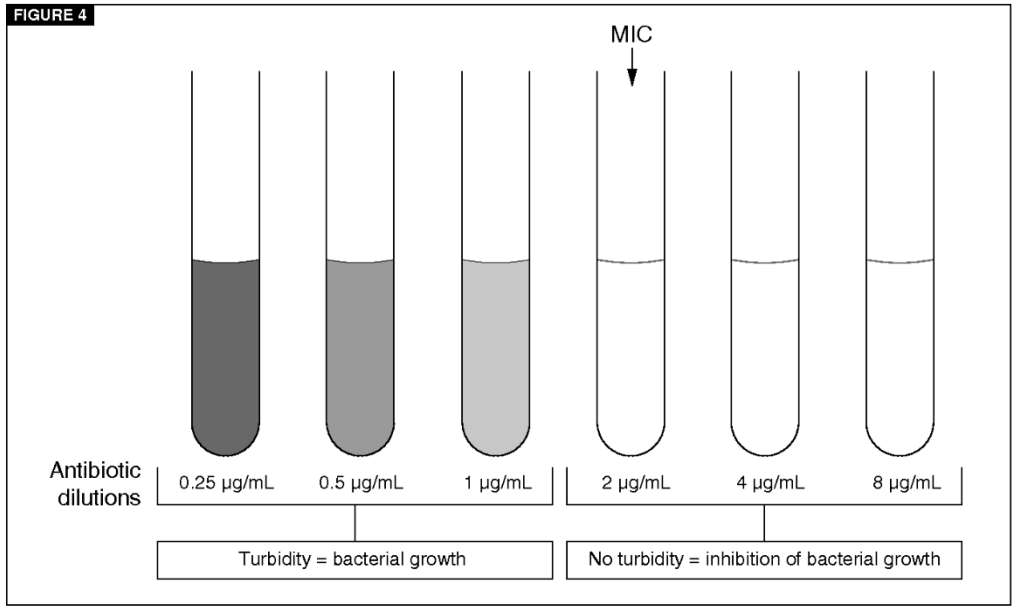
E Test



Final Culture and Sensitivity Report

Tracheal aspirate: *Pseudomonas aeruginosa*		
Antibiotic	**MIC** (CLSI Standard)	**Interpretation**
Aztreonam	8 (S ≤ 8, I=16, R ≥ 32)	S
Ceftriaxone	> 32	R
Cefepime	2 (S ≤ 8, I=16, R ≥ 32)	S
Ciprofloxacin	≤ 1 (S ≤ 0.5, I=1, R ≥ 2)	I
Tobramycin	2	**R**
Meropenem	≤ 0.5 (S ≤ 2, I=4, R ≥ 8)	S
Piperacillin/Tazobactam	≤ 4/4	S

Susceptible (S): organism likely to respond to the antibiotic
Intermediate (I): possible reduced response
Resistant (R): antibiotic unlikely to work



MIC = minimum inhibitory concentration

MIC results on a patient specific culture is compared to "standard" to decide on the interpretation (sensitive/resistant)

There is an MIC standard ("breakpoint") for every bug-drug combination per CLSI (Clinical and Laboratory Standard Institute)

What Is an Antibiogram?

An **antibiogram** is a summary report about the bug-drug susceptibility results in a given time period.

- Usually includes 1 year of data
- Organized by organism and antibiotic
- Displays the % of bacterial isolates susceptible to an antibiotic
- Best resource to "predict" the antibiotics that are more likely to be effective for infections treated within the facility
  - meant to help decide on the best antibiotic to start the patient on while we wait for the patient-specific culture to result
- Provides a way to monitor facility resistance trends

How an Antibiogram Is Created?

Process typically includes:

- Collect all bacterial isolates that were processed for the facility over 12 (or 24) months by calendar year
- Report only species with ≥30 isolates (<30 → poorer predictability)
- Apply CLSI standards to calculate % susceptibility
  - Duplicates are removed to better represent # of infections
  - Example: *Staphylococcus aureus* "one isolate per patient per year"

Patient	Organism	Drug	Blood culture	# isolates	MRSA rate (with duplicates)	Patients	MRSA rate (without duplicates)
A	MRSA	vancomycin	Day 1 , 2 , 3, 4	4	80% (incorrect)	1	50% (correct)
B	MSSA	cefazolin	Day 1	1		1	

What an Antibiogram Looks Like

		% Susceptible		
Organism	# Isolates	Antibiotic A	Antibiotic B	Antibiotic C
E. coli	100	85%	67%	98%
K. pneumoniae	50	78%	70%	95%

Interpretation: Higher % susceptible = higher likelihood the antibiotic will work.

General rule for selecting empiric therapy:

- **≥ 80% susceptible:** usually acceptable empiric treatment choice
- **60–79% susceptible:** use cautiously (consider resident risk factors)
- **< 60% susceptible:** avoid as empiric therapy

Final antibiotic choice must consider site of infection and resident factors.

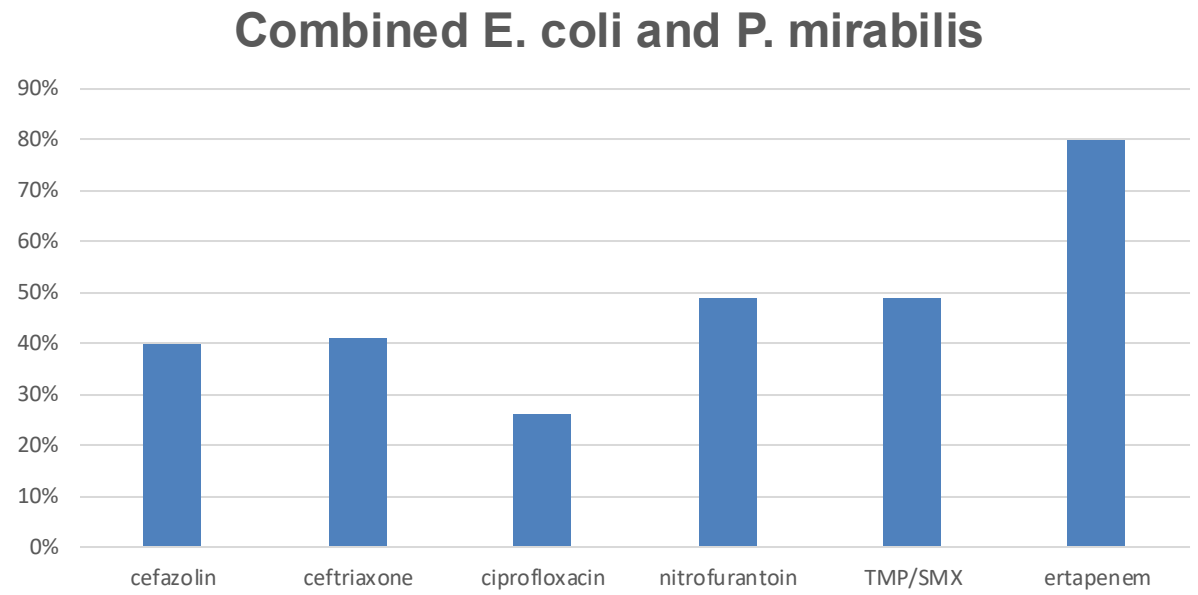
Facility Specific Antibiogram: Urine only 12 months

Minimum of 30 isolates

Gram-negative Organisms	# isolates	AMPIC/SULBAC	CEFAZOLIN	CEFEPIME	CEFTAZIDIME	CEFTRIAXONE	CIPROFLOXACIN	ERTAPENEM	GENTAMICIN	IMIPINEM(s)	LEVOFLOXACIN	NITROFURANTOIN	PIP/TAZO	TOBRAMYCIN	TRIMETH/SULFA
A. baumannii	1	0	0		0		100		100	0	100			100	100
A. baumannii, MDR	1	0	0		0		0		100	0	0		0	100	100
C. freundii	1	0	0	100	0	0	0	100	100	100	0	100	0	100	100
E. aerogenes	1		0		100	0			0	100	0		100	0	100
E. cloacae	2	0	0	50	0	0	100		100	100	100	50	0	100	100
E.coli overall	44	34	36	41	43	41	27	89	59	89	27	86	77	50	61
E. coli, non-ESBL	20	65	80	90	95	90	55	95	85	95	55	85	75	85	75
E. coli, ESBL+	24	8	0	29	4	0	4	87	37	87	4	87	79	20	50
K. oxytoca	1	0	100	100	100	100	100	100	100	100	100	100	100	100	100
K. pneumoniae	5	80	80	80	80	80	80	80	80	80	80	40	80	80	80
K. pneumoniae, ESBL+	8	0	0	12	0	0	12	62	12	62	37	12	37	0	25
K. pneumoniae, ESBL+, spp. Pneu	1	0	0	0	0	0	0	100	100	100	0	0	100	0	100
M. morganii	3	0	0	66	66	33	0	100	66	33	0	0	66	100	33
P. mirabilis	33	48	42	54	48	42	24	69	69	0	24	0	75	69	33
P. stuartii	10	0	0	50	90	40	40	100	0	20	30	0	60	0	80
P. aeruginosa	6			83	83		66		83	83	16		83	83	
S. marcescens	2		0	50	50	0	50	100	100		50	0		50	100
Sphingomonas paucimobilis	1		100		0		100		100	100	100		100	100	100
Stenotrophomonas maltophilia	1										100				100

Empiric Therapy Selection for UTI guideline

Gram-negative Organisms	# isolates	AMPIC/SULBAC	CEFAZOLIN	CEFEPIME	CEFTAZIDIME	CEFTRIAXONE	CIPROFLOXACIN	ERTAPENEM	GENTAMICIN	IMIPINEM(S)	LEVOFLOXACIN	NITROFURANTOIN	PIP/TAZO	TOBRAMYCIN	TRIMETH/SULFA
A. baumannii	1	0	0		0		100		100	0	100			100	100
A. baumannii, MDR	1	0	0		0		0		100	0	0		0	100	100
C. freundii	1	0	0	100	0	0	0	100	100	100	0	100	0	100	100
E. aerogenes	1		0		100	0			0	100	0		100	0	100
E. cloacae	2	0	0	50	0	0	100		100	100	100	50	0	100	100
E.coli overall	44	34	36	41	43	41	27	89	59	89	27	86	77	50	61
E. coli, non-ESBL	20	65	80	90	95	90	55	95	85	95	55	85	75	85	75
E. coli, ESBL+	24	8	0	29	4	0	4	87	37	87	4	87	79	20	50
K. oxytoca	1	0	100	100	100	100	100	100	100	100	100	100	100	100	100
K. pneumoniae	5	80	80	80	80	80	80	80	80	80	80	40	80	80	80
K. pneumoniae, ESBL+	8	0	0	12	0	0	12	62	12	62	37	12	37	0	25
K. pneumoniae, ESBL+, spp. Pneu	1	0	0	0	0	0	0	100	100	100	0	0	100	0	100
M. morganii	3	0	0	66	66	33	0	100	66	33	0	0	66	100	33
P. mirabilis	33	48	42	54	48	42	24	69	69	0	24	0	75	69	33
P. stuartii	10	0	0	50	90	40	40	100	0	20	30	0	60	0	80
P. aeruginosa	6			83	83		66		83	83	16		83	83	
S. marcescens	2		0	50	50	0	50	100	100		50	0		50	100
Sphingomonas paucimobilis	1		100		0		100		100	100	100		100	100	100
Stenotrophomonas maltophilia	1										100				100



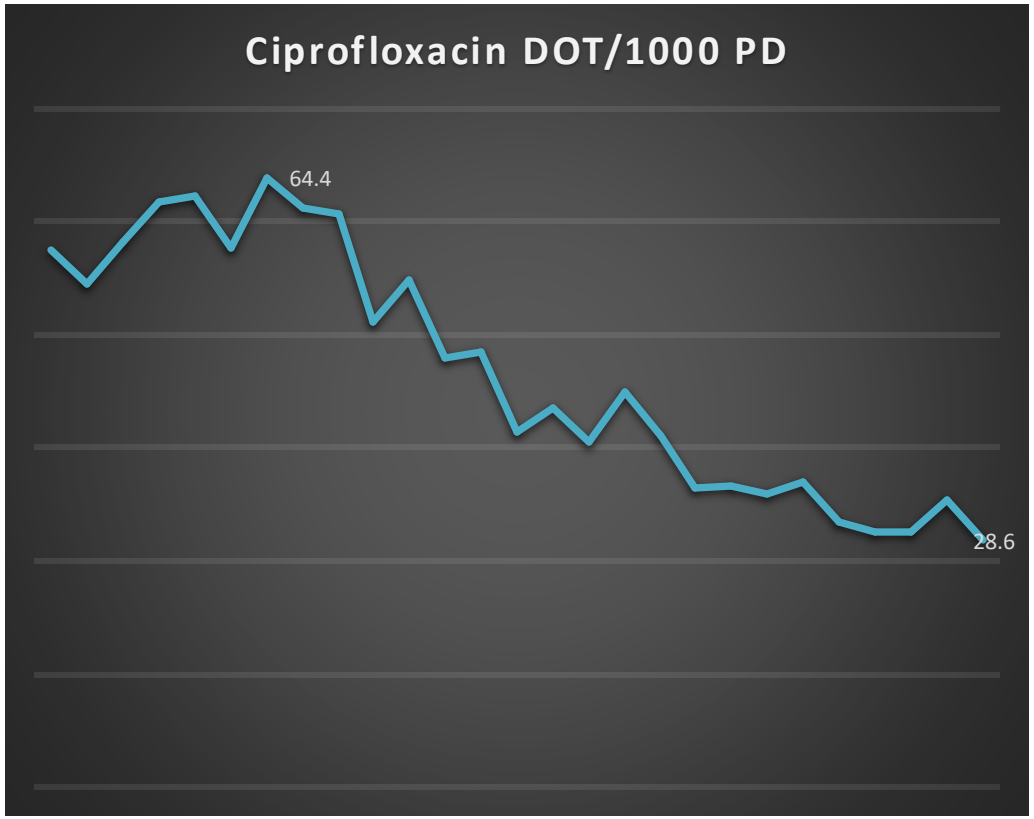
Considerations for selecting empiric therapy for a facility guideline:

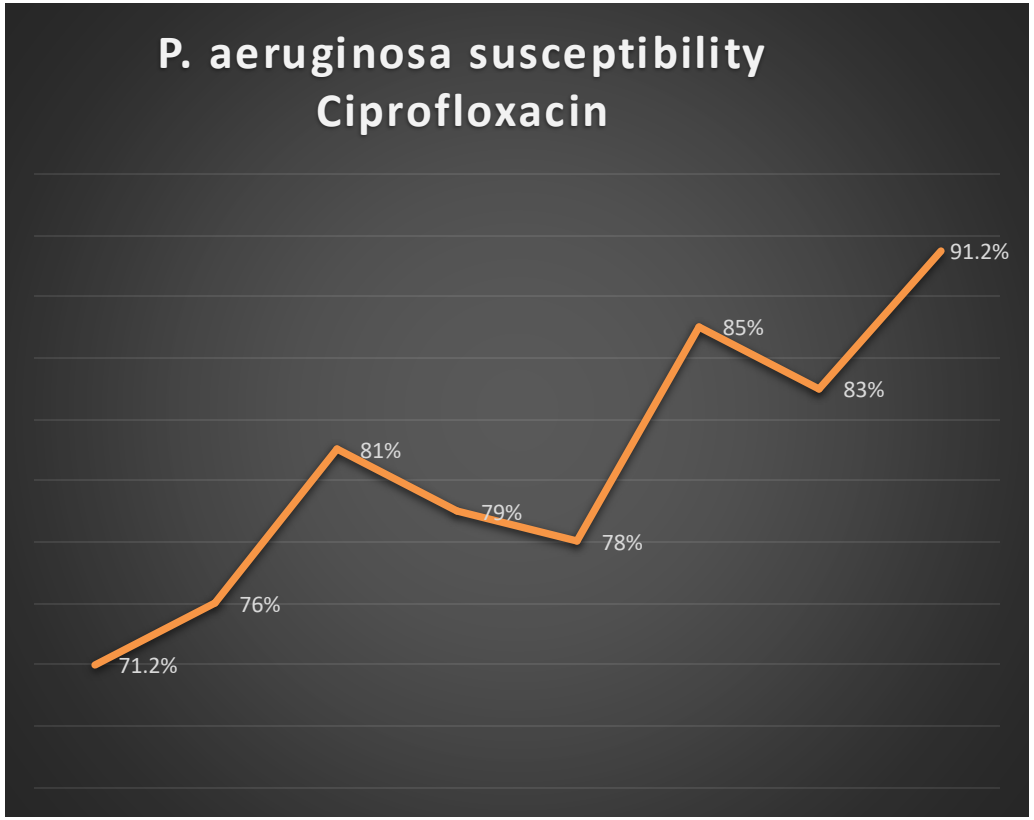
- Target the most common organisms isolated in urine (no need to target every organism)
- Select antibiotics with favorable susceptibility rates for the targeted organisms
- Where possible, promote narrower-spectrum antibiotics and avoid routine use of very broad-spectrum antibiotics

Potential UTI Guideline Recommendations:

- *Target empiric therapy to treat E.coli and P. mirabilis*
- *Ciprofloxacin should be avoided for empiric therapy*
- *Ertapenem should be reserved for higher risk infections or concern for an ESBL producer*
- *Nitrofurantoin is preferred for routine treatment of cystitis*
- *TMP/SMX is preferred for complicated UTI and pyelonephritis*
- ***Consider cefazolin or cephalexin given new breakpoints* (MIC breakpoint: ≤ 2 vs ≤ 16)

Facility Specific Antibiogram: track outcome measures





- Use the antibiogram to trend bug-drug susceptibility rates of interest
- Correlate with annual antibiotic use
- Assess the impact of antibiotic stewardship

Considerations for LTCF Antibiograms

- CDC and AHRQ recommend that all LTCF develop an antibiogram to help guide empiric therapy and monitor resistance trends

- A multidisciplinary group should formulate a plan for antibiogram development that meets the needs of the facility
  - leadership, medical director, consultant pharmacist, IP, ASP, Lab
  - Incorporate the plan into the ASP policy (accountability)

- Challenges with LTCF antibiograms
  - Use of multiple reference labs (different standards)
  - “Selective” culturing will result in a less accurate antibiogram
  - Smaller facilities have a small number of isolates (<30 isolates)
    - Combine data over more years (and/or specimen sites)
    - Combine with other antibiograms or use other antibiograms instead

What’s New in Antibiograms? Updating CLSI M39 Guidance with Current Trends J Clin Microbiology October 2022 Volume 60 (10)

Actions for Infection Preventionists

- ✓ Share the antibiogram annually with clinicians
- ✓ Incorporate into empiric treatment guidelines and algorithms
- ✓ Include in quick-reference tools and education for staff
- ✓ Monitor resistance trends and share with prescribers and stakeholders
- ✓ Integrate findings into surveillance and quality projects

QUESTIONS?