

Question: Which of the following is true regarding antibiotic use in the United States?

Answer: **Roughly 30 percent of antibiotic use in U.S. hospitals are considered unnecessary.**

Antibiotics are commonly used in both the inpatient and outpatient settings. However, a sizeable amount is used inappropriately. In U.S. hospitals, it is estimated that roughly 30 percent of antibiotic use is considered inappropriate. In one retrospective analysis of five hospitals, approximately one third of the inappropriate use was attributable to the availability of a more appropriate antibiotic (i.e. there were opportunities to de-escalate from a broad spectrum agent to a more narrow spectrum drug). In another third of this cohort, antibiotics were deemed not to be necessary for the care of the patient.¹

Data from the CDC's Emerging Infections Program sites in 10 states showed that overall hospital antimicrobial use did not differ in 2015 compared to 2011 in 148 participating hospitals. However, there was a shift in that third- and fourth-generation cephalosporin and carbapenem use increased (12.2% vs. 109.7% and 3.7% vs. 2.7%, respectively). Since the COVID-19 pandemic hit in 2020, hospitals have seen an increase in overall antibiotic use. This trend has not changed regardless of whether there is a surge of COVID-19 cases.²

The outpatient setting accounts for a large volume of antibiotic use – approximately 269 million prescriptions in the U.S. were dispensed by outpatient pharmacies. The most common conditions treated are upper respiratory tract infections with azithromycin and amoxicillin being amongst the most heavily prescribed. It is estimated that one third of these antibiotic prescriptions are unnecessary.^{3,4}

Antibiotic use is frequent in nursing home residents. A small CDC study of nine nursing homes showed that 11 percent of nursing home residents (roughly 1 in 10) were taking antibiotics on any single day, and nearly 40 percent of orders for antibiotics lacked important prescribing information.⁵

References.

1. Cosgrove SE *et al.* Infect Control Hosp Epidemiol 2012; 33: 374
2. Magill SS *et al.* Clin Infect Dis 2021; 72: 1784
3. CDC. Outpatient antibiotic prescriptions—United States, 2013. Atlanta, GA: US Department of Health and Human Services, CDC; 2013.
4. Fleming-Dutra KE *et al.* JAMA 2016;315:1864–73.
5. CDC. Antibiotic Use in the United States, 2017: Progress and Opportunities.
<https://www.cdc.gov/antibiotic-use/stewardship-report/2017.html>

Question 2: Which of the following persons with asymptomatic bacteriuria should be treated?

Answers:

1. **Pregnant women**
2. **Persons with neutropenia (ANC <500 cells./mm³)**
3. **Persons awaiting an endoscopic urologic procedure**

Based on the Infectious Diseases Society of America 2019 guidelines, the following persons with asymptomatic bacteriuria should be treated: pregnant women, persons with neutropenia (ANC <500 cells/mm³), and persons awaiting an endoscopic urologic procedure associated with mucosal trauma. While clinical data is lacking, many experts also advocate treating asymptomatic bacteriuria in persons found during the first month after a kidney transplant.

Bacteriuria in the absence of clinical symptoms in a person with an indwelling urinary catheter does not warrant antibiotic treatment. Acquisition of bacteriuria is 3-5% per catheter day. Antibiotics can temporarily suppress bacteriuria; however, recurrence with the same or different species, often with organisms of increased antimicrobial resistance, occurs universally. Screening for or treating asymptomatic bacteriuria at the time of catheter removal is not recommended and can cause harm to our patients via antibiotic adverse effects and promoting antibiotic resistance.

Treatment of asymptomatic bacteriuria in persons awaiting non-urologic procedures is not recommended. There is insufficient evidence to address whether the common strategy of expanding perioperative prophylaxis to include coverage of an asymptomatic bacteriuria organism has any benefit. However, there is much potential for harm. Screening for and treating ASB increases costs and can contribute to *Clostridioides difficile* infections, adverse drug effects, and antimicrobial resistance at an individual and health system level.

Reference

1. Nicolle LE *et al. Clin Inf Dis* 2019; 68: e83
2. Shenoy ES *et al. JAMA Int Med* 2021; 181: 1533

Question 3: In an asymptomatic person with an indwelling urinary catheter, which of the following is true?

Answer: Pyuria (urine WBC >10/hpf) is a common finding and does not require antibiotic treatment.

Pyuria (urine WBC >10/hpf) is a common finding and does not require antibiotic treatment.

Pyuria is a common finding in persons with indwelling urinary catheters. This can be related to inflammation from the presence of the catheter by itself. In the catheterized patient, the presence, absence, or degree of pyuria is not diagnostic of a urinary tract infection (UTI). Findings of malodorous or cloudy urine are also not diagnostic of a UTI.

Bacteriuria and fungiuria are common findings in persons with indwelling urinary catheters. *Virtually all persons with an indwelling urinary catheter are colonized within two weeks of placement.* It is estimated that bacteriuria in persons with indwelling urinary catheters occurs at a rate of 3-10 percent per day of catheterization. Asymptomatic candiduria rarely requires antifungal therapy unless it occurs in the setting of a condition that confers high risk of dissemination (neutropenia, very low birthweight infants (<1500 g), or urinary tract manipulation). The degree of microbial culture growth by itself is not diagnostic of a UTI.

The diagnosis of a catheter associated UTI should be based on the combination of clinical signs and symptoms (i.e. fever, altered mental status, flank pain) and laboratory findings.

Reference

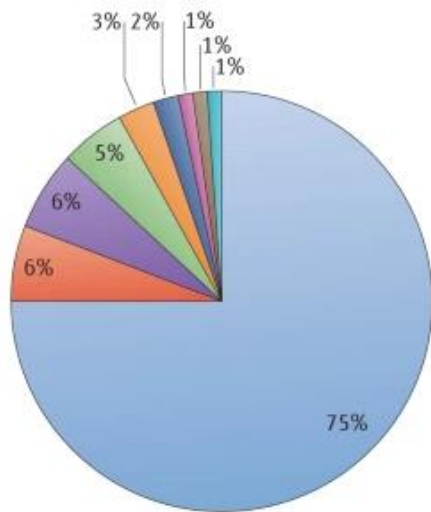
1. Hooton TM *et al. Clin Inf Dis* 2010; 50: 625
2. Nicolle LE *et al. Clin Inf Dis* 2019; 68: e83

Question 4: What is the most common pathogen seen with nosocomial urinary tract infections?

Answer: *Escherichia coli*

Enteric gram negative bacteria are the causative agent in the vast majority of community-acquired and nosocomial UTIs. Of the gram negative bacteria, *E.coli* is the most common uropathogen, attributed to 65-75% of infections. The second most common is *Klebsiella pneumoniae*, causing less than 10% of UTIs. Enterococcus species are found in urine cultures; however, they often are not causing disease. Staphylococcus aureus and Pseudomonas aeruginosa are both uncommon uropathogens, particularly in community acquired UTIs. When deciding on empiric antibiotic treatment for UTIs, most patients do not need Staph. aureus or Pseudomonas coverage. This can be considered in the setting of complicated infections involving persons with urologic hardware, immunosuppression, or recent antibiotic use.

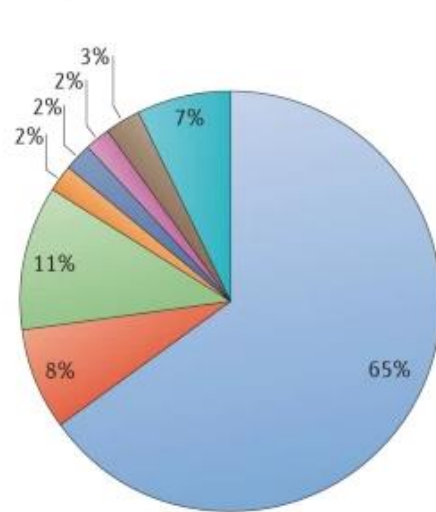
Uncomplicated UTI



Risk factors

- Female gender
- Older age
- Younger age

Complicated UTI



Risk factors

- Indwelling catheters
- Immunosuppression
- Urinary tract abnormalities
- Antibiotic exposure

Nature Reviews | Microbiology

References:

1. Flores-Mireles *et al.* *Nature Reviews Microbiol* 2015; 13: 269