North Carolina SPICE
Statewide Program for Infection Control & Epidemiology

North Carolina Clinical Antibiotic Stewardship Partners

Urinary Tract Infections:
Appropriate Prevention, Diagnosis, Treatment and Care

Infection Management AND Antibiotic Stewardship

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Conflict of interest Disclosures

- The views and opinions expressed in this course are my own and do not reflect the official policy or position of any agency of the U.S. or NC government or UNC.
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- These slides contain materials from a variety of colleagues including CDC, WHO, AHRQ, etc.

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Outline of today's session

1. Define urinary tract infection (UTI)
2. Discuss the prevention of UTIs
3. Review the purpose of Urinalysis (UA) and components of UA
4. Review the McGeer Criteria
5. Discuss treatment for UTIs

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A Common Case

- 84 yo F living in your facility is “sleepier” today per son’s report. Staff note she has eaten less than usual and does seem more fatigued but has no other symptoms or complaints.
- Son insists that this is what happens “every time Mom has a urine infection” and requests that antibiotic treatment be initiated now. How do you respond?

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CDC NHSN UTI Definitions

- Urinary Tract Infection (UTI)/Cystitis
  - infection of the bladder (lower urinary tract).
- Pyelonephritis –
  - infection of the upper urinary tract (ureters / renal collecting system / kidneys).

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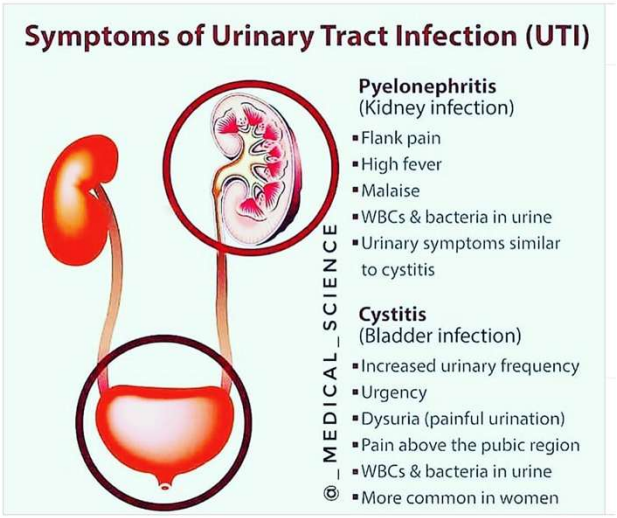
Symptoms of Urinary Tract Infection (UTI)
Pyelonephritis
(Kidney infection)
▪ Flank pain
▪ High fever
▪ Malaise
▪ WBCs & bacteria in urine
▪ Urinary symptoms similar to cystitis
Cystitis
(Bladder infection)
▪ Increased urinary frequency
▪ Urgency
▪ Dysuria (painful urination)
▪ Pain above the pubic region
▪ WBCs & bacteria in urine
▪ More common in women
@_MEDICAL_SCIENCE

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CDC NH UTI Definitions/Points to Clarify

"Mixed flora" is not considered an organism and cannot be reported.

*Yeast **cannot** be reported as an organism for a UTI.*

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UTIs: Why do we worry?

Primary cause of bacteremia in LTC residents is due to UTIs!

Incidence of **symptomatic UTIs** in elderly in LTC around 10%

Asymptomatic bacteriuria prevalence: 30% F/ 10% M

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Prevention of UTI

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Physiologic Risk Factors for UTIs in the Elderly

- Physiologic changes of the bladder with aging:
  - Women
  - Men

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Physiologic Risk Factors for UTIs in the Elderly

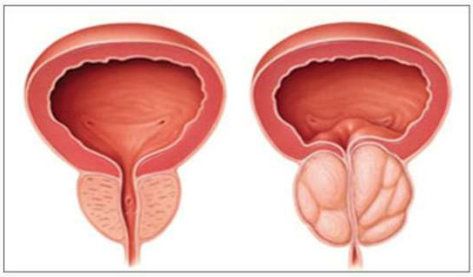
PHYSIOLOGIC CHANGES OF BLADDER WITH AGING:

Women:

- Elevation of vaginal pH due to estrogen deficiency
- Results in increased ability of bacteria to adhere to the mucosal cells of the bladder.

Men:

- Decreased bactericidal activity of prostatic secretions
- Increased post-void residual volume of urine
- - Cystocele/rectocele
- - Prostate hypertrophy
- - Neurogenic bladder from comorbidity



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Environmental Risk Factors for UTI in the Elderly

Environmental Risk Factors

- Indwelling urinary catheters
- Congregate living
  - Mechanical/chemical restraints
  - Increased exposure to antibiotics
  - Poor infection control techniques

The more impaired or frail the greater the risk of UTI!

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Physiologic Risk Factors for UTIs in the Elderly (2)

Functional / Cognitive Impairment

- Decrease self care
- Decrease cues to void
- Increased incontinence and perineal soiling
- Difficulty finding bathroom / suitable location to void

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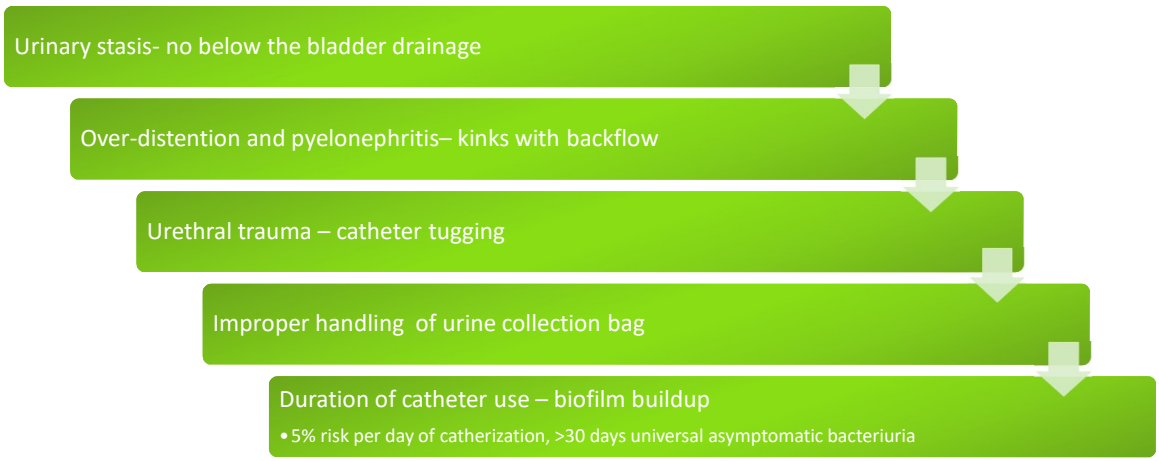
Risk Factors for CAUTI



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From this information, what are targeted ways to prevent UTI?

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Prevention of UTIs

- Hand Hygiene – both residents and staff
- Adequate hydration – 30cc/kg of body weight/day
- Perineal hygiene after toileting
- Routine toileting
- *Removing urinary catheter as early as possible.*

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WHO NEEDS A UA?

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Who Needs a UA?

- Burning
- Frequency
- Irritation
- Urgency
- New Blood in the Urine

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Dipstick Urinalysis

- Leukocyte esterase
- Nitrites
- Protein
- Blood

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Dipstick Urinalysis

- Leukocyte esterase positive (pyuria)
- Nitrites: positive (bacteriuria)
- Protein: small amount may be present
- Blood: small amount may be present

Leukocyte positive: 50–75% specific; 80-90% sensitive

Pyuria alone not an indication for treatment.

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UA: Hematuria

- Blood is not common with UTIs in older adults.
- Frank hematuria should be evaluated promptly!
- Causes:
  - Stones
  - Cancer
  - Trauma
  - Infection
  - Hemorrhage.

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CDC NHSN UTI Definitions

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Diagnostic Dilemmas for Older Adults with UTI

- Common symptoms
- Atypical symptoms
- Fever?
- Getting the history

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Evaluation of Possible UTI

- Vital signs
- Fever?
- History and examination

- U/A and C&S *BEFORE* starting antibiotics
- Clean catch vs I&O catheterization.

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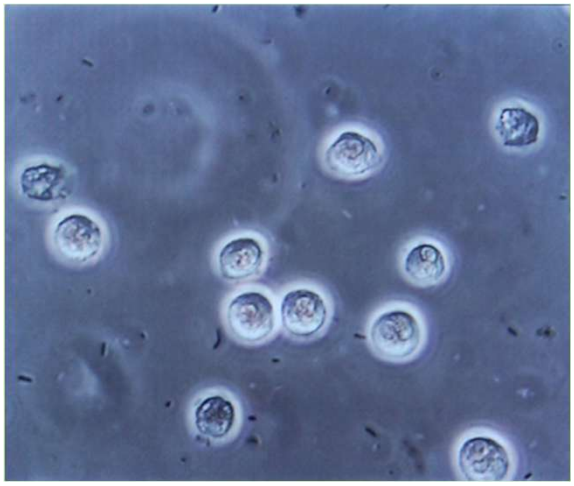
Microbiology of UTI

- 80% are caused by **gram negative bacilli**
  - E.coli, Klebsiella, Enterobacter, Proteus, and Serratia

Few Gram positive bacilli

-Staphylococcus



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Urine Culture

- **Gold STANDARD** to guide appropriate treatment
- Results : **>100,000 colonies** of one species
- Treatment can be delayed until culture results available.
- Positive culture (bacteriuria) alone **not** a reason to treat.

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McGeer Criteria

- Must fulfill both 1 AND 2
  - 1. At least 1 of the following signs/symptoms
    - Acute dysuria or pain, swelling, or tenderness of testes, epididymis, or prostate
    - Fever or leukocytosis and ≥1 of the following:
      - • Acute costovertebral angle pain or tenderness
      - • Suprapubic pain
      - • Gross hematuria
      - • New or marked increase in incontinence
      - • New or marked increase in urgency
      - • New or marked increase in frequency
    - If no fever or leukocytosis, then ≥2 or the following:
      - • Suprapubic pain • Gross hematuria • New or marked increase in incontinence • New or marked increase in urgency • New or marked increase in frequency
  - 2. At least 1 of the following microbiological criteria:
    - ≥105 cfu/mL of no more than 2 species of organisms in a voided urine sample
    - ≥102 cfu/mL of any organism(s) in a specimen collected by an in-and-out catheter

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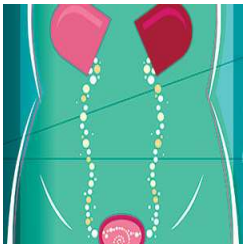
Treatment /NO Treatment

- Asymptomatic bacteriuria should **NOT** be treated.
- Routine or post-treatment screening for bacteriuria is not recommended. (Infectious Diseases Society of America)
- No benefits in decreasing rates of subsequent UTIs
- Increased risk of resistance and uropathogens



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Indwelling Catheter-Associated UTI (CAUTI)

- Catheter colonization and infection is inevitable and expected!
- Once bacteria colonizes urine, concentration is 100,000 colonies within 72 hours!!

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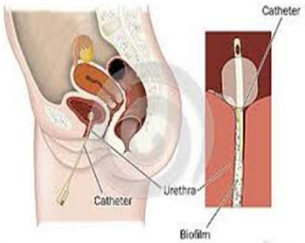
Mechanisms of Colonization

- **Colonic and perineal flora primary source**
- Extra-luminal-- women – shorter urethra
- Manipulation of the collection system
- From hands of personnel during insertion
- Ascending from drainage bag/junction



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CMS UTI Antibiotic Treatment

Minimum criteria for initiating antibiotics for UTI

NO indwelling catheter, include:

1. acute dysuria alone or fever (>37.9ºC [100ºF] or 1.5ºC [2.4ºF] increase above baseline temperature) and at least one of the following:

- new or worsening urgency, frequency, suprapubic pain, gross hematuria, costovertebral angle tenderness, or urinary incontinence.

Reference - "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;22:120-124.

CMS UTI Antibiotic Treatment

Minimum criteria for initiating antibiotics for UTI

2. **Chronic indwelling catheter** (indwelling Foley catheter or a suprapubic catheter), includes the presence of at least one of the following:

- fever (>37.9ºC [100ºF] or 1.5ºC [2.4ºF] increase above baseline temperature),
- new costovertebral tenderness, rigors (shaking chills) with or without identified cause, or new onset of delirium."

- *Reference - "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;22:120-124.*

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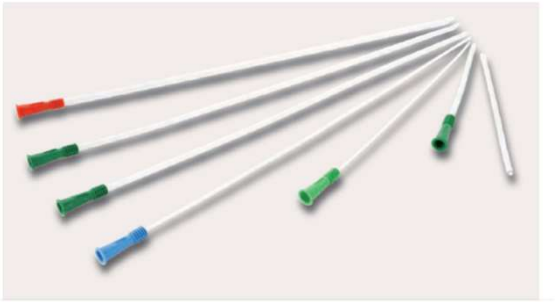
Intermittent Catheterization



- Intermittent catheterization can often manage overflow incontinence effectively.
- New onset incontinence from a transient, hypotonic/atonic bladder (usually seen following indwelling catheterization in the hospital) may benefit from intermittent bladder catheterization until the bladder tone returns (e.g., up to approximately 7 days).
- A voiding trial and post void residual can help identify when bladder tone has returned.

overflow incontinence effectively

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USE of Urinary Catheters

APPROPRIATE

- Clinical criteria for long/short for indwelling catheter:
  - Obstruction
  - Neurogenic bladder
  - Hematuria (short term)
  - Wounds stage 3 or >
  - Aggressive diuresis / monitoring of strict I/O (short term)
  - Terminally ill for comfort measures

INAPPROPRIATE

- Convenience
- Used in lieu of other bladder management strategies.
- Used for specimen collection when the resident can voluntarily void

(Indwelling catheters are associated with a 5% risk/day of new UTI)

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CDC Guidelines on Flushing and irrigation

- If obstruction or infection occurs - change the catheter.

"Unless obstruction is anticipated (e.g., as might occur with bleeding after prostatic or bladder surgery) bladder irrigation is not recommended...If obstruction is anticipated, closed continuous irrigation is suggested to prevent obstruction."

- *"Q2C.3. Bladder irrigation*

Low-quality evidence suggested no benefit of bladder irrigation in patients with indwelling or intermittent catheters.

www.cdc.gov/infectioncontrol/pdf/guidelines/...

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Prophylaxis For UTI Prevention: Cranberry

- **Cranberry juice/extract** –
  - Recent systematic reviews, including a 2023 update from the Cochrane Database, suggest that cranberry products can help prevent urinary tract infections (UTIs) in certain populations.
  - The active ingredients, proanthocyanidins (PACs), work by preventing *E. coli* bacteria from adhering to the bladder wall
- **Women with recurrent UTIs:** Multiple studies indicate that cranberry products likely reduce the risk of UTIs in women with a history of frequent infections. A 2023 Cochrane review found a 26% reduced risk in this group.
- **Elderly or institutionalized patients:** The evidence does not support the us of cranberry products for UTI prevention in other populations such Cranberry products may provide little to no benefit for older people living i nursing or care homes.

Williams G, Stothart CI, Hahn D, Stephens JH, Craig JC, Hodson EM. Cranberries for preventing urinary tract infections. Cochrane Database of Systematic Reviews 2023, Issue 11. Art. No.: CD001321. DOI: 10.1002/14651858.CD001321.pub7.

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Prophylaxis for UTI Prevention: Estrogens

- **Oral Estrogens** not shown to be beneficial.
- Topical, **vaginally applied estrogens** have been shown to be effective – 6 studies applying estrogen by ring, cream, or intravaginal tablet
  - Restores healthy vaginal tissue : keeps the tissue of the bladder and urethra healthy and flexible, improving function
  - Lowers vaginal pH which promotes growth of beneficial bacteria (like lactobacilli) and discourages pathogen growth

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Prophylaxis for UTI prevention: Methenamine

- A non-antibiotic medication used to prevent UTIs
  - Works by releasing formaldehyde in acidic urine (pH 5.5 or less)
  - Bc mechanism is different than antibiotics so bacteria don't develop a resistance
- Can lead to formation of uric acid crystals: Kidney stones: Lots of water necessary!
- Side effects: nausea, stomach upset, cramping
- Not effective for folks with renal tract abnormalities (neurogenic bladder)
- Methenamine vs Antibiotics in NH Patients (ALTAR Trial) : Effective in older adults! Even with reduced GFR.

Saul H, et al. C. Methenamine is as effective as antibiotics at preventing urinary tract infections. BMJ. 2023 Jan 17;380:72.
Harding C, et al. Alternative to prophylactic antibiotics for the treatment of recurrent urinary tract infections in women: multicentre, open label, randomised, non-inferiority trial. BMJ 2022;376:e068229.

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Prevention of UTI or Overtreatment

- Risk factor: Colonization
- Risk factor: Yeast
- Risk factor: Vaginal atrophy
- Risk factor: Indwelling Catheter
- Risk factor: Poor hygiene
- Prevention: Documentation
- Prevention: Await cultures
- Treatment: Vaginal estrogen, Vaseline
- Prevention: Remove catheter
- Prevention: Peri care and staff hand hygiene

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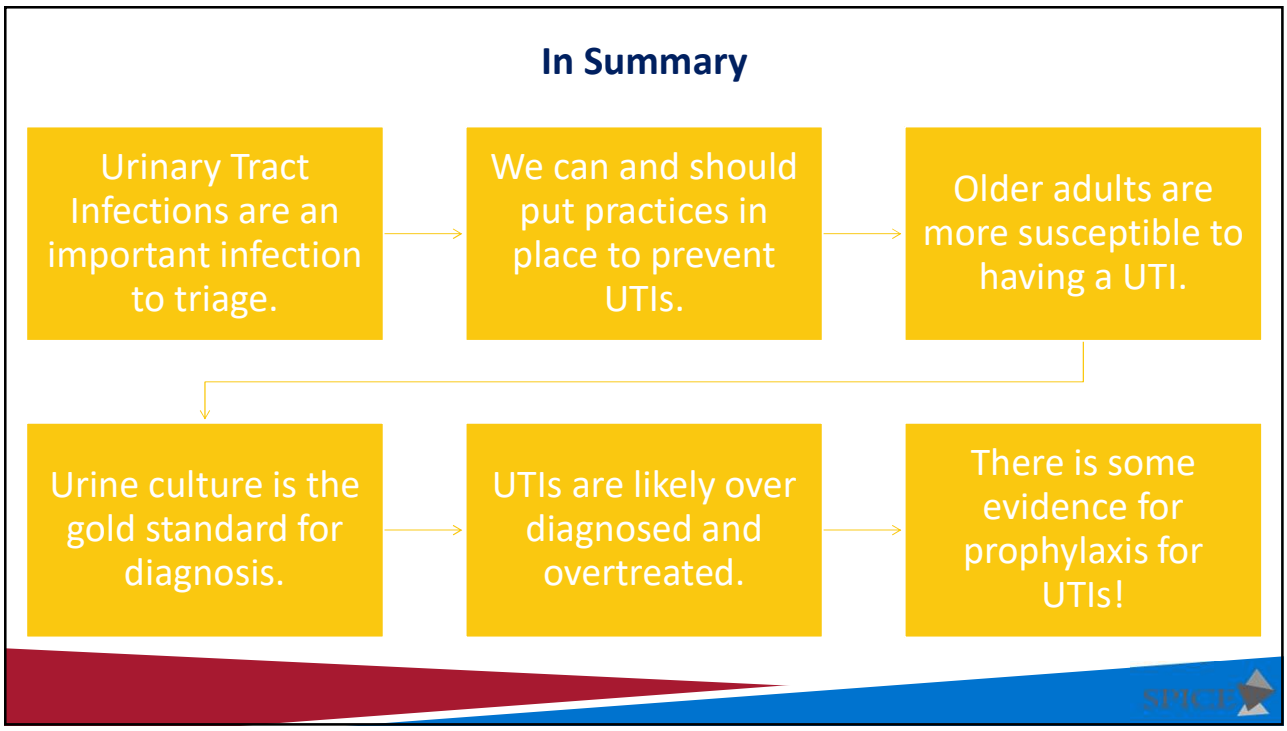
De-escalation in Urinary Tract Infection

1. Shorter length of therapy
   - Standard of care depends on the antibiotic choice, but is now typically 3 or 5 days.
   - Minimum necessary is best
2. Narrowing of spectrum
   - Utilize the culture results.
   - Consider awaiting treatment until these culture results return to ensure the appropriate antibiotic is being utilized.
3. Is this truly a UTI?

Goebel MC, Trautner BW, Grigoryan L. The Five Ds of Outpatient Antibiotic Stewardship for Urinary Tract Infections. Clin Microbiol Rev. 2021 Dec 15;34(4):e0000320. doi: 10.1128/CMR.00003-20. Epub 2021 Aug 25. PMID: 34431702; PMCID: PMC8404614.


In Summary
Urinary Tract Infections are an important infection to triage.
We can and should put practices in place to prevent UTIs.
Older adults are more susceptible to having a UTI.
Urine culture is the gold standard for diagnosis.
UTIs are likely over diagnosed and overtreated.
There is some evidence for prophylaxis for UTIs!
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A Common Case

- 84 yo F living in your facility is “sleepier” today per son’s report. Staff note she has eaten less than usual and does seem more fatigued but has no other symptoms or complaints.
- Son insists that this is what happens “every time Mom has a urine infection” and requests that antibiotic treatment be initiated now. How do you respond?

Questions and Discussion

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