

## Antimicrobial Stewardship in Ambulatory Care



### Do Bugs *NEED* Drugs?

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September 2023

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## Conflicts of Interest



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## Objectives

1. Summarize the importance of antimicrobial stewardship in ambulatory care.
2. Summarize key areas for antimicrobial stewardship implementation in the physician assistant daily practice.
3. Outline current treatment recommendations and pharmacology for antimicrobials and infections commonly encountered in primary care.

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## What is antimicrobial stewardship anyways?!

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### Antimicrobial Stewardship (ASP)

A *[multi-disciplinary healthcare initiative]* whose primary goal is to:

- optimize clinical outcomes *while*
- minimizing unintended consequences of antimicrobial use,
  - including toxicity,
  - the selection of pathogenic organisms, *and*
  - the emergence of resistance.



**Core Members:** ID physician, ID pharmacist, clinical microbiologist, information system specialist, infection control professional, hospital epidemiologist *with engagement from all clinicians.*

<https://www.cdc.gov/ncidod/dlqs/>

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### National Infection & Death Estimates for Antimicrobial Resistance



#### Urgent global public health threat

- 5 million AMR-associated deaths worldwide
- 2.8 million infections in the US each year
- \$4.6 billion to treat 6 top MDR infections

AMR: Antimicrobial Resistance; MDR: multi-drug resistant  
 CDC. Antimicrobial Resistance: National Infection & Death Estimates for Antimicrobial Resistance. <https://www.cdc.gov/ncidod/dlqs/>  
 The Lancet. Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. [https://doi.org/10.1016/S0140-6736\(20\)30181-6](https://doi.org/10.1016/S0140-6736(20)30181-6)

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## Antibiotic Misuse: Yes, it's an Inpatient thing...

### Antibiotic overuse

20-50% of U.S. Acute care hospital antibiotics are unnecessary/inappropriate

- Antibiotic overuse → Resistant organisms
- Resistant organism → Resistant infections
- Resistant infections → Patient deaths



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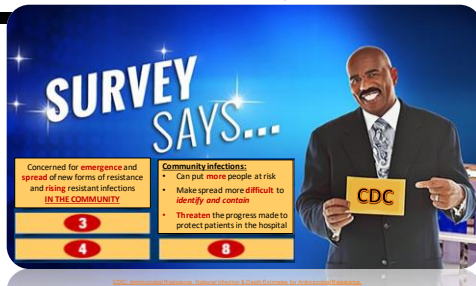
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## "The CDC Says..."



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## Antibiotic Consequences: Also an Ambulatory Thing!

### Shehab, et al. – aka the CDC

- An estimated **142,505** annual ER visits from systemic antibiotic adverse events
- Antibiotics were implicated in **19.3%** of all ED visits for drug-related adverse events

### Bates, et al.

- ~4,000 hospital admissions studied
- **24%** of ADE's were due to antibiotics
- **10% preventable**



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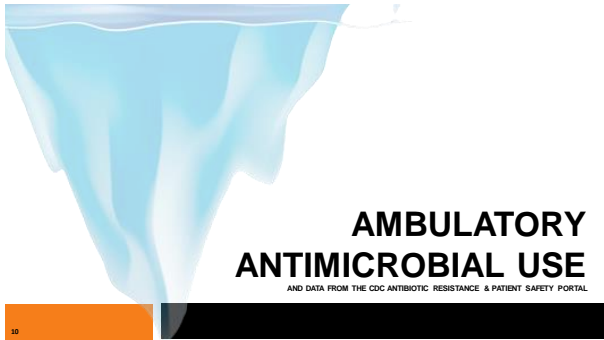
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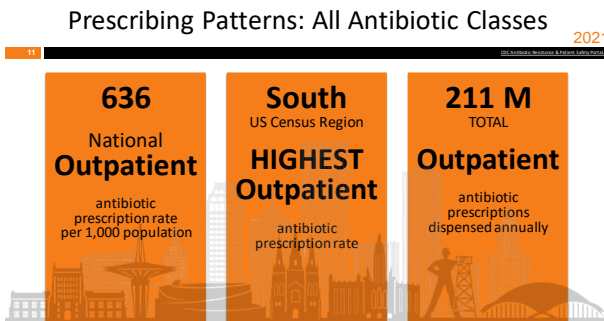
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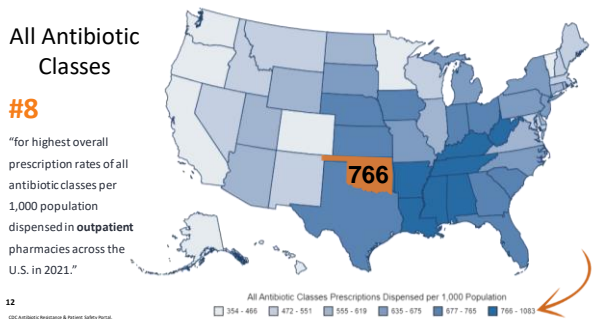
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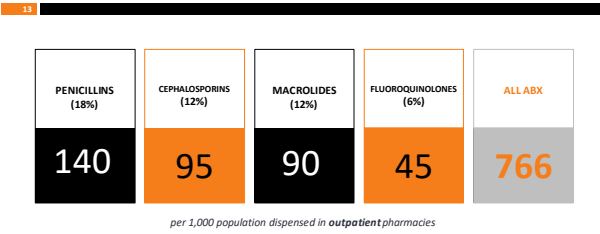
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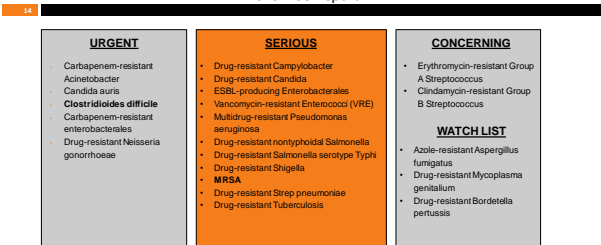
## Outpatient Antibiotic Use



GH Antibiotic Resistance & Patient Safety Report

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## Antibiotic Resistance Threats 2019 – US Report

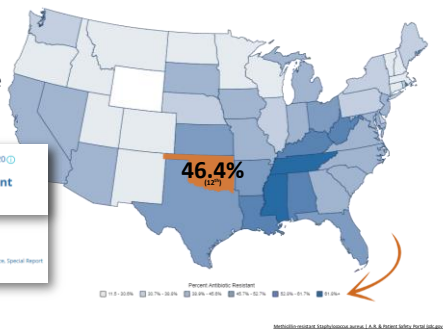


CDC, Antibiotic Resistance, 2019, US Threat Report

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## MRSA

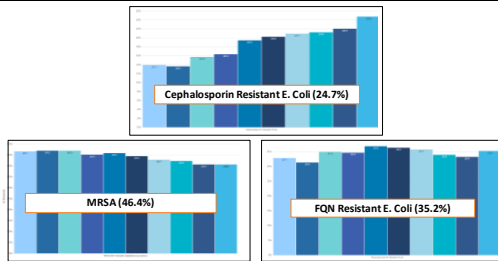
National Average  
40.6%



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## Changes over Time



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Key areas for  
antimicrobial stewardship  
implementation

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Key areas for  
antimicrobial stewardship  
implementation



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## AHRQ Safety Program (funded by HHS)

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"Is a National Stewardship program for AMBULATORY CARE associated with a DECREASE in antibiotic prescribing?"



- 389 Ambulatory Clinics
  - Primary care, pediatrics, urgent care, IHS, FQHC, and student health
- Utilized core concepts from:
  - Comprehensive Unit-based Safety Program (CUSP)
  - Four Moments of Antibiotic Decision Making

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## CUSP The Comprehensive Unit-based Safety Program

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- Goal is to create a safer clinical environment by combining:
  - improved teamwork
  - clinical best practices
  - science of safety
- Shown to prevent healthcare-associated infections (HAIs)



Module-based toolkit available on [ahrq.gov](http://ahrq.gov)

© 2010 AHRQ

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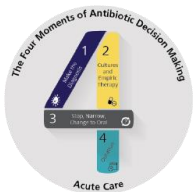
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**Moment 1:** *Make the diagnosis*

**Moment 2:** *Cultures & empiric therapy*

**Moment 3:** *Stop, narrow, change to oral*

**Moment 4:** *Duration*

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### FOUR MOMENTS OF ANTIBIOTIC DECISION MAKING

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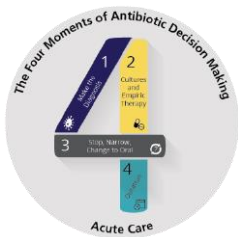
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## Moment 1: Make the Diagnosis



"Does my patient have an infection that requires antibiotics?"

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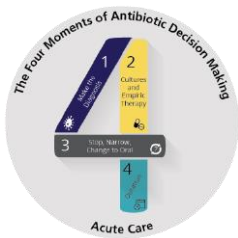
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## Moment 2: Cultures and empiric therapy



"Have I ordered appropriate cultures before starting antibiotics?"

What empiric therapy should I initiate?"

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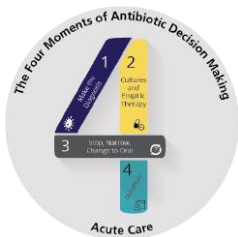
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## Moment 3: Stop, narrow, change to oral



"Can I stop antibiotics?"

Can I narrow therapy?

Can I change from IV to oral therapy?"

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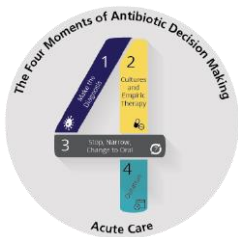
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## Moment 4: Duration



“What duration of antibiotic therapy is needed for my patient’s diagnosis?”

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## Results

	Total Visits for practice per month	Total Antibiotic Prescribing	Acute Respiratory Infection (ARI) Visits	ARI Antibiotic Prescribing
Baseline	1624	18.2%	321	32.9%
End of Program	1979	9.5%	239	24.7%

JAMA Netw Open. 2022;5(7):e220812. doi:10.1001/jamanetworkopen.2022.28812


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Key areas for antimicrobial stewardship implementation

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## Updated Guidelines and Pharmacology



Pharmacology Is Fun!

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### Updated Guidelines

- Clostridioides difficile
- Sexually transmitted infections (STI)
- Asymptomatic bacteriuria
- Community acquired pneumonia (CAP)

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### Updated Guidelines

**Clostridioides difficile**

Clinical Practice Guideline by the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA): 2021



Clinical Infectious Diseases, 2021(54) <https://doi.org/10.1093/cid/ciaa1049>

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## Clostridioides Difficile

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	Treatment Regimen
Initial episode	Fidaxomicin 200 mg PO BID for 10 days Alt: vancomycin 125 mg <u>qg</u> QID for 10 days Alt (non-severe): metronidazole 500 mg PO BID for 10-14 days
Fulminant	Vancomycin 500 mg PO/NG QID X 10 days <b>PLUS</b> Metronidazole 500 mg <u>IV</u> Q8H  *If ileus: Consider adding rectal vancomycin
First recurrence	Fidaxomicin 200 mg PO BID X 10 days <b>OR</b> Fidaxomicin 200 mg PO BID X 5 days then once every other day for 20 days <b>OR</b> PO Vancomycin taper

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## Clostridioides Difficile

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## □ Fidaxomicin

- Drug Class: Macrolide Antibiotic
- MOA: Binds to 50S subunit (transcription)
- Cost: Expensive (\$\$\$)

## □ Vancomycin

- Drug Class: Glycopeptide
- MOA: Inhibits cell wall synthesis (D-alanine-D-alanine)
- Cost: More costly orally than IV (\$\$)

## □ Metronidazole

- Drug Class: Nitroimidazole
- MOA: Free-Radical Damager to DNA
- Cost: Less Expensive (\$)



	Treatment Regimen
Initial episode	Fidaxomicin 200 mg PO BID for 10 days Alt: vancomycin 125 mg <u>qg</u> QID for 10 days Alt (non-severe): metronidazole 500 mg PO BID for 10-14 days
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## Updated Guidelines

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## Sexually transmitted infections (STI)

CDC - Treatment Guidelines  
Morbidity and Mortality Weekly Report-2021



Workowski KA, Bachmann PL, Chan PP, et al. Sexually Transmitted Infections Treatment Guidelines, 2021. MMWR Morbidity and Mortality Weekly Report 2021;70(16):1-246. <https://www.cdc.gov/mmwr/preview/mmwrhtml/sexually-transmitted-infections-treatment-guidelines-2021.pdf>

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## CHLAMYDIA

*Chlamydia trachomatis (Gram Negative Diplococci)*

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- Most common STI reported.
- Treatments:
  - Recommend **Azithromycin 1g PO x 1 dose** if
    - Urogenital infection only
    - Compliance is a concern
    - If rectal infection treated with azithromycin, test after treatment to ensure eradication
    - Pregnant patients
  - Recommend **Doxycycline 100 mg PO BID x 7 days** if
    - Infection is urogenital, rectal, oropharyngeal
- Alternative: **Levofloxacin 500 mg PO BID x 7 days**

Centers for Disease Control and Prevention. (2021, 2021). STI Treatment Guidelines Update. Retrieved from <https://www.cdc.gov/std/treatment-guidelines/2021/>. Published on 11, 2021.

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## GONORRHEA

*Neisseria gonorrhoeae*

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- 2<sup>nd</sup> most common STI reported.
- Treatments:
  - Known** Gonorrhea: **Ceftriaxone IM x 1 dose (≤150 kg: 500mg, >150kg: 1,000mg)**
  - Alternative** Gonorrhea: **Gentamycin 240mg IM plus azithromycin 2g PO x 1 dose**
    - Urogenital gonorrhea
  - Partner Therapy\***: **Cefixime 800 mg PO +/- doxycycline 100 mg po BID x 7 days**

MMWR Morbidity and Mortality Weekly Report. (2020) 69(10):2811-2814. Published on 11, 2020.

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## Antibiotic Pearls

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- Ceftriaxone & Cefixime** (*Cephalosporins: Inhibits cell wall production*)
  - Safer in pregnancy
  - Higher rates in failure associated with reinfection
  - For cephalosporin MIC elevation or allergy use: **Gentamicin 240mg IM + azithromycin 2g**
- Gentamycin** (*Aminoglycoside: Inhibition of bacterial protein synthesis by binding to 30S ribosomes*)
  - Ototoxicity & Nephrotoxicity
  - Avoid in Pregnancy
- Doxycycline** (*Tetracycline: Inhibits protein synthesis by binding to 30S ribosomal subunit*)
  - Photosensitive rash
  - Avoid in pregnancy (*bone/tooth formation abnormalities*)
  - Interactions: Cations (e.g. multi-vitamins, calcium, iron -Separate administration by several hrs)
- Azithromycin** (*Macrolide: Inhibits bacterial protein synthesis by binding to 50S ribosomal subunit*)
  - QTc prolongation
  - Safer in pregnancy

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## SYPHILIS Treponema pallidum

- Disease divided in stages based on clinical findings - Guides treatment & follow-up

**Primary, Secondary or EARLY latent:** Benzathine PCN G 2.4 million units IM x1  
Alternative: Doxycycline 100 mg PO BID x14 days

**Tertiary or LATE latent:** Benzathine PCN G 2.4 million units IM once weekly x3 wks  
Alternative: Doxycycline 100 mg PO BID x 4weeks

**Neurosyphilis:** Aqueous PCN G 3-4 million units IV Q4H or 18-24 million units continuous infusion IV x 10-14 days  
If PCN allergy: consider desensitization

<https://www.cdc.gov/std/treatment-guidelines/syphilis.htm>

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## Syphilis Antibiotic Pearls

### Penicillin G (Penicillins: Inhibits cell wall production)

- Preferred pregnancy, neurosyphilis & ALL disease stages
- Preparation [i.e., benzathine (IM), aqueous crystalline (IV)], dosage, and duration of treatment depend on the stage and clinical manifestations

#### Repository penicillins:

- Provide tissue depots from which the drug is absorbed
- IM use only
- Benzathine PCN G absorbed over days
  - Procaine PCN G absorbed over hours

Ensure correct formulation is used

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## Antibiotic Related Adverse Events: Syphilis Specific

- Jarisch-Herxheimer Reaction
- Acute febrile reaction
  - Frequently accompanied by headache, myalgia, and fever
  - Can occur within the first 24 hours after the initiation of any syphilis therapy
  - It is a reaction to treatment and NOT an allergic reaction

<https://www.cdc.gov/std/treatment-guidelines/syphilis.htm>

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## Updated Guidelines

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## Asymptomatic bacteriuria

Clinical Practice Guideline for the Management of Asymptomatic Bacteriuria: 2019 Update by the Infectious Diseases Society of America

Clinical Infectious Diseases, April 2019, <https://doi.org/10.1093/cid/ciy111> Published: 20 March 2019

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## Asymptomatic Bacteriuria (ASB)

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Screen	DO NOT Screen	No Recommendations
Pregnant women Positives: Treat for 4-7 days  Endoscopic urologic procedures associated with mucosal trauma Obtain culture prior to the procedure and target organisms 1 to 2 doses started 30-60 min before procedure	Infants & Children Nonpregnant women Functionally impaired community-dwelling persons Older residents in long-term care facilities Patients with diabetes Renal transplant >3 month ago Nonrenal solid organ transplant Impaired voiding following spinal cord injury Short- and long-term indwelling catheter Elective nonurologic surgery Implantation of or living with urologic devices	Patients with high-risk neutropenia Indwelling catheter (>30 days) Indwelling catheters at time of removal

Clinical Infectious Diseases, April 2019, <https://doi.org/10.1093/cid/ciy111> Published: 20 March 2019

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## Functionally or cognitively impaired patients

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**No** benefit to screening or treating, including:

- Bacteriuria and **delirium** but **no** local genitourinary symptoms or other systemic signs of infection
- Bacteriuria but no local genitourinary symptoms or other systemic signs of infection who experience a **fall**



Assess for **other** causes and careful **observation of UTI s/sx rather than** initiation of antimicrobial treatment

Clinical Infectious Diseases, April 2019, <https://doi.org/10.1093/cid/ciy111> Published: 20 March 2019

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## Updated Guidelines

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## Community Acquired Pneumonia (CAP)

Clinical Practice Guideline for the Management of Asymptomatic Bacteriuria: 2019 Update by the Infectious Diseases Society of America



Clinical Infectious Diseases, cci123, <https://doi.org/10.1184/clin.201908.1387>, July 2019

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## Initial Treatment of Outpatient CAP

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Patient Characteristics	Treatment Regimen		
<b>Age &lt; 65 years</b> <b>No comorbidities</b> <b>No recent antibiotics</b> <b>No risk factors for MRSA or Pseudomonas</b> <small>(History of hospitalization, long-term care, travel to high-risk areas, contact with healthcare workers, contact with nursing homes, and contact with long-term care facilities)</small>	Amoxicillin (high dose: 3 gram PO TID)		
	Doxycycline		
	Macrolide (if local resistance is <25%)		
<b>Age 65+ years</b> <b>With comorbidities</b> <b>Recent antibiotics</b> <small>(History of hospitalization, long-term care, travel to high-risk areas, contact with healthcare workers, contact with nursing homes, and contact with long-term care facilities)</small>	amoxicillin/clavulanate OR cefepodoxime OR cefuroxime	AND	azithromycin OR clarithromycin OR doxycycline
	Levofloxacin OR moxifloxacin		

**MRSA or Pseudomonas:** Risk factors: history of respiratory MRSA or P. aeruginosa, recent hospitalization with IV antibiotics (within 90 days)  
**Comorbidities:** chronic heart, lung, liver or renal disease, diabetes mellitus, alcoholism, malignancy, asplenia  
**Legionella:** First-Line Therapy is always a Respiratory Fluoroquinolone

Clinical Infectious Diseases, cci123, <https://doi.org/10.1184/clin.201908.1387>, July 2019

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We have discussed...

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- 
- 1 The importance of antimicrobial stewardship in ambulatory care
  - 2 The key areas for antimicrobial stewardship implementation in the physician assistant daily practice.
  - 3 The current trends in antimicrobial resistance and the pharmacology for antimicrobials and infections control in ambulatory care.



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**CDC** Core Elements  
Outpatient Antibiotic Stewardship

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# Commitment Action Tracking & Reporting Education & Expertise



Sanchez, E. V., Fleming-Dutra, K. E., Roberts, S. M., Hicks, L. A. (2010). Elements of Subjective Indicator Construction. *Statistical Science* 25(1), 43-54.

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**CDC** Core Elements  
Outpatient Antibiotic Stewardship

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**Commitment  
Action  
Tracking & Reporting  
Education & Expertise**

[illegible]

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## CDC Core Elements Outpatient Antibiotic Stewardship

- ✓ Combination of interventions are more effective than single interventions
- ✓ Interventions targeting decreases in overall antibiotic prescriptions were more often effective than interventions targeting improvements in antibiotic selection
- ✓ Using EHR clinical decision support systems improves antibiotic selection – develop the process around the user and educate providers on how to use it
- ✓ Educate parents on antibiotic use including possible adverse effects
- ✓ No single intervention is recommended for all settings
- ✓ Clinician education should be interactive not passive and include communication skills

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## Antimicrobial Stewardship in Ambulatory Care

### Do Bugs *NEED* Drugs?



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September 2023

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