

This is The Way: Empiric Treatment Updates of Infectious Diseases

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Name of Ineligible Company(ies)	Nature of Relevant Financial Relationship	
	What was received?	For what role?
McGraw Hill	Honorarium	Consultant
McGraw Hill	Royalties	Book authorship

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Experimental or Off-Label Drug/Therapy/Device Disclosure

I will be discussing experimental or off-label drugs, therapies and/or devices that have not been approved by the FDA.



3

Professional Practice Gap

Clinical practice guidelines have been updated recently for STI and CAP infections in the last few years, but updates remain under development for UTI and ABSSSI. Between updates, much literature is published influencing care. This will review those high-yield updates on top of the foundational topics in each of these four categories. Treatment and updates for STI and CAP will be reviewed, with a look at notable changes throughout. For UTI and ABSSSI, empiric therapy will be reviewed and supplemented with relevant primary literature that may inform empiric management and guideline development. Pharmacists with a sound foundation of guideline-based care can optimize care with literature reviews of common conditions for which antibiotics are used.



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Learning Objectives

At the completion of this activity, pharmacists will be able to:

1. List appropriate first- and second-line options for urinary tract infections
2. Choose empiric treatment options for patients diagnosed with community acquired pneumonia based on past medical history
3. Select options for acute bacterial skin and skin structure infections in pregnant or breastfeeding patients
4. State the current antibiotics and dosages for treatment of gonorrhea
5. Analyze literature on anaerobic coverage with metronidazole in pelvic inflammatory disease



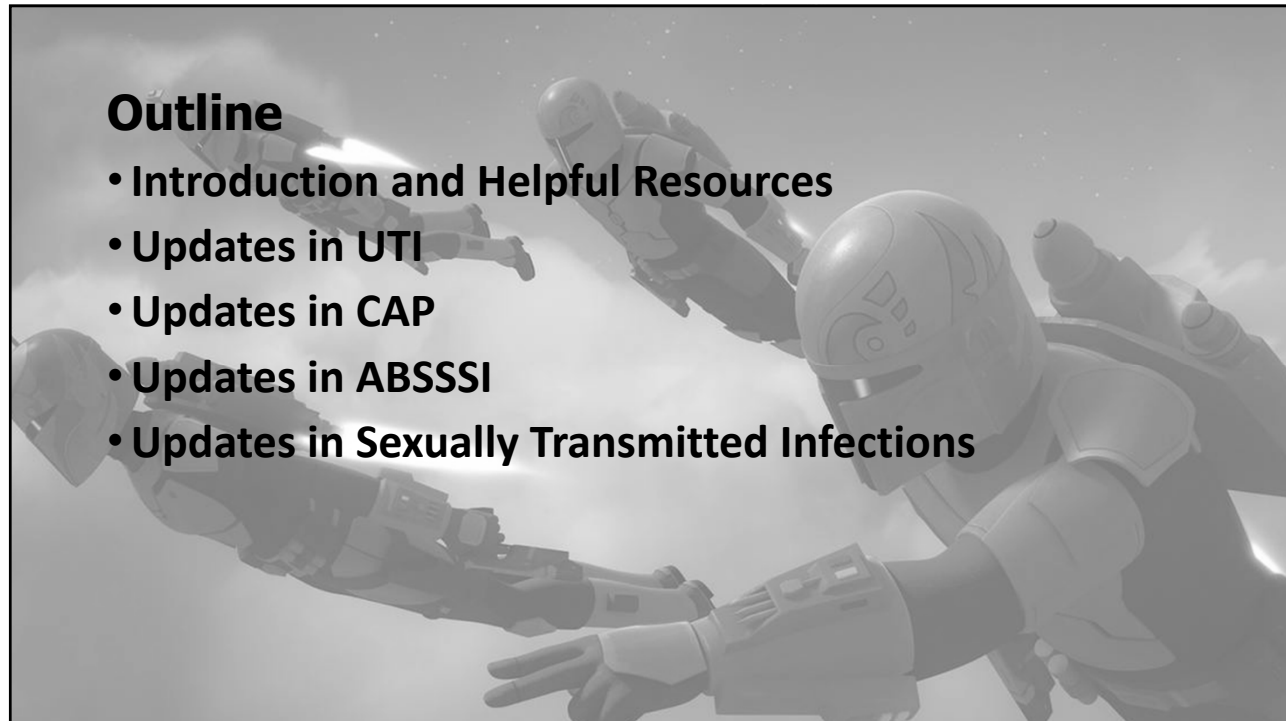
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Abbreviations Used

- ABSSSI: acute bacterial skin and skin structure infections
- Abx: antibiotics
- AC: acute cystitis
- AKI: acute kidney injury
- C&S: culture and sensitivities
- CAP: community acquired pneumonia
- CI: contraindication
- CKD: chronic kidney disease
- CNS: central nervous system
- CrCl: Creatinine clearance
- ED: Emergency Department
- ESBL: extended spectrum β lactamase
- ESRD: end stage renal disease
- FQ: fluoroquinolone
- GI: gastrointestinal
- HA: headache
- I&D: incision and drainage
- ID: Infectious Diseases
- IDSA: Infectious Diseases Society of America
- IM: intramuscular
- IV: intravenous
- LFT: liver function tests
- MAOI: monoamine oxidase inhibitor
- MDRO: multidrug resistant organisms
- MRSA: methicillin resistant *Staph. aureus*.
- MSSA: methicillin sensitive *Staph. aureus*.
- N/V/D: nausea/vomiting/diarrhea
- OR: odds ratio
- PCR: polymerase chain reaction
- Pip/Tazo: piperacillin/tazobactam
- RF: risk factor
- SMX/TMP: sulfamethoxazole/trimethoprim
- Spp.: species
- Tx: treatment
- UTI: urinary tract infection
- VPT: vancomycin + piperacillin/tazobactam



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Outline

- Introduction and Helpful Resources
- Updates in UTI
- Updates in CAP
- Updates in ABSSSI
- Updates in Sexually Transmitted Infections

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What best describes where you primarily practice?

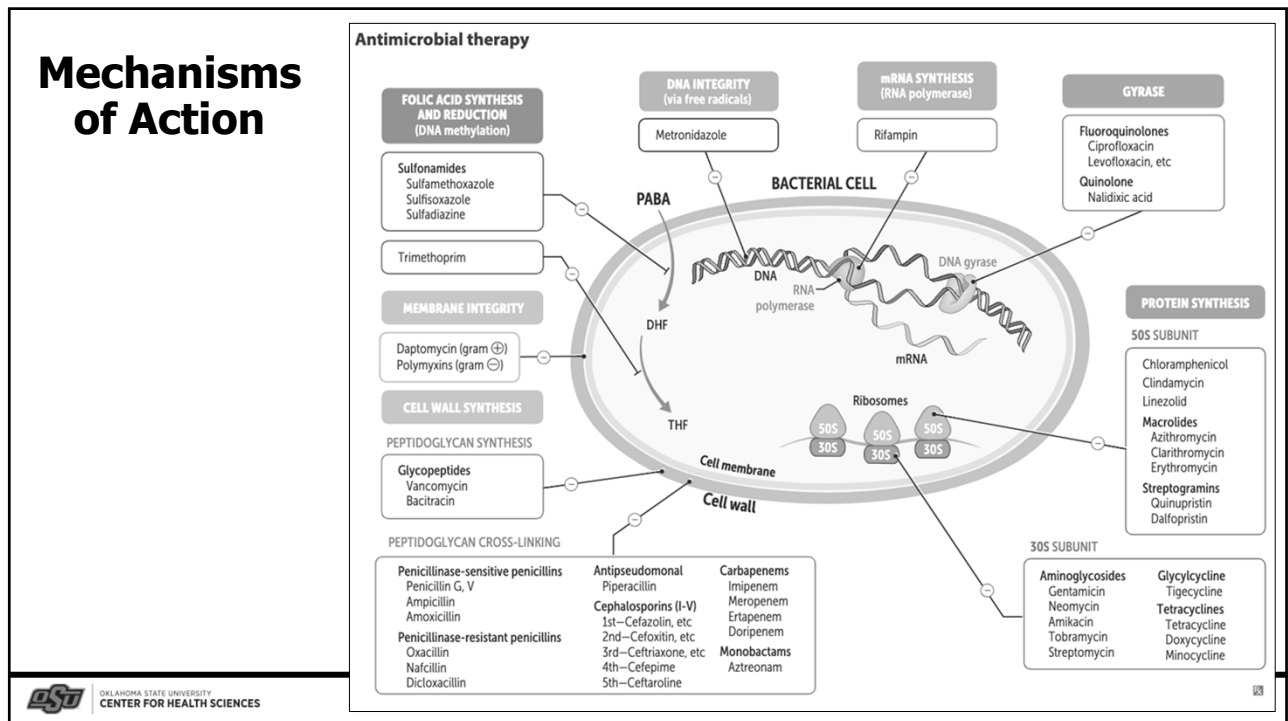
- Community pharmacy
- Hospital pharmacy
- Clinical pharmacy (inpatient)
- Clinical pharmacy (outpatient)
- Consulting pharmacy
- Academia
- Other

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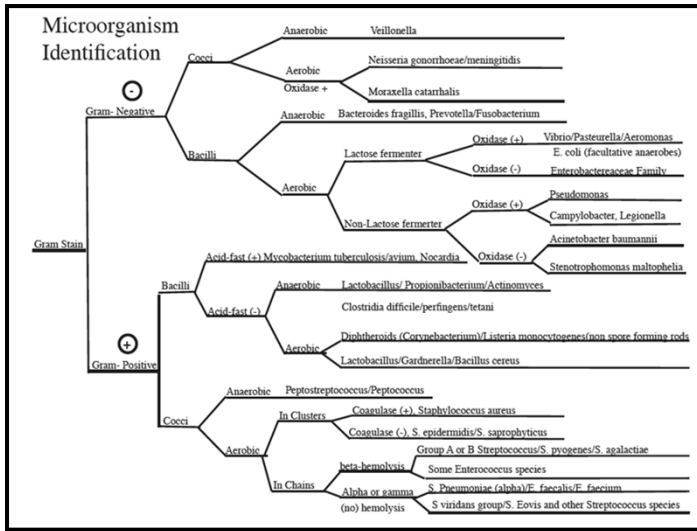
Use Your Resources

- Antibigram
- Sanford Guide
- IDSA guidelines
- ID PharmD
- Order Sets

Organism	Isolates	Ampicillin	Ampicillin/Sulbactam	Aztreonam	Cefazolin	Ceftiozone	Ceftiozone Meningitis	Cefepime	Cilindamycin	Daptomycin	Ertapenem	Erythromycin	Genitamicin	Levofloxacin	Linezolid	Meropenem	Nitrofurantoin [†]	Oxacillin	Piperacillin/tazobactam	Quinupristin/dalfopristin	Tetracycline	Tobramycin	TMP/SMX	Vancomycin
Gram-Negative																								
<i>Acinetobacter baumannii</i> complex	27	-	70	0	-	15	-	40	-	-	-	-	74	66	-	74	-	-	62	-	-	NR	NR	-
<i>Citrobacter freundii</i> complex	22	-	81	-	72	-	NR	-	100	-	90	77	-	100	-	100	-	-	-	-	-	NR	NR	-
<i>Enterobacter cloacae</i> complex	75	-	92	-	87	-	NR	-	100	-	98	89	-	100	-	100	-	-	-	-	-	98	90	-
<i>Escherichia coli</i>	876	47	NR	91	87	89	-	NR	-	100	-	91	69	-	100	95	-	-	-	-	-	98	64	-
<i>Escherichia coli</i> (urine)	778	46	NR	90	87	89	-	NR	-	100	-	90	70	-	100	95	-	-	97	-	-	-	63	-
<i>Klebsiella aerogenes</i>	31	-	73	-	73	-	NR	-	96	-	100	85	-	NR	13	-	-	-	-	-	-	-	100	-
<i>Klebsiella pneumoniae</i>	169	0	75	85	83	85	-	NR	-	99	-	91	78	-	99	25	-	90	-	-	-	NR	83	-
<i>Klebsiella oxytoca</i>	30	0	56	90	83	90	-	NR	-	100	-	90	86	-	100	80	-	NR	-	-	-	NR	83	-
<i>Proteus mirabilis</i>	138	70	NR	96	89	91	-	NR	-	100	-	86	70	-	100	0	-	100	-	-	-	NR	73	-
<i>Pseudomonas aeruginosa</i>	125	-	-	NR	0	-	90	-	-	-	-	95	74	-	93	-	-	83	-	-	-	NR	-	-
<i>Serratia marcescens</i>	19	-	-	100	0	100	-	NR	-	100	-	100	100	-	100	0	-	NR	-	-	-	-	NA	-
Gram-Positive																								
<i>Enterococcus faecalis</i>	187	100	-	-	-	-	-	-	-	-	-	-	-	78	100	-	98	-	-	-	-	-	-	100
<i>Enterococcus faecalis</i> (urine only)	72	98	-	-	-	-	-	-	NR	-	-	-	-	98	-	97	-	-	-	-	-	-	-	100
<i>Enterococcus faecium</i>	14	28	-	-	-	-	-	-	NR	-	-	-	-	35	100	-	14	-	-	NR	NR	-	-	92
<i>Enterococcus faecium</i> (VRE)	60	1	-	-	-	-	-	-	81	-	-	-	-	0	96	-	3	-	-	83	-	-	-	0
<i>Staphylococcus aureus</i> (MSSA)	204	-	-	-	-	-	-	75	NR	100	59	-	-	NR	NR	-	100	100	-	-	-	95	-	99
<i>Staphylococcus aureus</i> (MRSA)	215	-	-	-	-	-	-	60	NR	-	11	-	NR	NR	-	99	0	-	0	89	-	-	90	100
<i>Streptococcus pneumoniae</i>	19	-	-	-	-	100	88	-	-	-	57	-	100	-	83	-	-	-	-	-	88	-	-	55

OSU Medical Center Antibigram 2021.

Bacteria Differentiation



- Culture and sensitivities
- Information received in stages
- Helps to de-escalate therapy

Durations of Therapy

- Dr. Brad Spellberg, MD: “Shorter is better”

	Short Treatment	Long Treatment	Results	# Supporting RCTs
Community Acquired Pneumonia	3-5 days	5-14 days	Equivalent	14
Pyelonephritis	5 or 7 days	10 or 14 days	Equivalent	9
Cellulitis/Wound/Abscess	5-6 days	10 days	Equivalent	4

Spellberg B. JAMA Intern Med 2016;176(9):1254-1255.
<https://www.bradspellberg.com/shorter-is-better>



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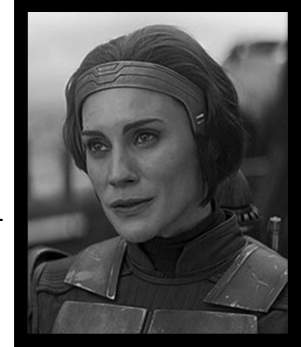


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Case #1

You receive a phone call from the urgent care next door, which is staffed by a physician assistant who is new to the state.

She tells you about a patient - Bo-Katan Kryze, 36-year-old female - who presents with a chief complaint of dysuria and urinary frequency. She denies fever and flank pain. She is sexually active. This is her 2nd urinary tract infection in the past year.



She has no known drug allergies. She has a past medical history significant for high cholesterol and osteoarthritis, for which she takes rosuvastatin 10 mg po daily, meloxicam 7.5 mg po daily prn. She has recently added phenazopyridine prn for urinary symptoms.

You are asked for your recommendation on empiric treatment as well as any other pharmacotherapeutic suggestions.

Image: https://en.wikipedia.org/wiki/Bo-Katan_Kryze

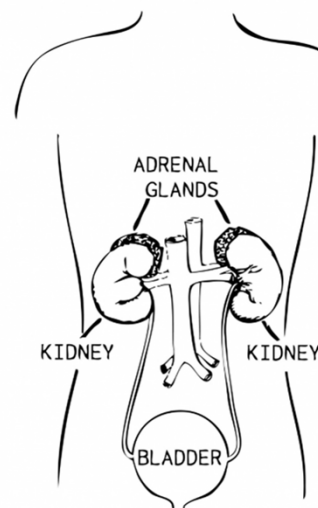


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Urinary Tract Infections

- Cystitis (infection of bladder) initial s/sx: increased urinary frequency, dysuria, nocturia
- Pyelonephritis (infection of kidneys) initial s/sx: symptoms as above + signs of systemic infection such as fever, flank pain, N/V and chills
- Uncomplicated vs. complicated



Gupta, et al. Clin Infect Dis 2011;52:e103-e120. Durham SH. ACSAP 2022 Book 2. Infectious Diseases in Ambulatory Care.

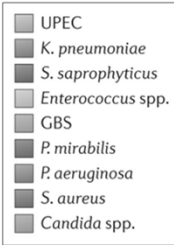
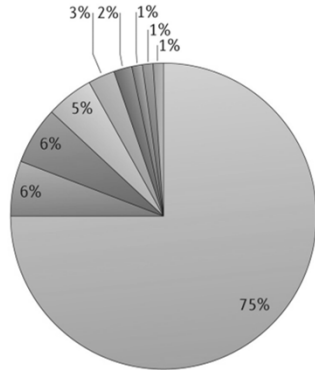


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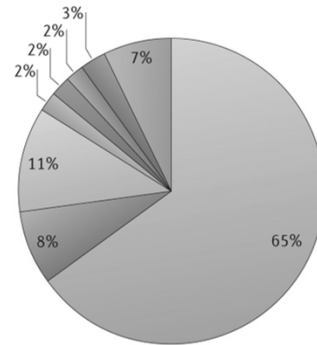
Expected Uropathogens

Uncomplicated UTI



- Risk factors**
- Female gender
 - Older age
 - Younger age

Complicated UTI



- Risk factors**
- Indwelling catheters
 - Immunosuppression
 - Urinary tract abnormalities
 - Antibiotic exposure

Empiric antibiotics should cover uropathogenic *Escherichia coli* (UPEC)

Flores-Mireles A, et al. Urinary tract infections: epidemiology, mechanisms of infection and treatment options. *Nat Rev Microbiol* 2015;13:269–284.

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CYSTITIS

- Nitrofurantoin
 - Lowest collateral damage
 - Longest treatment course of 1st line (5d)
- Fosfomycin
 - Clinical/microbiologic cure less likely at 28d vs. nitrofurantoin (100mg TID)
 - Expensive
 - Helpful for MDRO, but multiple doses needed
- SMX/TMP
 - Avoid if local resistance for *E. coli* is 20% or higher

First Line

Nitrofurantoin x 5d

Fosfomycin x 1 dose

SMX/TMP x 3d
(*E. coli* resistance <20%)

Second Line

Fluoroquinolones x 3d

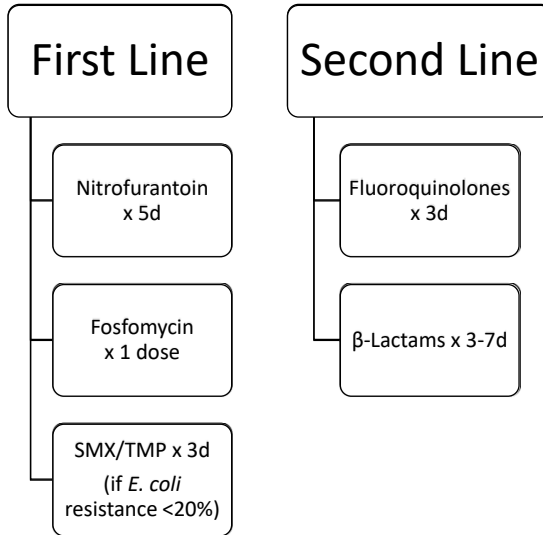
β-Lactams x 3-7d

Gupta, et al. *Clin Infect Dis* 2011;52:e103-e120. Durham SH. ACSAP 2022 Book 2. Infectious Diseases in Ambulatory Care. Huttner et al. *JAMA* 2018;319:1781-9.

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CYSTITIS

- Fluoroquinolones
 - Highest collateral damage
 - Adverse effects: [tendon rupture], [peripheral neuropathy], [CNS effects], [exacerbation of myasthenia gravis]
 - GI perf, aortic aneurysm/dissection, retinal detachment, glucose disturbances, QT prolongation, *C. difficile*
- Beta-lactams
 - Amox/clav, cefdinir, cefpodoxime, cefaclor (and also cephalexin)
 - Avoid amoxicillin and ampicillin



Gupta, et al. Clin Infect Dis 2011;52:e103-e120. Durham SH. ACSAP 2022 Book 2. Infectious Diseases in Ambulatory Care. Huttner et al. JAMA 2018;319:1781-9.

Use your institutional resistance rates

Antibiotic (Gen)	Guideline Rec	OSUMC <i>E. coli</i> Susceptibility
SMX/TMP	Avoid in all UTIs if resistance >20%	63%
Levofloxacin	Avoid in pyelo if resistance >10%	70%
Cefazolin (1 st)	none	87%
Ceftriaxone (3 rd)	none	89%
Nitrofurantoin	none	95%



Use comparable class cephalosporin available in oral dosage form.
 cefazolin → cephalexin ceftriaxone → cefdinir

OSU Medical Center Antibiogram 2021. Gupta, et al. Clin Infect Dis 2011;52:e103-e120.

CYSTITIS: Nitrofurantoin vs. β -lactam?

Select Nitrofurantoin (1st line) if:

- CrCl is >30
- High suspicion of *E. coli* or *Klebsiella* spp.
- Patient can afford the prescription
- Patient is female; cystitis is uncomplicated

Select β -Lactam (2nd line) if:

- CrCl is <30
- High suspicion of *Proteus* spp. is expected
- Cost of nitrofurantoin is prohibitive
- Patient is male; cystitis is complicated
- Patient has pyelonephritis

Lexi-complete. Uptodate.com. Accessed 4/24/2023.



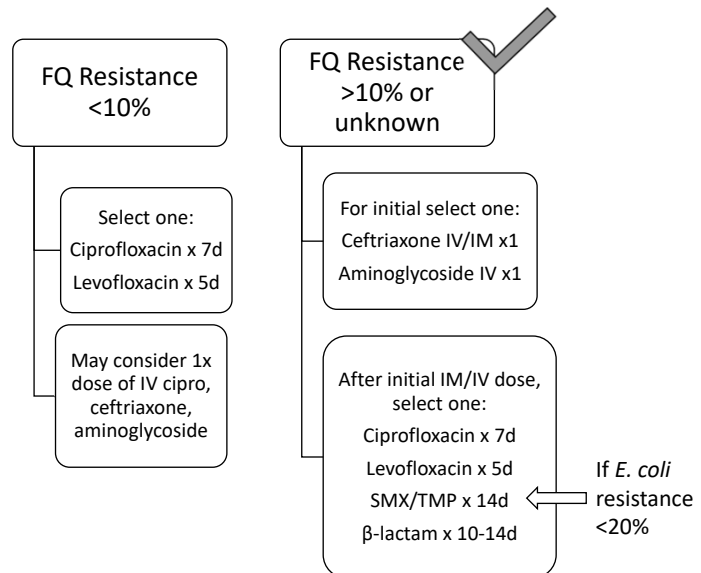
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PYELONEPHRITIS

- Fever / Flank Pain
- Obtain urine/cultures
- Review previous cultures from 6-9 months
- Determine fluoroquinolone resistance \rightarrow OSUMC is 30%



Gupta, et al. Clin Infect Dis 2011;52:e103-e120.



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PYELONEPHRITIS

- Fever / Flank Pain
- Obtain urine/cultures
- Review previous cultures from 6-9 months
- Determine fluoroquinolone resistance → OSUMC is 30%

```

graph TD
    A[FQ Resistance <10%] --> B[Select one:  
Ciprofloxacin x 7d  
Levofloxacin x 5d]
    B --> C[May consider 1x dose of IV cipro,  
ceftriaxone,  
aminoglycoside]
    D[FQ Resistance >10% or unknown] --> E[For initial select one:  
Ceftriaxone IV/IM x1  
Aminoglycoside IV x1]
    E --> F[After initial IM/IV dose,  
select one:  
Ciprofloxacin x 7d  
Levofloxacin x 5d  
SMX/TMP x 14d  
β-lactam x 10-14d]
    G[If E. coli resistance <20%] --> F
  
```

Gupta, et al. Clin Infect Dis 2011;52:e103-e120.

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PYELONEPHRITIS: Ceftriaxone vs. Aminoglycoside?

Select ceftriaxone if:	Select aminoglycoside if:
<ul style="list-style-type: none"> • PMH does not include ESBL • Underlying renal dysfunction 	<ul style="list-style-type: none"> • PMH includes ESBL • No underlying renal dysfunction
<ul style="list-style-type: none"> • Dose as a one-time IV or IM <ul style="list-style-type: none"> • Ceftriaxone 1 gram 	<ul style="list-style-type: none"> • Dose as a consolidated 24-hour one-time IV <ul style="list-style-type: none"> • Gentamicin 5-7 mg/kg • Tobramycin 5-7 mg/kg

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Antimicrobial Resistance

- Extended Spectrum β -Lactamases (ESBLs):
 - Outpatient: Avoid all β -lactam antibiotics
 - Inpatient: Select carbapenem as tx (e.g., ertapenem)

Susceptibility		Klebsiella pneumoniae
VITEK GN PANEL		
Amikacin MicroScan GN		
Amoxicillin/K Clavulanate MicroScan GN		
Ampicillin/Sulbactam	> =32	Resistant
Cefazolin	> =64	Resistant
Cefepime	2	Resistant
Ceftazidime	16	Resistant
Ceftazidime/Avibactam		
Ceftolozane/Tazobactam		
Ceftriaxone	> =64	Resistant
ESBL	Positive	
Gentamicin	< =1	Susceptible
Levofloxacin	1	Intermediate
Meropenem	< =0.25	Susceptible
Meropenem/Vaborbactam		
Minocycline		
Nitrofurantoin	64	Intermediate
Piperacillin/Tazobactam	16	Susceptible Dose Dependent
Tobramycin	> 16	Resistant
Trimethoprim/Sulfamethoxazole	> =320	Resistant


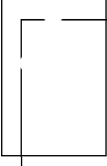
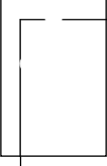



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Special Populations

- Pregnancy – UTI or asymptomatic bacteriuria

	β -lactam (ok at any trimester)		Nitrofurantoin (avoid in last 30 days – neonatal jaundice; contraindicated at weeks 38-42 – hemolytic anemia)
	SMX/TMP (2 nd trimester only if no other options exist – congenital malformations)		Fluoroquinolones (Never ok in pregnancy – inhibit cartilage and bone development)

Lexi-complete. Uptodate.com. Accessed 4/24/2023.



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Special Populations

- Prostatitis
 - **SMX/TMP** and **fluoroquinolones** concentrate in prostate best – use empirically until further culture and susceptibility known
 - Empiric alternatives are nitrofurantoin or beta-lactams
 - Duration of treatment = 2 to 4 weeks


Lipsky et al. Clin Infect Dis 2010;50:1641-52.

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Special Populations

- Catheter-associated UTI
 - Source control
 - Watch for MDRO
 - Empiric antibiotics guided by local antibiogram and previous C&S

Hooton et al. JAMA 2005;293:949-55.

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Recurrent UTI Treatment

- Recurrent UTI:
 - 2+ separate, culture-proven episodes of symptomatic UTI episodes within 6 months
 - 3+ within 1 year

- Shared decision making for risks and benefits

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Recurrent UTI Treatment

- | | |
|--|---|
| <ul style="list-style-type: none"> • Continuous prophylaxis <ul style="list-style-type: none"> • TMP 100mg once daily • TMP/SMX SS ½ po daily • TMP/SMX SS ½ po 3x weekly • Nitrofurantoin 50 mg daily • Nitrofurantoin 100 mg daily • Cephalexin 125 mg daily • Cephalexin 250 mg daily • Fosfomycin 3 g every 10 days | <ul style="list-style-type: none"> • Pre- or postcoital prophylaxis <ul style="list-style-type: none"> • TMP/SMX SS ½ tablet once • TMP/SMX SS 1 tablet once • Nitrofurantoin 50 mg • Nitrofurantoin 100 mg • Cephalexin 250 mg |
|--|---|

Evidence favors nitrofurantoin due to tolerability and low collateral damage risk. Select another agent if chronic lung or liver disease.

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Non-Antibiotic Pharmacotherapy

- Phenazopyridine
 - Urinary pain relief for 2 days while treating urinary tract infection
- Cranberry:
 - Several RCTs have shown benefit with various formulations
 - No one product recommended over another
 - Caution juices in people with diabetes
 - Interference with urinalysis
- Estrogen therapy:
 - Reduces UTI in peri- and postmenopausal women
 - Minimal systemic absorption



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What about The Child(ren)?

- 95-90% caused by *E. coli*
- Use local resistance patterns to guide therapy
- Third generation cephalosporins have minimal resistance
 - Avoid amoxicillin
- Febrile child = 3rd generation cephalosporin
- Afebrile child = 1st generation cephalosporin
- Duration of treatment = 7-10 days



Image: <https://disney.fandom.com/wiki/Grogu>

Mattoo TK et al. Pediatrics 2021;147(2):e2020012138.



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Case #1 Revisited

You receive a phone call from the urgent care next door, which is staffed by a physician assistant who is new to the state.

She tells you about a patient - Bo-Katan Kryze, 36-year-old female - who presents with a chief complaint of dysuria and urinary frequency. She denies fever and flank pain. She is sexually active. This is her 2nd urinary tract infection in the past year.

She has no known drug allergies. She has a past medical history significant for high cholesterol and osteoarthritis, for which she takes rosuvastatin 10 mg po daily, meloxicam 7.5 mg po daily prn. She has recently added phenazopyridine prn for urinary symptoms.

You are asked for your recommendation on empiric treatment as well as any other pharmacotherapeutic suggestions.

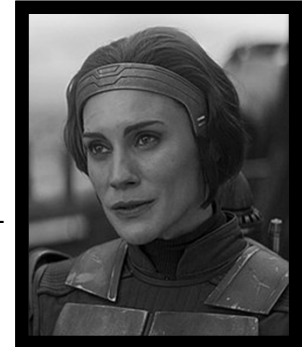


Image: https://en.wikipedia.org/wiki/Bo-Katan_Kryze



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What else would you like to know before making recommendations for Bo-Katan's urinary tract infection?

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Text **OU321** to **37607** once to join

What antibiotic would you like to recommend for Bo-Katan today?

Sulfamethoxazole/Trimethoprim

Ciprofloxacin

Nitrofurantoin

Cephalexin

Fosfomycin

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What other recommendations do you have for the physician assistant?

Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

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UTI Summary

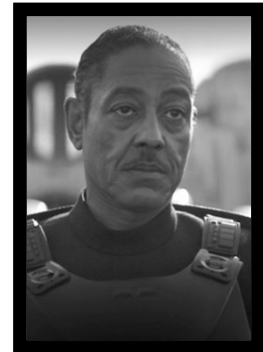
- Cystitis:
 - Nitrofurantoin usually best first line agent in uncomplicated acute cystitis if CrCl >30
 - β -lactams are second line
 - SMX/TMP resistance precludes use as empiric tx
- Pyelonephritis:
 - Fluoroquinolone or β -lactam
 - 1-time parenteral dose
- OTC recommendations



Updates in Community Acquired Pneumonia

Case #2

- Moff Gideon is a new patient to your pharmacy, and he presents after being discharged from the ED for a diagnosis of community acquired pneumonia with a prescription for azithromycin 500 mg on day 1, followed by 250 mg on days 2-5 and a refill of his albuterol inhaler
- His past medical history is significant for peripheral artery disease, COPD, and hypertension
- He smokes 2 packs per day, with a 30 pack year history
- Medications:
 - aspirin 81 mg daily
 - fluticasone/umeclidinium/vilanterol 1 puff daily
 - amlodipine 10mg daily
 - albuterol as needed



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Expected empiric organisms

Streptococcus pneumoniae

- Antibiotics can target cell wall, DNA gyrase, or protein synthesis

Atypicals:

- *Legionella* spp., *Chlamydia pneumoniae*, *Mycoplasma pneumoniae*
- Antibiotics can target DNA gyrase, protein synthesis
 - Atypicals lack a cell wall

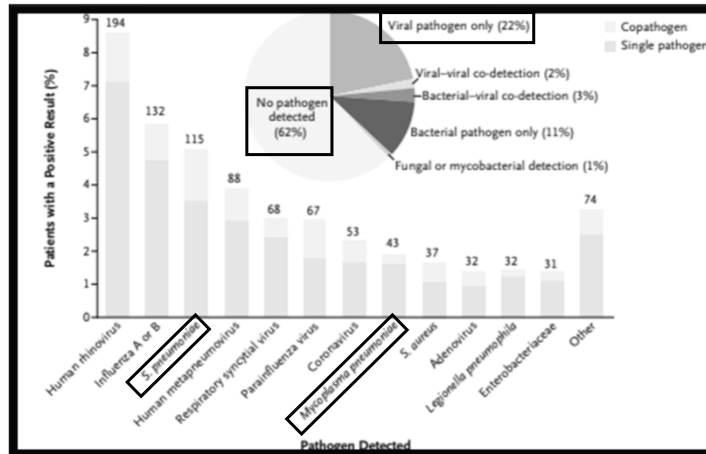


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Community-Acquired Pneumonia Requiring Hospitalization among U.S. Adults



Jain et al. N Engl J Med 2015;373:415-27.



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CAP Guidelines

AMERICAN THORACIC SOCIETY DOCUMENTS

Diagnosis and Treatment of Adults with Community-acquired Pneumonia

An Official Clinical Practice Guideline of the American Thoracic Society and Infectious Diseases Society of America

Joshua P. Metlay*, Grant W. Waterer*, Ann C. Long, Antonio Anzueto, Jan Brozek, Kristina Crothers, Laura A. Cooley, Nathan C. Dean, Michael J. Fine, Scott A. Flanders, Marie R. Griffin, Mark L. Metersky, Daniel M. Musher, Marcos I. Restrepo, and Cynthia G. Whitney; on behalf of the American Thoracic Society and Infectious Diseases Society of America

THIS OFFICIAL CLINICAL PRACTICE GUIDELINE WAS APPROVED BY THE AMERICAN THORACIC SOCIETY MAY 2019 AND THE INFECTIOUS DISEASES SOCIETY OF AMERICA AUGUST 2019

Metlay JP, et al. Am J Respir Crit Care Med 2019;200(7):e45–e67.



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Treatment: Outpatients with Community-Acquired Pneumonia

No comorbidities or risk factors for MRSA or *Pseudomonas aeruginosa*

- Amoxicillin OR
- Doxycycline OR
- Macrolide (IF local pneumococcal resistance is <25%)

With comorbidities

- Combination therapy with:
 - Amoxicillin/clavulanate or cephalosporin AND
 - Macrolide or doxycycline
- Monotherapy with:
 - Respiratory fluoroquinolone

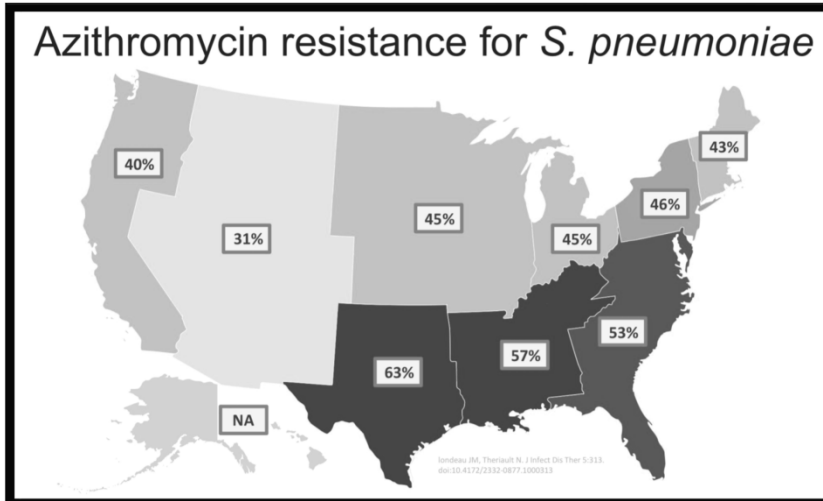
- RF: prior resp. MRSA or *Pseudomonas* isolation or recent hospitalization AND receipt of parenteral abx in last 90 days
- Comorbidities: chronic heart, lung, liver, or renal disease; diabetes mellitus; alcoholism; malignancy; or asplenia.

Mellay JP, et al. Am J Respir Crit Care Med 2019;200(7):e45–e67.



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What is our macrolide *S. pneumoniae* resistance?



Nowhere in the continental U.S. is macrolide susceptibility below 25%

Blondeau JM, Theriault N (2017) Application of the Formula for Rational Antimicrobial Therapy (FRAT) to Community-Acquired Pneumonia. J Infect Dis Ther 5:313. doi:10.4172/2332-0877.1000313



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Treatment: Outpatients with Community-Acquired Pneumonia

No comorbidities or risk factors for MRSA or *Pseudomonas aeruginosa*

- Amoxicillin OR
- Doxycycline OR
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- Combination therapy with:
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- Comorbidities: chronic heart, lung, liver, or renal disease; diabetes mellitus; alcoholism; malignancy; or asplenia.

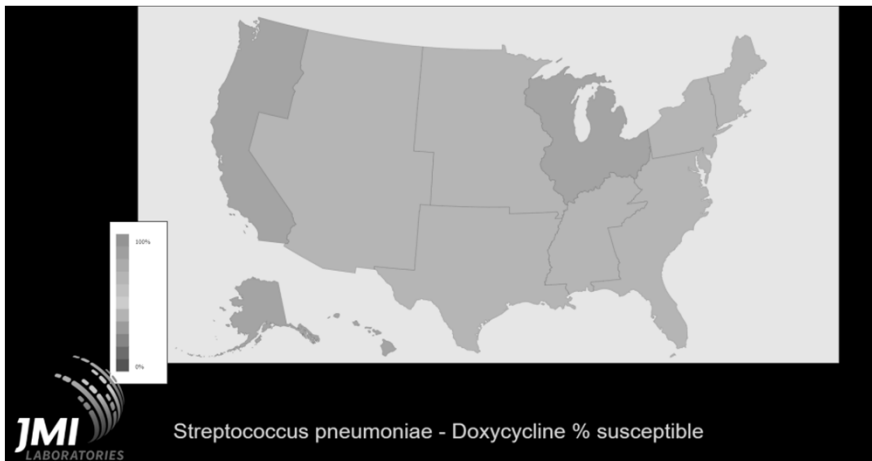
Metlay JP, et al. Am J Respir Crit Care Med 2019;200(7):e45–e67.



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Is doxycycline any better?



YES

Metlay JP, et al. Am J Respir Crit Care Med 2019;200(7):e45–e67.



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Treatment: Outpatients with Community-Acquired Pneumonia

No comorbidities or risk factors for MRSA or *Pseudomonas aeruginosa*

Amoxicillin OR
Doxycycline OR

- ~~Macrolide (if local pneumococcal resistance is <25%)~~

With comorbidities

- Combination therapy with:
 - Amoxicillin/clavulanate or cephalosporin AND
 - Macrolide or doxycycline
- Monotherapy with:
 - Respiratory fluoroquinolone

- RF: prior resp. MRSA or *Pseudomonas* isolation or recent hospitalization AND receipt of parenteral abx in last 90 days
- Comorbidities: chronic heart, lung, liver, or renal disease; diabetes mellitus; alcoholism; malignancy; or asplenia.

Mellay JP, et al. Am J Respir Crit Care Med 2019;200(7):e45–e67.



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Treatment: Outpatients with Community-Acquired Pneumonia

No comorbidities or MDRO RFs

- **Amoxicillin 1 gram po TID**
- **Doxycycline 100 mg po BID**
- ~~Azithromycin 500 mg day 1, 250 mg days 2–5~~
- ~~Clarithromycin 500mg po BID~~
- ~~Clarithromycin ER 1000 mg po daily~~


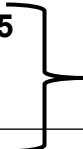


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Treatment: Outpatients with Community-Acquired Pneumonia

With comorbidities

- | | | | |
|--|---|---|-------------------------------------|
| <ul style="list-style-type: none"> • Amoxicillin/clavulanate 875/125 mg po BID • Amoxicillin/clavulanate 500/125 mg po TID • Amoxicillin/clavulanate 2000/125 mg po BID • Cefpodoxime 200 mg po BID • Cefuroxime 500 mg po BID |  | Pick one for <i>S. pneumoniae</i> | <h1 style="font-size: 2em;">OR</h1> |
| <ul style="list-style-type: none"> • Doxycycline 100 mg po BID • Azithromycin 500 mg day 1, 250 mg days 2-5 • Clarithromycin 500mg po BID • Clarithromycin ER 1000 mg po daily |  | AND

Pick one for atypical coverage | |



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Treatment: Outpatients with Community-Acquired Pneumonia

With comorbidities

- **Levofloxacin 750 mg po daily**
- Moxifloxacin 400 mg po daily
- Gemifloxacin 320 mg po daily



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During any Treatment Phase:

- QT prolongation?
 - β -lactam + doxycycline
- CI to fluoroquinolone and macrolide?
 - β -lactam + doxycycline
- Anaphylactoid allergy to penicillin?
 - 3rd (or 4th) generation β -lactam + macrolide/doxycycline/(maybe FQ)
- CI to cephalosporin?
 - Aztreonam (IV only) + fluoroquinolone/macrolide/doxycycline



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Pharmacy Pearls

- MRSA suspected
 - MRSA pneumonia may be more common following influenza infections
 - Additional coverage may be added inpatient, and add MRSA nares by PCR
 - Vancomycin or linezolid; Daptomycin ineffective
 - De-escalate when results are available
- Pregnancy
 - Avoid doxycycline and fluoroquinolone containing regimens
 - Azithromycin for atypical coverage



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Duration of therapy

- Guided by resolution of vital sign abnormalities, ability to eat, normal mentation for NO LESS THAN



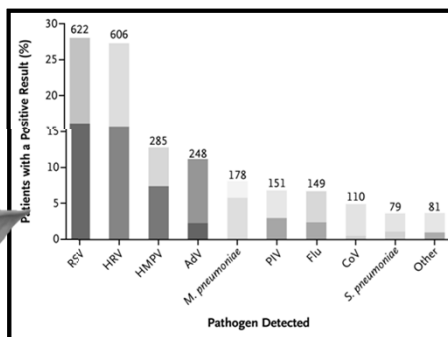
Exceptions: pneumonia + meningitis, endocarditis, or other deep-seated infection; pneumonia with less-common pathogens

Mellay JP, et al. Am J Respir Crit Care Med 2019;200(7):e45–e67.

What about The Child(ren)?



Image: <https://disney.fandom.com/wiki/Grogu>



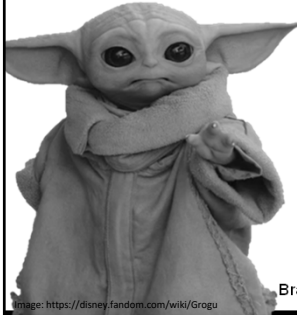
Community-Acquired Pneumonia Pathogens in Children by Age Group

Pathogen	Younger than 2 years	2 to 4 years	5 to 9 years	10 to 17 years
Viral				
Adenovirus	18%	9%	4%	2%
Coronaviruses	6%	6%	3%	4%
Human metapneumovirus	14%	17%	10%	4%
Human rhinovirus	29%	25%	30%	19%
Influenza A/B	6%	5%	9%	11%
Parainfluenza virus 1 to 3	7%	8%	6%	4%
Respiratory syncytial virus	42%	29%	8%	7%
Bacterial				
<i>Mycoplasma pneumoniae</i>	2%	5%	16%	23%
<i>Staphylococcus aureus</i>	1%	1%	1%	1%
<i>Streptococcus pneumoniae</i>	3%	4%	4%	3%
<i>Streptococcus pyogenes</i>	1%	1%	< 1%	< 1%

Jain S, et al. N Engl J Med 2015;372(9):835-845. Smith DK, et al. Am Fam Physician 2021;104(6):618-625.

What about The Child(ren)?

- Outpatient:
 - Presumed bacterial: amoxicillin high dose, amox/clav
 - Presumed atypical: azithromycin, clarithromycin or doxy (>7y)
 - Presumed influenza: oseltamivir
- Duration: 7 days max
 - Expected treatment failure rate = 4%
- Immunizations are keys to prevention



Bradley JS, et al. CID 2011;53(7):e25-76. Smith DK, et al. Am Fam Physician 2021;104(6):618-625. Same RG, et al. JPIDS 2021;10(3):267-73

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What about The Child(ren)?

- Amoxicillin High Dose
 - Need appropriate dose: 80 – 90 mg/kg/day
 - Need patient weight: 20 kg
 - Need product concentration: 400 mg/5 mL
(has to be this one)



$$\frac{\cancel{80 \text{ mg}}}{\cancel{\text{kg}}} \mid \frac{\cancel{20 \text{ kg}}}{\cancel{\text{kg}}} \mid \frac{5 \text{ mL}}{\cancel{400 \text{ mg}}} = 20 \text{ mL/day}$$

10 mL po q 12 hrs

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What about The Child(ren)?

• Amoxicillin High Dose

- Need appropriate dose: 80 – 90 mg/kg/day
- Need patient weight: 20 kg
- Need product concentration: 400 mg/5 mL
(has to be this one)



Take weight in kg,
change to mL, divide by
2, give that number of
mLs BID

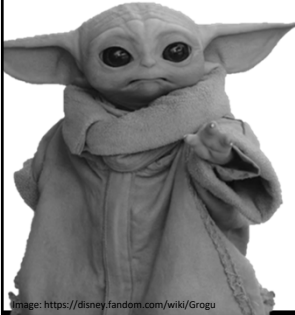


Image: <https://disney.fandom.com/wiki/Gregu>

$$20 \cancel{\text{kg}} \text{ mL} \div 2 =$$

(because q12h)

10 mL po q 12 hrs

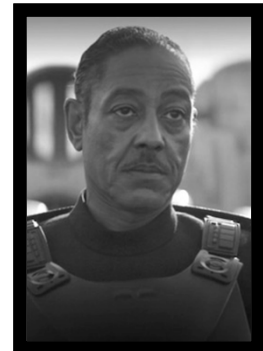


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Case #2 Revisited

- Moff Gideon is a new patient to your pharmacy, and he presents after being discharged from the ED for a diagnosis of community acquired pneumonia with a prescription for azithromycin 500 mg on day 1, followed by 250 mg on days 2-5 and a refill of his albuterol inhaler
- His past medical history is significant for peripheral artery disease, COPD, and hypertension
- Medications:
 - aspirin 81 mg daily
 - fluticasone/umeclidinium/vilanterol 1 puff daily
 - amlodipine 10mg daily
 - albuterol as needed



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What else would you like to know before making recommendations for Moff Gideon's CAP?

Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

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Text **OU321** to **37607** once to join

What is your assessment of his current antibiotic regimen to treat his community acquired pneumonia?

His regimen is appropriate

Levofloxacin should be added to his azithromycin

Amoxicillin/clavulanate should be added to his azithromycin

Azithromycin should be changed to amoxicillin monotherapy

Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

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CAP Summary

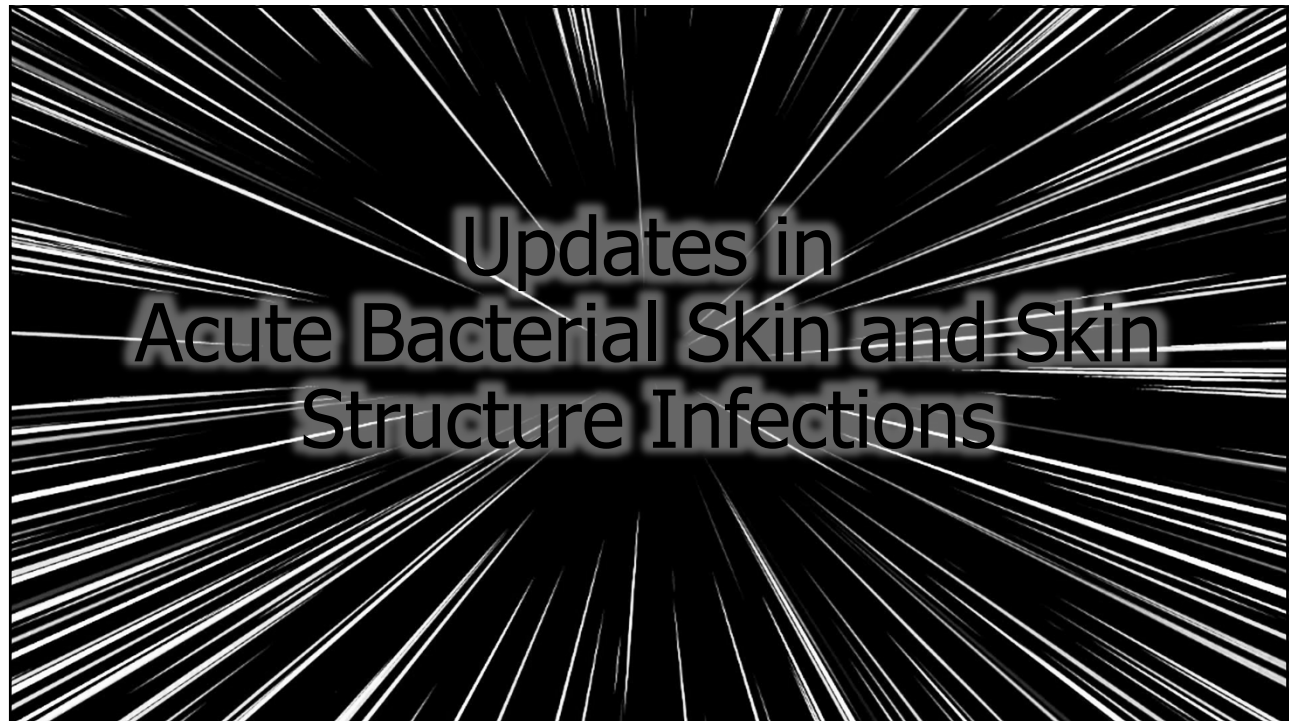
- Doxycycline and amoxicillin monotherapy is only for patients with no comorbidities
- Azithromycin monotherapy = no longer an option due to macrolide resistance
- Remember: Cover *Strep. pneumo* + atypicals
 - Amox/clav + [azithromycin or doxy]
- Kids: amox high dose
- Duration of therapy 5-7 days

THIS IS
THE WAY



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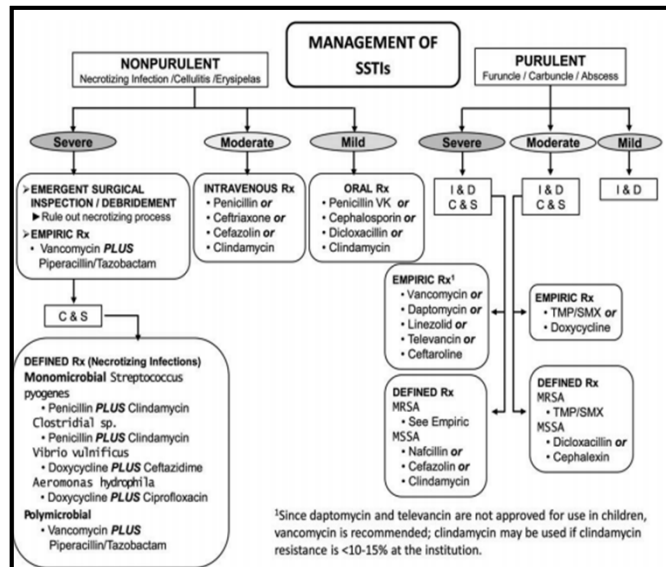
Case #3

- The Mandalorian presents to your pharmacy with complaint of a wound that has become more painful over the last couple days. He denies fever, chills.
- You see a painful, purulent lesion with surrounding erythema.
- He is 101 kg, and reports he has a drug allergy to cephalexin (reaction: throat swelling)
- He reports no additional PMH, but also reports due to traveling he doesn't see a doctor often.



ABSSSI

- Encompasses nonpurulent (cellulitis, erysipelas), purulent (major cutaneous abscesses), and wound infections



Stevens DL, et al. CID 2014;59(2):e10-52.

Cellulitis

- Causative organisms:

- **β -hemolytic streptococcus spp. (*Strep. pyogenes*) – 57-75%**

- Staph spp. – 14%

- Gram negative orgs. - consider in immunocompromised, aquatic exposure, or bites

- Polymicrobial – overlapping wounds + ulcers

Gunderson et al. J Infect 2012;64(2):148-55.



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Cellulitis

Agent	Relevant Antimicrobial Spectrum	Items for Consideration
FIRST LINE - Oral β -lactams		
-Cephalexin 500 mg PO QID -Cefadroxil 500 mg PO BID OR 1 g PO once daily -Amoxicillin/clavulanate 500 mg PO BID OR 875 mg PO BID	MSSA <i>Strep. spp.</i>	-Renal dose adjustments -Caution with severe penicillin or β -lactam allergies
ALTERNATIVES		
Dicloxacillin 500 mg PO QID	MSSA <i>Strep. spp.</i>	-Caution with severe penicillin or β -lactam allergies -Moderate CYP2C19 inducer
Clindamycin 450 mg PO TID	MSSA + limited MRSA <i>Strep. spp.</i>	-Should only be used in the setting of severe penicillin allergies -GI adverse effects, including <i>C. difficile</i> infections

Wagner J, Lee T. Interactive Case: Acute Bacterial Skin and Skin Structure Infections. In: Irons BK, Meredith AH, eds. Ambulatory Care Self-Assessment Program, 2022 Book 2. *Infectious Diseases in Ambulatory Care*. Lenexa, KS: American College of Clinical Pharmacy. 2022:172-174.



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Cellulitis

- MRSA coverage unnecessary in general population
 - Cephalexin vs. cephalexin + SMX/TMP = cure rates similar
 - (82% vs. 85%, risk diff. 2.7%, p=0.66)
 - Non- β -lactams that cover MRSA > β -lactams = failure rates similar, AE and discontinuation rates higher
 - (2.2% vs. 0.5%, p=0.04)
- Duration of therapy = 5 to 7 days
 - Extend if immunocompromised or slow clinical response

Madaras-Kelly KJ, et al. Am J Med 2008;121:419-25. Pallin DJ, et al. Clin Infect Dis 2013;56:1754-62.



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Abscesses

- Include furuncles, carbuncles, folliculitis, dental abscesses, hidradenitis suppurativa, pilonidal abscesses
- Causative organisms:
 - MRSA and MSSA – up to 75%
 - *Streptococcus* spp.
 - *Enterococcus* spp.
 - *P. aeruginosa*, *Clostridium* spp. – unhygienic tattoo practices

Watkins et al. Infect Dis Clin North Am 2021;35:1-48. . Dieckmann et al. Dtsch Arztebl Int 2016;113:665-71. .

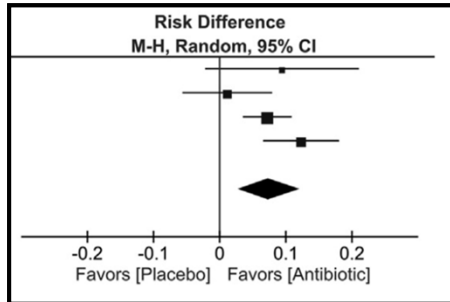


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Abscesses: I&D + Antibiotics or I&D alone?

- 4 studies included (n=2406)
- I&D + antibiotics vs. I&D alone
- Primary Outcome: Cure rates at 21 days



- **Fewer treatment failures**
 - 89 (7.7%) abx vs. 150 (16.1%) placebo
 - Risk difference: 7.4%
 - P=0.002, 95% CI, 2.8%-12.1%
 - OR of clinical cure= 2.32
 - 95% CI, 1.75-3.08
- Decreased incidence of new lesions in the antibiotic group
- **Increased risk of minor adverse events (4.4% increase)**

Recommend: I&D + Antibiotics

Gottlieb M, et al. Ann Emerg Med 2019;73(1):8-16.



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Abscesses

Agent	Relevant Antimicrobial Spectrum	Items for Consideration
FIRST LINE		
Sulfamethoxazole-Trimethoprim DS 1-2 tablets PO BID	MSSA + MRSA Limited <i>streptococcal</i> coverage	-May be used with caution in 2 nd trimester -1 tab BID vs. 2 tabs BID – TBD -Renal adjustments needed -Sulfa allergy -Hyperkalemia risk -Drug interaction with warfarin (↑INR)
Doxycycline 100 mg PO BID	MSSA + MRSA Limited <i>streptococcal</i> coverage	-Avoid in pregnancy -Esophagitis risk due to drug acidity -Photosensitivity risk -Avoid cation containing foods/medications (separate by 2-4 hours)

Wagner J, Lee T. Interactive Case: Acute Bacterial Skin and Skin Structure Infections. In: Irons BK, Meredith AH, eds. Ambulatory Care Self-Assessment Program, 2022 Book 2. *Infectious Diseases in Ambulatory Care*. Lenexa, KS: American College of Clinical Pharmacy, 2022:172-174.



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Abscesses

Agent	Relevant Antimicrobial Spectrum	Items for Consideration
ALTERNATIVES		
Clindamycin 450 mg PO TID	MSSA + limited MRSA <i>Streptococcus</i> spp.	-Safe in pregnancy -Caution clindamycin-resistant MRSA isolates -GI adverse effects, <i>C. difficile</i> diarrhea
Linezolid 600 mg PO BID	MSSA + MRSA <i>Streptococcus</i> spp.	-Safety in pregnancy unknown -MAO-I drug interaction may lead to serotonin syndrome -Myelosuppression after 2 weeks of therapy -Peripheral neuropathy after 4 weeks of therapy

Others: Tedizolid, Omadacycline, Delafloxacin

Wagner J, Lee T. Interactive Case: Acute Bacterial Skin and Skin Structure Infections. In: Irons BK, Meredith AH, eds. Ambulatory Care Self-Assessment Program, 2022 Book 2. *Infectious Diseases in Ambulatory Care*. Lenexa, KS: American College of Clinical Pharmacy, 2022:172-174.



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SMX/TMP DS: 1 OR 2 tabs po BID?

- Pharmacokinetics:
 - Concentration-dependent killing for MRSA
 - Similar killing rates of both regimens
- Evidence:
 - No clinical difference in standard vs. high dose regimens (OR 0.96, 95% CI 0.76-1.2)
 - Obesity led to higher clinical failure rates in standard dosing regimen (p=0.002)

Higher dose may be warranted in:

- Obesity (>100 kg)
- Trauma-induced
- Immunocompromised

Higher dose = higher AE risk

Cadena J, et al. *Antimicrob Agents Chemother.* 2011;55(12):5430-5432. Halilovic J, et al. *J Infect.* 2012;65(2):128-134.



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Cellulitis and Abscesses

- Outpatient Prescription Duration:

5-7 days

- If no improvement at 5 days, reevaluate therapy and escalate care



Wagner J, Lee T. Interactive Case: Acute Bacterial Skin and Skin Structure Infections. In: Irons BK, Meredith AH, eds. Ambulatory Care Self-Assessment Program, 2022 Book 2. *Infectious Diseases in Ambulatory Care*. Lenexa, KS: American College of Clinical Pharmacy, 2022:172-174.



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Outpatient treatment failed, not sick enough for admission? Consider lipoglycopeptides!

Oritavancin

- 1200 mg x 1 dose
- No renal dose adjustment suggested
- Infuse over 3 hours
- Approved for adults
- AE: tachycardia, N/V/D, increased LFT, phlebitis, HA

Dalbavancin

- 1500 mg x 1 dose
- Dose adjust if CrCl <30
- Infuse over 30 minutes
 - Slow if infusion reaction occurs
- Approved for adults and peds
- AE: N/V/D, HA

Dunne MW, et al. Clin Infect Dis 2016;62(5):545-551.



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What about The Child(ren)?

Cellulitis

- Cephalexin
- Cefadroxil
- Cefuroxime

Abscess

- SMX/TMP
- Doxycycline (>7y)
- Clindamycin



Stevens DL, et al. CID 2014;59(2):e10-52.



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What about The Child(ren)?

• SMX/TMP Dosing Trick

- Need appropriate dose: 8-12 mg TMP / kg
- Need patient weight: 20 kg
- Need product concentration: 40 mg TMP / 5 mL



$$\frac{\cancel{8 \text{ mg}}}{\cancel{\text{kg}}} \times \frac{\cancel{20 \text{ kg}}}{\cancel{40 \text{ mg}}} \times \frac{5 \text{ mL}}{\cancel{40 \text{ mg}}} = 20 \text{ mL/day}$$

10 mL po q 12 hrs



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What about The Child(ren)?

- SMX/TMP Dosing Trick

- Need appropriate dose: 8-12 mg TMP / kg
- Need patient weight: 20 kg
- Need product concentration: 40 mg TMP / 5 mL



Take weight in kg, change to mL, divide by 2, give that number of mLs BID

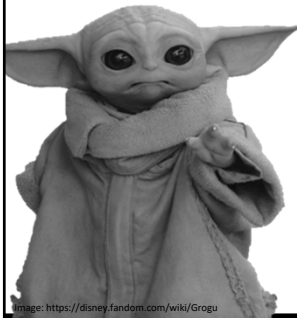


Image: <https://disney.fandom.com/wiki/Gregu>

$$20 \cancel{\text{kg}} \text{ mL} \div 2 = \boxed{10 \text{ mL po q 12 hrs}}$$

(because q12h)



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How about the mommas?

- Pregnancy:

- SMX/TMP – ok 2nd trimester only
- Doxycycline – not ok in pregnancy
- Clindamycin – ok any trimester, but caution resistance

- Lactation:

- SMX/TMP – ok in healthy, full-term infants
- Doxycycline – staining of teeth
- Clindamycin – disruption of infant's GI flora

Drugs and Lactation Database (LactMed®) [Internet]. Bethesda (MD): National Institute of Child Health and Human Development; 2006-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK501922/>. Lexi-complete Online.



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Case #3 Revisited

- The Mandalorian presents to your pharmacy with complaint of a wound that has become more painful over the last couple days. He denies fever, chills.
- You see a painful, purulent lesion with surrounding erythema.
- He is 101 kg, and reports he has a drug allergy to cephalexin (reaction: throat swelling)
- He reports no additional PMH, but also reports due to traveling he doesn't see a doctor often.



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Text **OU321** to **37607** once to join

What do you recommend for initial empiric treatment of The Mandalorian's abscess and cellulitis?

Doxycycline

SMX/TMP + Cephalexin

Clindamycin

Linezolid

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When poll is active, respond at pollev.com/ou321

Text **OU321** to **37607** once to join

The decision was made to prescribe cephalexin 500 mg po q 6 hours, and SMX/TMP. The patient's nurse practitioner asks your opinion on how to dose SMX/TMP for an abscess. What SMX/TMP dosing regimen do you recommend for The Mandalorian?

SMX/TMP DS 1 BID x 7 days

SMX/TMP DS 2 BID x 7 days

Weight-based, 8-12 mg TMP/kg daily x 7 days

None of the above are correct

Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

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ABSSSI Summary

- MRSA coverage not routinely needed for non-purulent infections
 - Cephalexin is first line
- Abscesses need I&D and abx
 - Doxycycline or SMX/TMP
 - Dose up SMX/TMP in obesity
 - Add strep coverage to either if suspected
- Clindamycin only antibiotic ok at any trimester of pregnancy



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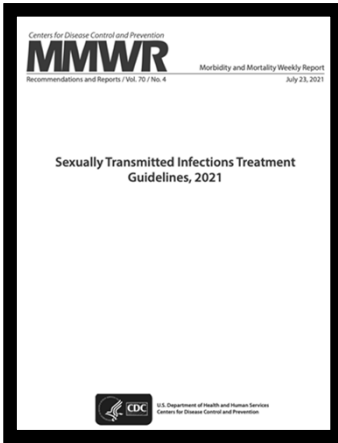
Case #4

- A female storm trooper (23 years old, 75 kg) presents to your ED with complaint of “possible sexually transmitted infection.”
- Symptoms she is experiencing include dysuria, malodorous discharge, and a nonpainful sore on her labia. Her partner, who is not present today, also has similar symptoms.
- PMH allergic rhinitis and asthma, takes cetirizine and albuterol prn
- NKDA, does not smoke, drink, or do street drugs



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STI Treatment Guideline Updates



- Occur every 5 years
 - Name changed “STD” to “STI”
- CDC STI Treatment Guideline Update Webinar
- Most recent update changed mgmt. of gonorrhea, chlamydia, and trichomoniasis

MMWR Morb Mortal Wkly Rep. 2020;69(50):1911. Epub 2020 Dec 18.
Centers for Disease Control and Prevention. CDC's 2021 STI Treatment Guidelines Update Webinar. Accessed at https://www.youtube.com/watch?v=azXn_Bv_R7Y.
Published Jan 27, 2021.

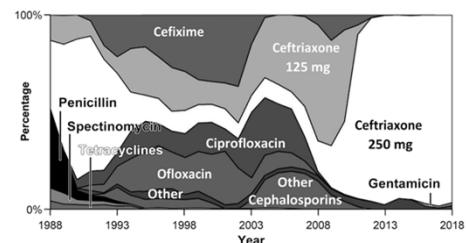


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GONORRHEA

- Second most commonly reported notifiable disease in the U.S.
 - 580,000 cases in 2018
- Gonococcal Isolate Surveillance Project (GISP)
 - Monitor antimicrobial resistance of 7 antibiotics
 - Ceftriaxone, cefixime, azithromycin, spectinomycin, ciprofloxacin, penicillin, tetracycline
 - Report results of minimum inhibitory concentrations (MIC)
 - Ceftriaxone, cefixime, and azithromycin



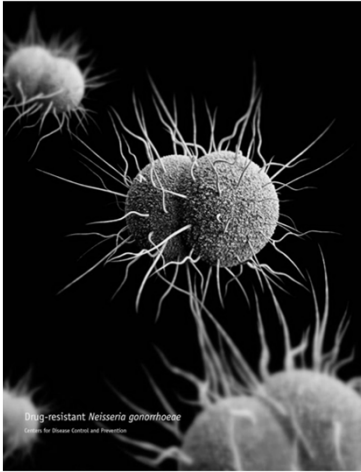
Gonococcal Isolate Surveillance Project (GISP) and Enhanced GISP (eGISP). Accessed at https://www.cdc.gov/std/gisp/GISP_eGISP_Protocol_January_2020.pdf on 21 April 2021.
Gonococcal Isolate Surveillance Project 2009-2018 Treatments. Accessed at <https://www.std.uw.edu/go/pathogen-based/gonorrhea/core-concept/all> on 21 April 2021.



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GONORRHEA



Drug-resistant *Neisseria gonorrhoeae*

Image by Disease Control and Prevention

Image: <https://phil.cdc.gov/details.aspx?pid=16874>

MMWR Morb Mortal Wkly Rep. 2020;69(50):1911. Epub 2020 Dec 18.

- Update in MMWR Publication dated December 17, 2020
 - Antimicrobial stewardship
 - Dual therapy may have led to increased resistance
 - Antimicrobial resistance
 - Azithromycin
 - Pharmacokinetic/Pharmacodynamic Considerations
 - Minimum inhibitory concentration



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Determining Microbial Resistance

- Determine the MIC →

Classify the org as:	susceptible (S)
	intermediate (I)
	resistant (R)
- Based on relationship between the MIC and the peak serum concentration (C_{max})



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Why Does Resistance Occur?

1. When organism is exposed to suboptimal concentrations of an antibiotic.
 - The longer the organism is present (because low dose is ineffective), the greater chance of mutation
 - Increased growth (selection for) organisms with innate resistance
2. During prolonged exposure to an antibiotic
 - Same as above, plus “good bacteria”, that would normally limit growth of pathogenic organisms, are being eliminated

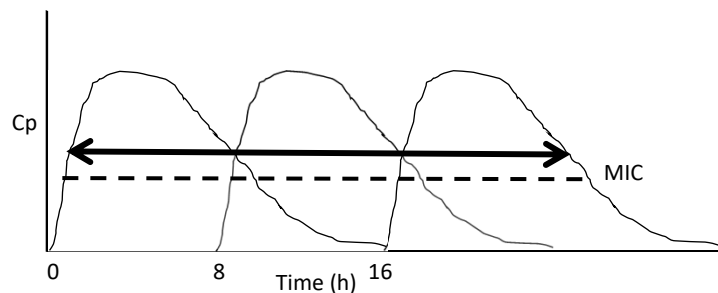


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CEFTRIAXONE PHARMACOKINETICS

- Bactericidal, third generation cephalosporin
- TIME DEPENDENT KILLING
 - More effective the longer the drug concentration remains above the MIC
 - “time over MIC matters”
a.k.a. T>MIC
 - Important to not miss dose
 - Other examples: penicillins



Brenner G, Stevens C (2017). *Pharmacology*. 5th ed. Elsevier.

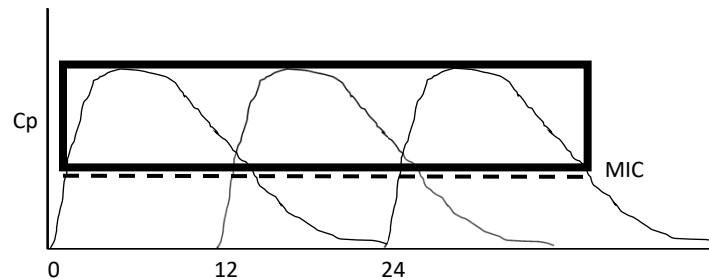


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AZITHROMYCIN, DOXYCYCLINE PHARMACOKINETICS

- Bacteriostatic, protein synthesis inhibitors
- TIME-DEPENDENT KILLING + POST-ANTIBIOTIC EFFECTS
 - AUC/MIC ratio is most important
 - Maximizes the AMOUNT of drug received



Brenner G, Stevens C (2017). *Pharmacology*. 5th ed. Elsevier.

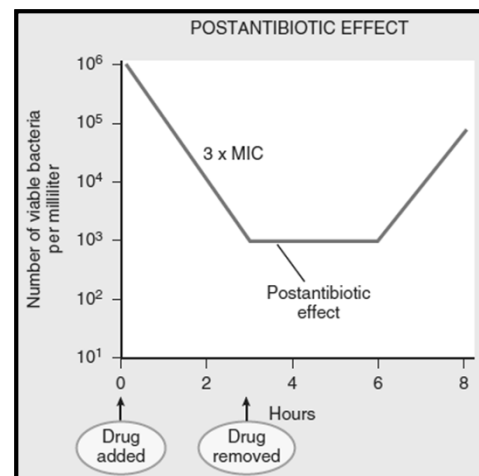


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POST-ANTIBIOTIC EFFECT

- Persistent suppression of bacterial growth after limited exposure to drug
- Reflects the time required for the bacteria to return to log growth following drug withdrawal
- Proposed mechanisms:
 - Recovery from non-lethal cell damage
 - Persistence of drug at site of action
 - The need to synthesize new enzymes before new growth can occur

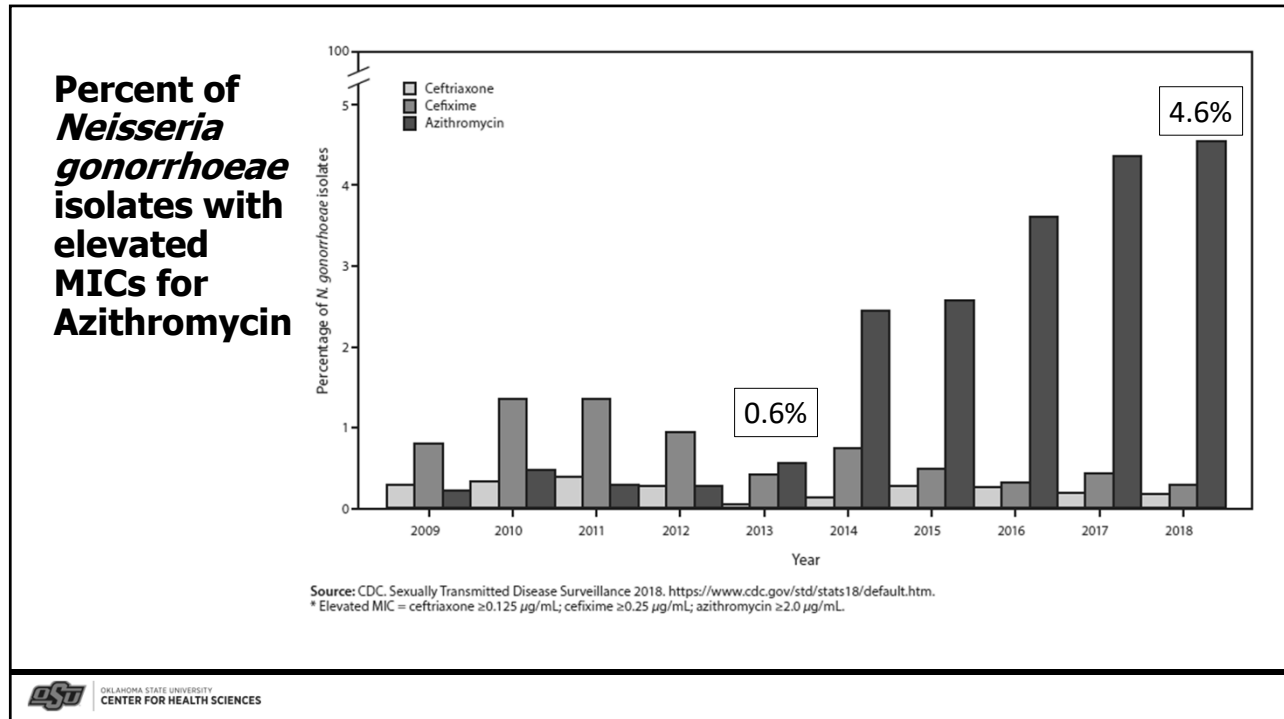


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GONORRHEA

- Treatment updates need to address concern for resistance
 - Minimum inhibitory concentration increased
 - Concern for exposure to multiple antibiotics, therefore multiple opportunities to develop resistance
 - Resistance to azithromycin detected

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Back to the Emergency Department Patient...

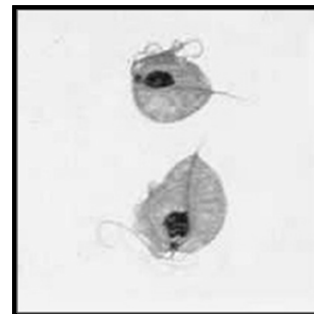
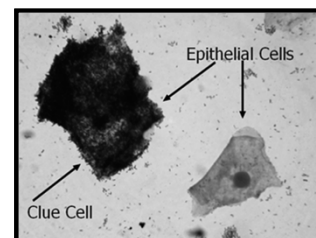


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PELVIC EXAM TESTS

- Wet Prep tests for:
 - Clue cells (indicative of bacterial vaginosis)
 - *Trichomonas vaginalis*
 - Yeast

- PCR tests for:
 - *Neisseria gonorrhoeae*
 - *Chlamydia trachomatis*



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CERVICITIS

- Umbrella term: when infection cause is unknown, but infection likely
- *Chlamydia trachomatis* or *Neisseria gonorrhoeae* is most common
- Persistence may be from abnormal vaginal flora, *Mycoplasma genitalium*, or irritability

Cervicitis (undifferentiated)

- ≤150 kg: Ceftriaxone 500 mg IM x 1 + Doxycycline 100 mg po BID x 7 days
- >150 kg: Ceftriaxone 1000 mg IM x 1 + Doxycycline 100 mg po BID x 7 days

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GONORRHEA

Gonorrhea (known)

- ≤150 kg: Ceftriaxone 500 mg IM x 1
- >150 kg: Ceftriaxone 1000 mg IM x 1

Gonorrhea Alternatives (urogenital)

- Gentamicin 240 mg IM + azithromycin 2 g PO
- Cefixime 800 mg PO +/- doxycycline 100 mg po BID x 7 days

Partner Therapy (state-dependent)

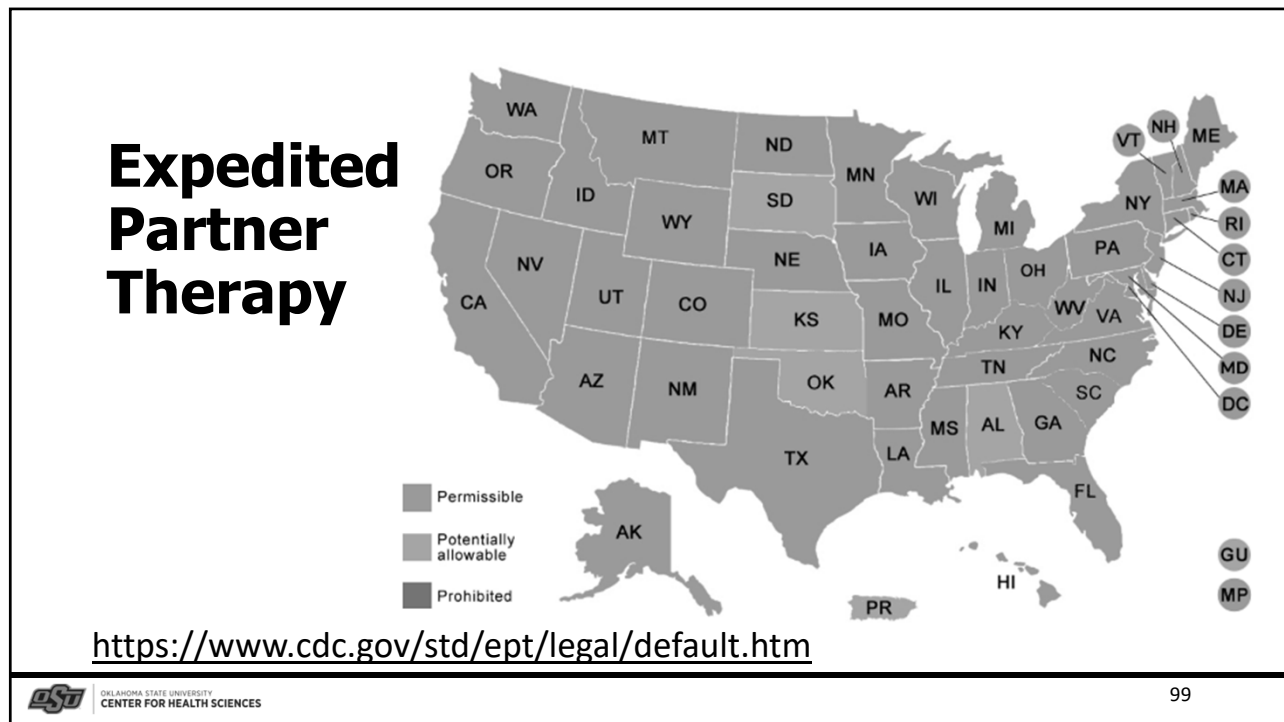
- Cefixime 800 mg PO +/- doxycycline 100 mg po BID x 7 days

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GONORRHEA

- Cephalosporin treatment failure
 - Most likely due to reinfection
 - Retreat with initial weight-based regimen
 - If concerns for cephalosporin MIC elevation
 - Gentamicin 240 mg IM + azithromycin 2 g
- Cephalosporin allergy
 - Gentamicin 240 mg IM + azithromycin 2 g PO

MMWR Morb Mortal Wkly Rep. 2020;69(50):1911. Epub 2020 Dec 18.

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CHLAMYDIA

- Known Chlamydia infections:
 - Recommend Azithromycin 1 g 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
- Recommend Doxycycline 100 mg PO BID x 7 days if
 - Infection is urogenital, rectal, oropharyngeal

Centers for Disease Control and Prevention. CDC's 2021 STI Treatment Guidelines Update Webinar. Accessed at https://www.youtube.com/watch?v=azXn_Bv_R7Y.
Published Jan 27, 2021.

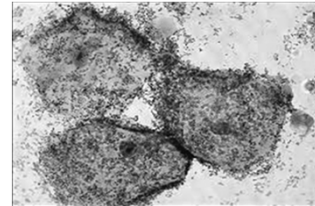


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BACTERIAL VAGINOSIS

- Recommended regimens same
 - Metronidazole 500 mg po BID x 7 days
 - Metronidazole gel 0.75% x 5 days
 - Clindamycin cream 2% x 7 days
- New alternative single-dose regimens for non-pregnant women
 - Secnidazole 2 g oral granules
 - Metronidazole 1.3% vaginal gel



Centers for Disease Control and Prevention. Accessed at https://www.youtube.com/watch?v=azXn_Bv_R7Y. Published Jan 27, 2021.
Image: https://www.researchgate.net/figure/Wet-mount-appearance-of-clue-cells_fig1_340179493



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BACTERIAL VAGINOSIS

- Metronidazole
 - In vitro studies showed metronidazole and EtOH inhibited the liver's alcohol dehydrogenase
 - Two studies showed no difference in subjective symptoms of disulfiram-like reaction

Fact versus Fiction: a Review of the Evidence behind Alcohol and Antibiotic Interactions

Kari A. Mergenhagen,* Bethany A. Wattengel,* Megan K. Skelly,* C

Can Metronidazole Cause a Disulfiram-Like Reaction? A Case-Control Study Propensity Matched by Age, Sex, and Ethanol Concentration

Ryan Feldman, PharmD; Rachael Jaszczenski, PharmD

- Alcohol alone may explain the e

Figure 1. Mechanism of Disulfiram Reaction With Ethanol



The syndrome is caused by disulfiram inhibiting ALDH, halting metabolism at the acetaldehyde phase, and leading to build up of acetaldehyde.

Feldman R, et al. WMJ. 2023 Jul;122(3):171-177.

EMERGENCY MEDICINE REVIEW

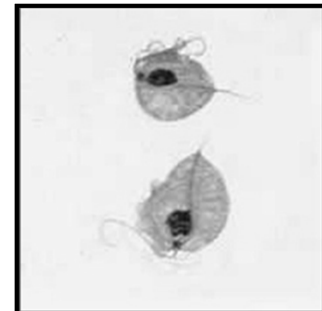


CONTINUING MEDICAL EDUCATION
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TRICHOMONIASIS

- Metronidazole 2g x 1 dose versus 500mg BID x 7d
 - All women including HIV positive:
 - Pooled risk ratio showed higher treatment failure with single dose vs multi-dose
 - 1.87 (95% confidence interval of 1.23-2.82, p<0.01)
 - All women excluding HIV positive:
 - Similar pooled risk ratio
 - 1.80 (95% confidence interval of 1.07-3.02, p<0.03)
- Metronidazole 500 mg po BID x 7 days is superior to single dose regimen in all women



Howe K. Single-dose compared to multi-dose metronidazole for the treatment of trichomoniasis in women: A meta-analysis. Sex Transm Dis 2017;44(1):29-34.

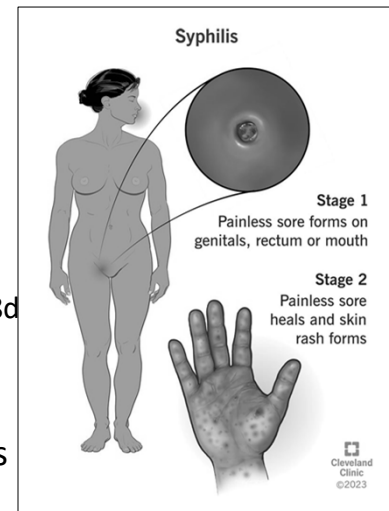


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SYPHILIS

- Penicillin benzathine shortage
 - Prioritized for pregnant women, babies
- Alternate options in PCN shortage:
 - **1st, 2nd, early latent:** Doxycycline 100 mg po BID x 14d
 - **Late latent / unknown:** Doxycycline 100 mg po BID x 28d
 - **Neurosyphilis:** Ceftriaxone 1 g IM or IV daily x 10-14d
- Jarish-Herxheimer reaction occurs with any syphilis therapy



Centers for Disease Control and Prevention. CDC's 2021 STI Treatment Guidelines Update Webinar. Accessed at https://www.youtube.com/watch?v=azXn_Bv_R7Y. Published Jan 27, 2021. Image: <https://my.clevelandclinic.org/health/diseases/4622-syphilis>



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PELVIC INFLAMMATORY DISEASE

- Sexually transmitted infection + systemic symptoms (fever, abdominal pain)
- Risks to patient:
 - Infertility
 - Ectopic pregnancy
 - Chronic pelvic pain
 - Tubo-ovarian abscess
- Cases due to chlamydia/gonorrhea are decreasing
- Add metronidazole only if clue cells or trichomonas, or add always?

Weisenfeld HC, et al. A randomized controlled trial of ceftriaxone and doxycycline, with or without metronidazole, for the treatment of acute pelvic inflammatory disease. Clin Infect Dis 2021;72(7): 1181-9.



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PELVIC INFLAMMATORY DISEASE

A Randomized Controlled Trial of Ceftriaxone and Doxycycline, With or Without Metronidazole, for the Treatment of Acute Pelvic Inflammatory Disease

Harold C. Wiesenfeld,^{1,2} Leslie A. Meyn,^{1,2} Toni Darville,³ Ingrid S. Macio,² and Sharon L. Hillier^{1,2}

- Results:
 - Clinical improvement at 3 days- No difference (82.8% versus 80.3%, p=0.74)
 - At 30 days post enrollment:
 - Pelvic tenderness less common in metronidazole group (9% versus 20%, p<0.05)
 - Presence of anaerobic orgs at 30 days less frequent in metronidazole group (8% versus 21%, p<0.05)
 - Clinical cure at 30 days - No difference (97% versus 90%, p=0.38)
 - Adherence and tolerability were similar between groups
 - Higher rate of VVC in metronidazole group
- New guideline regimen
 - Ceftriaxone + doxycycline (14d) + metronidazole (14d)

Weisenfeld HC, et al. A randomized controlled trial of ceftriaxone and doxycycline, with or without metronidazole, for the treatment of acute pelvic inflammatory disease. Clin Infect Dis 2021;72(7): 1181-9.



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Case #4 Revisited

- A female storm trooper (23 years old, 75 kg) presents to your ED with complaint of “possible sexually transmitted infection.”
- Symptoms she is experiencing include dysuria, malodorous discharge, and a nonpainful sore on her labia. Her partner, who is not present today, also has similar symptoms.
- PMH allergic rhinitis and asthma, takes cetirizine and albuterol prn
- NKDA, does not smoke, drink, or do street drugs



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When poll is active, respond at pollev.com/ou321
 Text **OU321** to **37607** once to join

While in the ED, the following results return:

Wet Prep	Patient Result
Clue Cells	Negative
Trichomonas	Positive
Yeast	Negative

Which of the following medications will be added to her treatment regimen?

- Ceftriaxone
- Doxycycline
- Azithromycin
- Penicillin Benzathine
- Metronidazole

Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

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When poll is active, respond at pollev.com/ou321
 Text **OU321** to **37607** once to join

After discharging the patient, the following results return: *Chlamydia trachomatis* (positive), *Neisseria gonorrhoeae* by PCR (positive), syphilis treponemal test (reactive). It is your job to call the patient for them to come back in for proper treatment and to make recommendations to the physician on duty.

Which of the following medication regimens most appropriately treats her gonorrhea infection?

- Ceftriaxone 250 mg IM x 1 plus azithromycin 1 gram PO x 1
- Ceftriaxone 500 mg IM x 1
- Ceftriaxone 1000 mg IM x 1
- Doxycycline 100 mg po BID x 7 days
- Doxycycline 100 mg po BID x 14 days

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STI Summary

- Ceftriaxone dosed based on weight threshold of 150 kg
- Chlamydia treatment is doxycycline first line, azithromycin second line
- Syphilis treatment is affected by penicillin shortages; doxycycline is best alternative in primary and secondary
- PID duration of treatment is 14 days
- Metronidazole and EtOH?



EMERGENCY MEDICINE REVIEW

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Conclusion and Clinical Pearls



- Antibiotics are complicated so use your resources
- Know the guidelines and your institution antibiogram or region's susceptibilities
- Duration of therapy matters
- Dosing tricks make checking pediatric doses easy
- Watch for updates to guidelines

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What changes do you intend to make in your practice as a result of this activity?

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This is The Way: Empiric Treatment Updates of Infectious Diseases

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