Antibiotics

Why and Why Not

2025

DALHOUSIE UNIVERSITY
FACULTY OF MEDICINE
Academic Detailing Service

nova scotia health
Drug Evaluation Unit

Dalhousie CPDME Clinical Webinar Series

April 8, 2026

Kelly MacKinnon, RPh, Dalhousie Academic Detailing Service
Deanna Field, MD, Dalhousie Academic Detailing Service

At the end of this presentation participants will be able to:

- Identify best practices for the management of common community-acquired infections based on current evidence and antimicrobial stewardship principles.
- Discuss antimicrobial treatment options in adult & pediatric populations.
- Acquire local AMS resources available to primary care providers.
- Explore questions asked during detailing visits and patient case scenarios.

These learning objectives are linked to CanMEDS roles of Scholar, Health Advocate, and Leader.

We acknowledge that the lands on which we are conducting this session include the traditional territories of many nations and invite all participants to reflect on these territories as we commit ourselves to gaining knowledge; forging a new, culturally safe relationship; and contributing to reconciliation..

Presenter Disclosure

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Kelly MacKinnon:

- Director of the Dalhousie Academic Detailing Service
- Pharmacist with NS Health
- Has no current or past relationships with commercial entities
- Has no relationships with commercial interests

Deanna Field:

- Clinical Director of the Academic Detailing Service
- Family Physician, Hospitalist and Emergency Physician with NS Health
- Has no current or past relationships with commercial entities
- Has no relationships with commercial interests

Speaker fees for current program:

- Kelly and Deanna have not received a speaker's fee for this learning activity

Commercial Support Disclosure

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Drug Evaluation Unit

This program has received no financial or in-kind support from any commercial or other organization.

The Dalhousie Academic Detailing Service

- operates through the office of Continuing Professional Development and Medical Education, Faculty of Medicine, Dalhousie University and has full control over content.
- is funded by the Nova Scotia Department of Health and Wellness.

The information contained within these presentation slides is not all inclusive.
Refer to the full evidence review for detailed information related to this academic detailing topic at:
https://medicine.dal.ca/departments/core-units/cpd/programs/academic-detailing-service/AC-Service-Resources.html

PLANNING COMMITTEE, ACKNOWLEDGEMENTS, AND DISCLOSURES

CONTENT DEVELOPMENT

Clinical Content Expert Reviewers

- Paul Bonnar MD FRCPC, Assistant Professor Division of Infectious Disease, Dalhousie University, Medical Director, Antimicrobial Stewardship Program, Nova Scotia Health
- Jeannette Comeau MD MSc FRCPC FAAP, Pediatric Infectious Diseases Consultant, Assistant Professor, Dalhousie University, Medical Director, Infection Prevention and Control, Medical Lead, Antibiotic Stewardship IWK Health Centre
- Jennifer Curran BSc, PharmD, ACPR, ACPR2, Clinical Pharmacy Specialist, Infectious Diseases, Co-lead Antimicrobial Stewardship Program
- Andrea Kent, BSc Pharm, PharmD, Clinical Pharmacy Coordinator & Co-Lead Antimicrobial Stewardship Program, Nova Scotia Health
- Valerie Murphy BSc Pharm, ACPR, Antimicrobial Stewardship Pharmacist, Nova Scotia Health, Central Zone
- Emma Reid BSc Pharm, ACPR, PharmD, Antimicrobial Stewardship Pharmacist, Emerging & Re-emerging Infections, Nova Scotia Health
- Mariah Hughes MD FRCPC, Assistant Professor Division of Infectious Diseases, Dalhousie University, Medical Director NSHA Infection Prevention and Control Long-Term Care
- Reema Alabulqadar MD, Antimicrobial Stewardship Fellow, Dalhousie University, Nova Scotia Health
- Sarah Burgess, BSc Pharm, ACPR, PharmD, BCCCP, Clinical Pharmacy Coordinator – Infectious Diseases, Nova Scotia Health, Central Zone

Clinical Content Editors

- Jennifer Fleming, BSc Pharm, ACPR, Drug Evaluation Unit, NSH
- Edith Baxter MD, CCFP, Clinical Director Academic Detailing Service
- Kelly MacKinnon, BSc Pharm, Director Academic Detailing Service
- Deanna Field, MD, CCFP, FCFP, Clinical Director Academic Detailing Service

CONTENT PLANNING

Family Physician Advisory Panel

- Ken Cameron BSc, MD, CCFP, Dartmouth, NS.
- Deanna Field MD, CCFP, FCFP, Truro, NS.
- Madeline Arkle MD, CCFP, Yarmouth, NS.
- Stephanie Omoifo MD, Little Harbour, NS.

CONTENT DELIVERY

Academic Detailers

- Denise Brownell BSc Pharm
- Janelle Gray BSc Pharm
- Holly d'Entremont BSc Pharm
- Shelagh Campbell-Palmer BSc Pharm
- Jodi Matlock BSc Pharm
- Julia Green BSc Pharm
- Graham MacKenzie BSc Pharm
- Colleen Donder BSc Pharm, ACPR
- Kelly MacKinnon BSc Pharm

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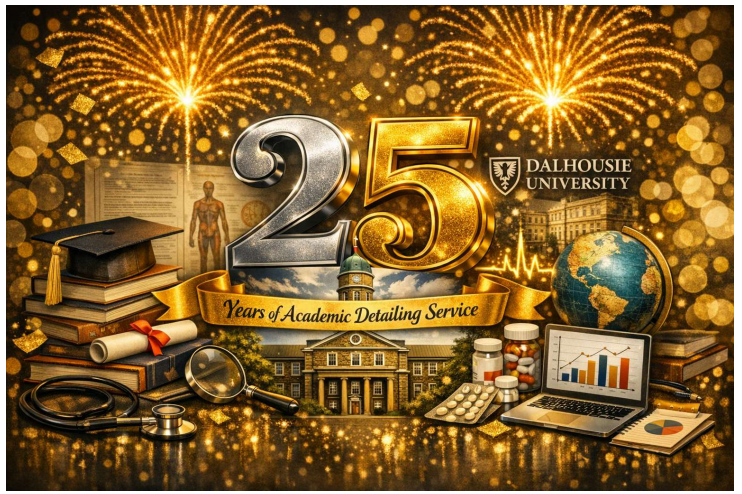
What is Academic Detailing?

Continuing Medical Educational outreach

- Trained healthcare professionals to PCPs
- 1:1/small group, in-person/online learning
- Interactive, tailored, objective, evidence-based discussion on therapeutic topics

British Columbia	BC Provincial Academic Detailing (PAD) Service	bcpad.ca
Saskatchewan	RxFiles Academic Detailing	RxFiles.ca
Ontario	Centre for Effective Practice Academic Detailing Service	cep.health/academic-detailing/
Nova Scotia	Dalhousie Academic Detailing Service	dal.ca/academic-detailing



The evolution of academic detailing in Canada | Canadian Healthcare Network
Jin M et al. CPJ 2012 May; 145(3): 142–146.e2. doi: 10.3821/145.3.cpj142
Canada Map Graphic created by Debbie Bunka RxFiles
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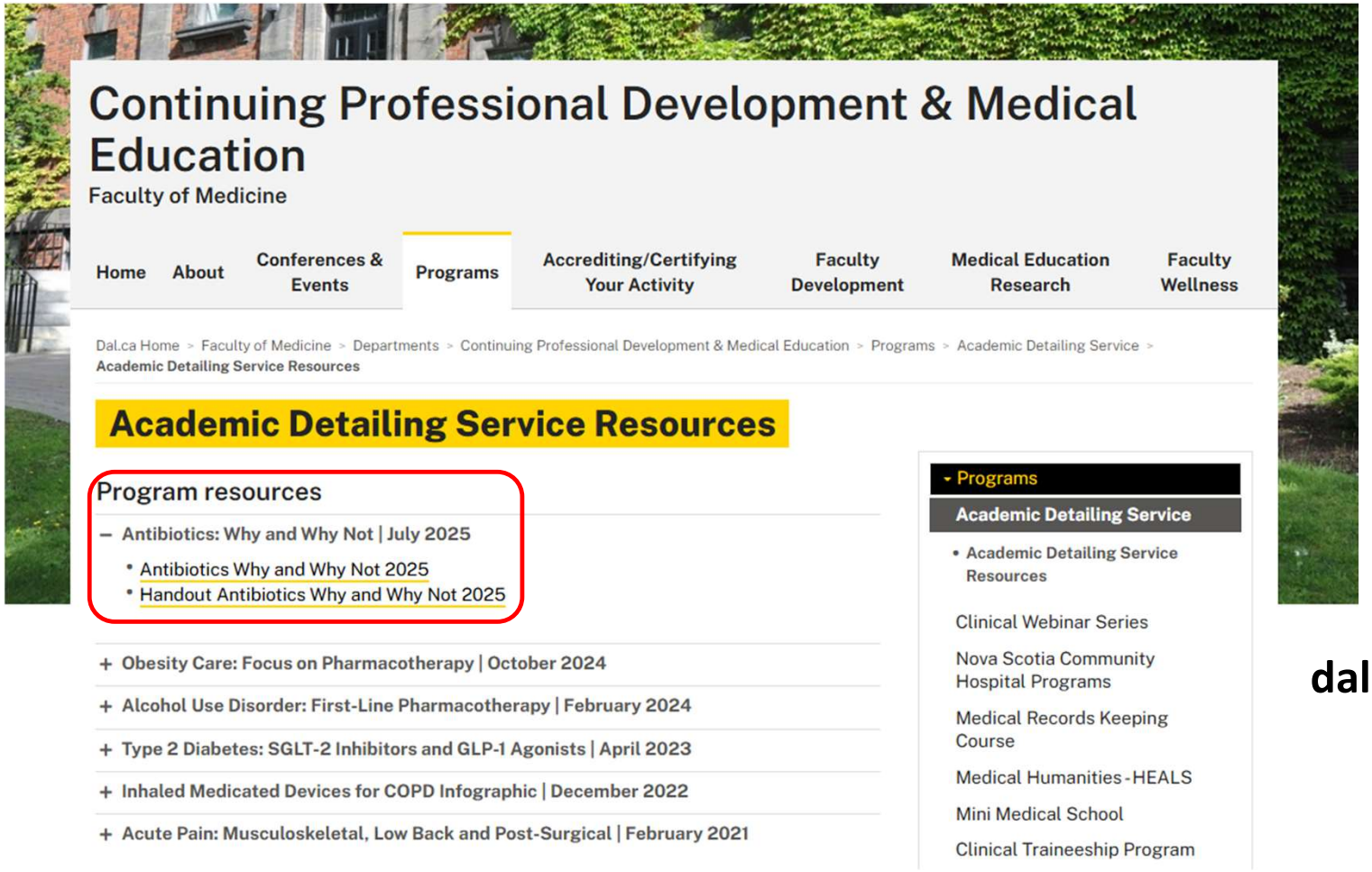


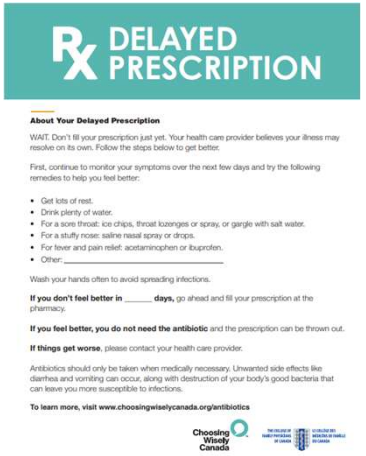
dal.ca/academic-detailing

https://medicine.dal.ca/departments/core-units/cpd/programs/academic-detailing-service/AC-Service-Resources.html

AMS Clinical Resources

Choosing Wisely Canada *(Using Antibiotics Wisely in Primary Care)*

- Practice recommendations, posters, prescribing tools



Rx DELAYED PRESCRIPTION

About Your Delayed Prescription

WAIT. Don't fill your prescription just yet. Your health care provider believes your illness may resolve on its own. Follow the steps below to get better.

First, continue to monitor your symptoms over the next few days and try the following remedies to help you feel better:

- Get lots of rest.
- Drink plenty of water.
- For a sore throat: ice chips, throat lozenges or spray, or gargle with salt water.
- For a stuffy nose: saline nasal spray or drops.
- For fever and pain relief: acetaminophen or ibuprofen.
- Other: _____

Wash your hands often to avoid spreading infections.

If you don't feel better in _____ days, go ahead and fill your prescription at the pharmacy.

If you feel better, you do not need the antibiotic and the prescription can be thrown out.

If things get worse, please contact your health care provider.

Antibiotics should only be taken when medically necessary. Unwanted side effects like diarrhea and vomiting can occur, along with destruction of your body's good bacteria that can leave you more susceptible to infections.

To learn more, visit www.choosingwiselycanada.org/antibiotics

Choosing Wisely Canada

Firstline

- Web-based (links below) or mobile download (QR code)
- Choose location to Nova Scotia Health or IWK Health Centre
  - **Nova Scotia Health** *(adults):*
    - https://library.nshealth.ca/ams
    - https://firstline.org/nsha
  - **IWK Health Centre** *(pediatrics & women's health)*
    - https://firstline.org/iwk/

Firstline

Dose table colors indicate treatment choices

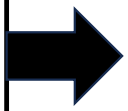
Green = 1st line

Yellow = 2nd line

Orange = 3rd line

KIDNEY SYMBOL

Drugs tagged with this symbol may require dose adjustment in people with impaired kidney function



Antibiotics Why and Why Not 2025

DALHOUSIE UNIVERSITY | Nova Scotia Health Drug Evaluation Unit

RESPIRATORY TRACT INFECTIONS

Acute GAS Pharyngitis

Antibiotic	*ADULT* Dose	Cost/day
Penicillin V[a]	600 mg PO BID	$0.97
Amoxicillin[b]	500 mg PO BID	$0.26
Cephalexin	500 mg PO BID	$0.35
Cefuroxime[c]	500 mg PO BID	$1.66
Clarithromycin[d]	250 mg PO BID	$0.82

Antibiotic	*PEDIATRIC* Dose	Cost/day
Penicillin V[a]	≤ 27 kg: 300 mg PO BID > 27 kg: 600 mg PO BID	$0.48 $0.97
Amoxicillin[b]	50 mg/kg/day PO once daily or divided BID (max 1000 mg/day)	$0.05/kg
Cefprozil	20 mg/kg/day divided PO BID (max 1000 mg/day)	$0.08/kg
Cefuroxime[c]	30 mg/kg/day divided PO BID (max 1000 mg/day)	$0.22/kg
Clarithromycin[d]	15 mg/kg/day divided PO BID (max 1000 mg/day)	$0.14/kg

Duration: 10 days

[a] Penicillin V preferred 1st line (narrow spectrum, safe and low cost). No documented GAS resistance. No commercially available suspension.
[b] Amoxicillin broader spectrum than required, but option where palatable liquid preferred.
[c] 1st line option if patient has experienced an IgE mediated amoxicillin reaction.
[d] If patient is unable to take any β-lactam (e.g., history of a delayed, severe, non-IgE mediated hypersensitivity reaction). **Increased GAS resistance to macrolides.**
GAS = Group A Streptococcus

Acute Bacterial Rhinosinusitis *Most cases are VIRAL and DO NOT require antibiotics!*

Antibiotic	*ADULT* Dose	Cost/day
Amoxicillin	500 – 1000 mg PO TID[a]	$0.39 – 0.78
Amox/Clav[b]	875 mg PO BID	$1.11
Cefuroxime[c]	500 mg PO BID	$1.66
Clarithromycin[d]	500 mg PO BID	$1.66
Doxycycline[d]	100 mg PO BID	$0.93
Duration: 5 days in otherwise healthy individuals		

Antibiotic	*PEDIATRIC* Dose	Cost/kg/day
Amoxicillin	45-90 mg/kg/day divided PO TID (max 3000 mg/day)	$0.05 – 0.10
Amox/Clav[b] 80mg/mL, 7:1 formulation	45-60 mg/kg/day divided PO TID (max 1500 mg/day) Dose based on amoxicillin	$0.09 – 0.12
Cefprozil	30 mg/kg/day divided PO BID (max 1000 mg/day)	$0.12
Cefuroxime[c]	30 mg/kg/day divided PO BID (max 1000 mg/day)	$0.22
Clarithromycin[d]	15 mg/kg/day divided PO BID (max 1000 mg/day)	$0.14
Duration: 5-7 days 7-10 days may be considered if fever > 39°C or failure to respond to amoxicillin after 3-5 days.		

[a] Use higher dose if antibiotic use in past 3 months.
[b] *Adults:* Broader spectrum for amoxicillin treatment failure; *Pediatrics:* Broader spectrum if patient presents with fever > 39°C or fails to respond to amoxicillin after 3-5 days.
[c] 1st line option if patient has experienced an IgE mediated amoxicillin reaction.
[d] If patient is unable to take any β-lactam (e.g., history of a delayed, severe, non-IgE mediated hypersensitivity reaction). **Increased *Streptococcus pneumoniae* resistance to macrolides and tetracyclines.**

Expect symptoms to improve but not completely resolve at the end of antibiotic therapy. Some persistence of symptoms is NOT an indication for an immediate second antibiotic.

Treatment Options: Green = 1st line Yellow = 2nd line Orange = 3rd line = May require renal dose adjustment
NS Health Firstline (adults) https://firstline.org/nsha IWK Firstline (pediatrics) https://firstline.org/iwk/

Beta(β)–Lactam Allergy

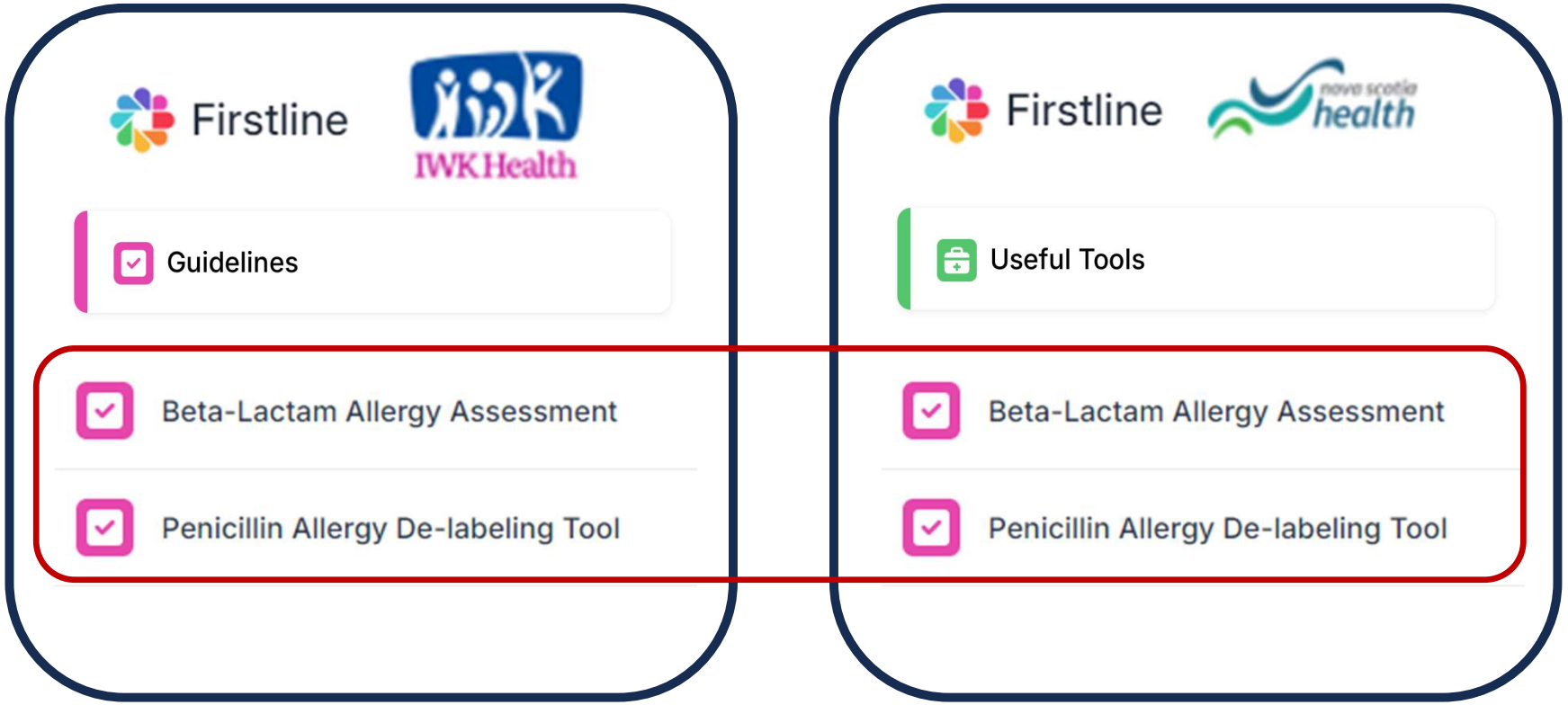
Updated content for

- Acute respiratory tract infections
- Acute UTIs
- SSTIs
- Lyme disease

Newly added content for

- Dental abscess infections
- IE prophylaxis before dental procedures
- *C. difficile* infections
- Anaplasmosis

Beta-lactam allergy assessment and de-labelling tools



Beta-Lactam Allergy Assessment

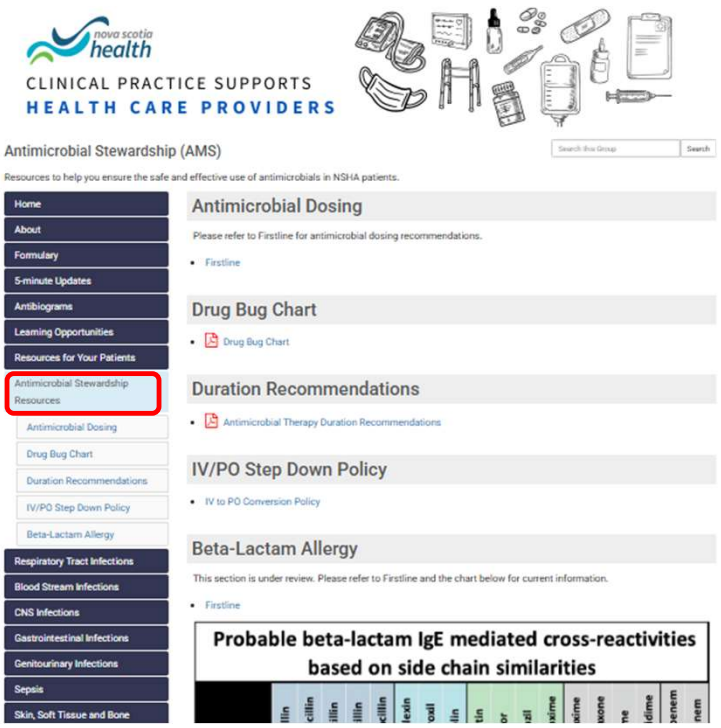
Appropriate management is based on type of allergic reaction

Reaction	Management
Hypersensitivity IgE mediated (within 2 hours, e.g., anaphylaxis)	• Avoid reaction-provoking drug • Choose β-lactam with different side chain • Consider further evaluation of allergy status when feasible
Hypersensitivity Non-IgE-mediated (delayed > 72 hours)	**Non-serious** (more common) • Choose β-lactam with different side chain • Direct oral challenge (if feasible) • Consider further evaluation of allergy status when feasible
	Serious/life threatening (rare) e.g., Stevens-Johnson syndrome • Avoid all β-lactams
Non-hypersensitivity (adverse drug event)	• Not a contraindication

Probable beta-lactam IgE mediated cross-reactivities based on side chain similarities

	Penicillin	Amoxicillin	Ampicillin	Cloxacillin	Piperacillin	Cephalexin	Cefadroxil	Cefazolin	Cefoxitin	Cefaclor	Cefprozil	Cefuroxime	Cefotaxime	Ceftriaxone	Cefixime	Ceftazidime	Meropenem	Ertapenem
Penicillin		X	X	X	X	X	X		X									
Amoxicillin	X		X	X	X	X	X			X	X							
Ampicillin	X	X		X	X	X	X			X	X							
Cloxacillin	X	X	X		X													
Piperacillin	X	X	X	X		X	X			X	X							
Cephalexin	X	X	X		X		X			X	X							
Cefadroxil	X	X	X		X	X				X	X							
Cefazolin																		
Cefoxitin	X											X						
Cefaclor		X	X		X	X	X				X							
Cefprozil		X	X		X	X	X			X								
Cefuroxime									X				X	X	X	X		
Cefotaxime												X		X	X	X		
Ceftriaxone												X	X		X	X		
Cefixime												X	X	X		X		
Ceftazidime												X	X	X	X			
Meropenem																		X
Ertapenem																	X	

X: Risk of IgE mediated cross reaction, use alternative



https://library.nshealth.ca/AMS/Resources

Question:

Can you confirm the suggestion to avoid cephalexin with a reported penicillin allergy? Other references say it is only an issue with amoxicillin allergy.

2018:

Table 2: β-lactams with similar side chains

Nova Scotia Health Authority
Antimicrobial Stewardship Program

	Penicillin	Amoxicillin	Ampicillin	Cloxacillin	Piperacillin	Cephalexin	Cefazolin	Cefadroxil	Cefoxitin	Cefuroxime	Cefprozil	Cefaclor	Cefotaxime	Ceftriaxone	Cefixime	Ceftazidime
Penicillin		X	X	X	X				X							
Amoxicillin	X		X	X	X	X		X			X	X				

2025:

Figure 1: Probable β-lactam IgE mediated cross-reactivities based on side chain similarities

Probable beta-lactam IgE mediated cross-reactivities based on side chain similarities

	Penicillin	Amoxicillin	Ampicillin	Cloxacillin	Piperacillin	Cephalexin	Cefadroxil	Cefazolin	Cefoxitin	Cefaclor	Cefprozil	Cefuroxime	Cefotaxime	Ceftriaxone	Cefixime	Ceftazidime	Meropenem	Ertapenem
Penicillin		X	X	X	X	X	X		X									
Amoxicillin	X		X	X	X	X	X			X	X							

Response:

- This information was updated in 2019.
- Cautious decision based on uncertainty with allergy reporting to avoid any potential risk.
  - The drug names are often used interchangeably, or people cannot recall what they took, regardless of what they had when they experienced the reaction.

Source: NSH AMS correspondence

Direct oral drug challenge

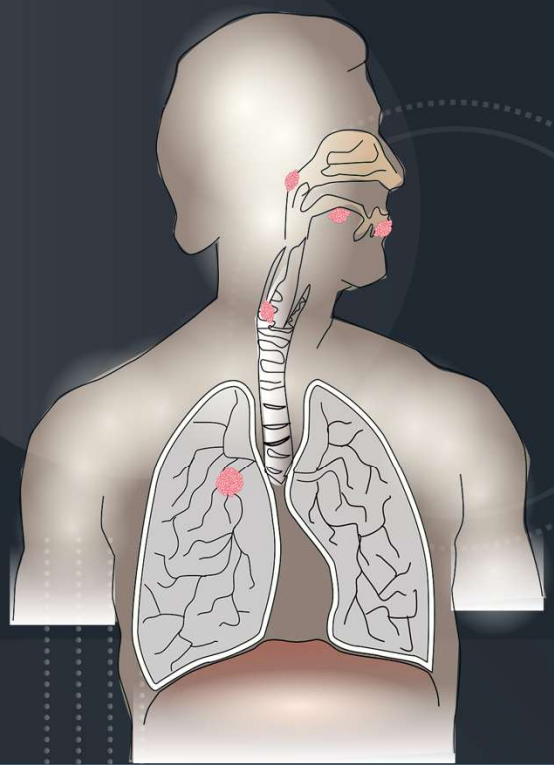
- To clarify allergy status in appropriate candidates (e.g., low-risk people based on assessment)
- Single step vs graded protocols (amoxicillin administered followed by observation)
- Anaphylaxis management protocol/supplies required

When to consider referral to an Allergist

- If unable to rule in/out an IgE mediated allergy. For moderate to high-risk patients, penicillin skin testing may be considered before the challenge.

ADULT referrals	ADULT and PEDIATRIC referrals	PEDIATRIC referrals
Drug Allergy Clinic Bayer's Lake Community Outpatient Centre f: 902-473-8430	Halifax Allergy and Asthma Associates 5657 Spring Garden Road, Suite 503 Halifax, NS, B3J 3R4 t: 902-425-3927 f: 902-425-3928	IWK Allergy Clinic t: 902-470-6554 f: 902-470-7308
		East Coast Allergy Dr. Laura Murphy 4 Forest Hills Parkway, Cole Harbour t: 902-435-5530 (ext. 10) f: 1-833-333-2679

RESPIRATORY TRACT INFECTIONS



- Acute Pharyngitis
- Acute Otitis Media
- Acute Rhinosinusitis
- Acute Bronchitis
- AECOPD
- CAP (adult and pediatrics)

Image source: https://pixabay.com/vectors/cancer-carcinoma-metastases-airway-156101/

Acute Pharyngitis

Most cases are viral[1]

Most common bacterial pathogen is Group A Streptococcus (GAS)[1]

Treat confirmed GAS pharyngitis to reduce the risk of complications[1]

Do not routinely prescribe antibiotics unless modified Centor score is ≥ 2 AND test confirms GAS.[2]

1. RxFiles "Acute Pharyngitis: Management Considerations" November 2024. https://www.rxfiles.ca/RxFiles/uploads/documents/ABX-Pharyngitis.pdf
2. https://choosingwiselycanada.org/primary-care/antibiotics/

Modified Centor Score [1,2]

Criteria	Points
Temperature > 38^0 C	1
Absence of cough	1
Swollen tender anterior cervical lymph nodes	1
Tonsillar swelling or exudate	1
Age 3-14 years[a]	1
Age 15-44 years	0
Age ≥ 45 years	-1
Total Score[b]:	

IWK & NSH Suggested Management

Total score ≤ 1: No throat swab or antibiotics.

Total score = 2: Use clinical judgement (e.g., may test a patient with mild symptoms if they have a close contact who tested positive for GAS pharyngitis).

Total score ≥ 3: Perform throat swab culture or POCT

- A back-up culture is recommended in *children* ≤ 18 years old with a negative RADT. A negative NAAT does not require a back-up culture.
- A back-up culture is NOT required in *adults* with a negative RADT due to low incidence of GAS pharyngitis and very low risk of rheumatic fever.[13]
- If culture or POCT is **positive for GAS, TREAT with antibiotic** to ↓ the risk of complications.
- In uncomplicated cases, if culture is **negative for GAS, STOP antibiotics** (if started).

1. McIsaac WJ. Journal of the American Medical Association. 2004;291 (13): 1587–1595.
2. Centor Score (Modified/McIsaac) for Strep Pharyngitis calculator https://www.mdcalc.com/centor-score-modified-mcisaac-strep-pharyngitis

Antibiotic	PEDIATRIC Acute Pharyngitis	Cost/day
Penicillin V[a] No commercially available suspension	≤ 27 kg: 300 mg PO BID > 27 kg: 600 mg PO BID	$0.48 $0.97
Amoxicillin[b]	50 mg/kg/day once daily or divided PO BID (max 1000 mg/day)	$0.05/kg
Cefprozil	20 mg/kg/day divided PO BID (max 1000 mg/day)	$0.08/kg
Cefuroxime[c]	30 mg/kg/day divided PO BID (max 1000 mg/day)	$0.22/kg
Clarithromycin[d]	15 mg/kg/day divided PO BID (max 1000 mg/day)	$0.14/kg
Duration: 10 days		

Antibiotic	ADULT Acute Pharyngitis	Cost/day
Penicillin V[a]	600 mg PO BID	$0.97
Amoxicillin[b]	500 mg PO BID	$0.26
Cephalexin	500 mg PO BID	$0.35
Cefuroxime[c]	500 mg PO BID	$1.66
Clarithromycin[d]	250 mg PO BID	$0.82
Duration: 10 days		

[a] Penicillin V preferred 1st line (narrow spectrum, safe and low cost). No documented GAS resistance.

[b] Amoxicillin broader spectrum than required.

[c] 1st line option if patient has experienced an IgE mediated amoxicillin reaction.

[d] If patient is unable to take any β-lactam (e.g. history of delayed, severe, non-IgE mediated hypersensitivity reaction).

Increased GAS resistance to macrolides.

Poll Question 1:

Why is clarithromycin "**orange**" 3rd line?

Response options:

a. High empiric GAS resistance based on local antibiogram data
b. More expensive
c. Poorly tolerated by patients
d. All the above
e. Unsure

NS Health QEII HSC Antibiotic Susceptibility (Jan 1, 2023 – Dec 31, 2023)

Outpatients – Gram Positive Isolates: % Susceptible

	# tested**	Amoxicillin	Amoxicillin/Clavulanate	Ampicillin	Penicillin	Cloxacillin[8]	Ceftriaxone	Clindamycin	Erythromycin	Ciprofloxacin	Levofloxacin	Nitrofurantoin[9]	SXT/TMP	Doxycycline	Vancomycin
Staphylococcus aureus [1]	648	R	86[2]	R	R	86	-	76	65	81	-	99[9]	94	96[6]	99
MRSA	100	R	R	R	R	R	R	58	14	16	-	99[9]	91	88[6]	99
Staphylococcus lugdunensis	117	R	90[2]	R	R	90	-	90	90	100	-	100	100	98[6]	100
Coagulase negative Staphylococcus	207	R	52	R	R	52	-	78	54	68	-	99	71	89[6]	100
Enterococcus faecalis	322	98[2]	98[2]	98	-	-	R	-	-	79[9]	-[7]	100	R	29	100
Enterococcus faecium	93	17[2]	17[2]	17	-	-	R	-		14[9]	-	R	R	59	100
Streptococcus pyogenes [4] (Group A Streptococcus)	61	100[3]	100[3]	100[3]	100[3]	100[3]	100[3]	62	61	-	-	-	-	-	100[3]
Streptococcus pneumoniae (CSF infection) [4,5]	87	-	-	-	68[10]	-	99[5]	-	-	-	-	-	-	-	100[3]
Streptococcus pneumoniae (non-CSF infection with IV therapy) [4,5]	87	-	99[2,10]	-	100[10]	-	99	-	72	-	100	-	-	-	100[3]
Streptococcus pneumoniae (with oral therapy) [4,5]	87	99[10]	99[2,10]	-	68[10]	-	-	-	72	-	100	-	-	60	-

All results are rounded to the nearest whole number.
Some isolates may have duplicates included which may alter the results.
** approximate # tested as not all isolates tested against all antibiotics
"R" intrinsically resistant or susceptibility <10%
"-" either not tested or not active

Susceptibility	<50%	50-89%	≥90%

https://library.nshealth.ca/AMS/Antibiograms

Question:
Is once daily amoxicillin dosing a treatment option *for adults* with confirmed GAS pharyngitis?

Response:
*Bottom Line: Amoxicillin should NOT be dose once daily in **adults** with GAS pharyngitis.*

- Limited supporting data for high dose amoxicillin administered once daily in pediatrics.[1,2]
- Has not been evaluated in adults nor for other respiratory tract infections.
- Amoxicillin has a short half-life and time dependent killing.
- Long-acting amoxicillin formulation available in the US.[3]

Acute GAS Pharyngitis

Antibiotic	*ADULT* Dose	Cost/day
Penicillin V[a]	600 mg PO BID	$0.97
Amoxicillin[b]	500 mg PO BID	$0.26

Antibiotic	*PEDIATRIC* Dose	Cost/day
Penicillin V[a]	≤ 27 kg: 300 mg PO BID > 27 kg: 600 mg PO BID	$0.48 $0.97
Amoxicillin[b]	50 mg/kg/day PO once daily or divided BID (max 1000 mg/day)	$0.05/kg

1. Lennon et. Al. Arch Dis Child 2008;93:474–478. doi:10.1136/adc.2006.113506
2. Clegg et al. *Pediatr Infect Dis J* 2006;25: 761–767. DOI: 10.1097/01.inf.0000235678.46805.92
3. Pavia A. Sanford Guide Online. Updated April 22, 2025: https://web.sanfordguide.com/en/sanford-guide-online/disease-clinical-condition/pharyngitis-exudative-diffuse

Case #1

- 51-year-old male, smoker
- NKDA
- 5-day history sore throat. No cough, no nasal symptoms, no fever.
- On palpation: swollen anterior cervical lymph nodes
- Visual inspection: throat erythema, but no tonsillar swelling or exudate

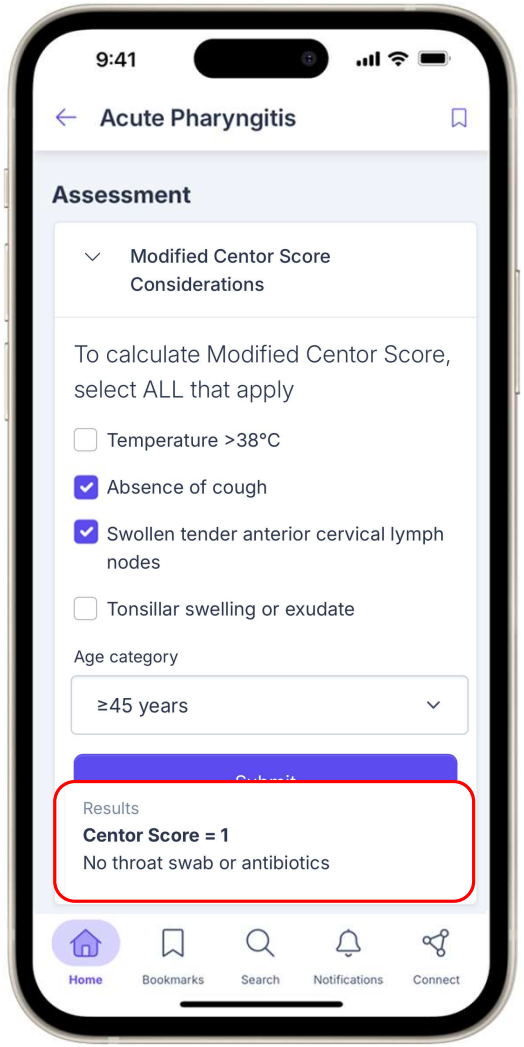
"Do I need to swab for strep throat?"

Image source: https://www.beckerentandallergy.com/blog/throat-symptoms-of-sleep-apnea

Case #1

- 51-year-old male, smoker
- NKDA
- 5-day history sore throat. No cough, no nasal symptoms, no fever.
- On palpation: swollen anterior cervical lymph nodes
- Visual inspection: throat erythema

“Do I need to swab for strep throat?”



Case #2

Table 2: Modified Centor Score[7-8]

Criteria	Points
Temperature ≥ 38^0 C	1
Absence of cough	1
Swollen tender anterior cervical lymph nodes	1
Tonsillar swelling or exudate	1
Age 3-14 years[a]	1
Age 15-44 years	0
Age ≥ 45 years	-1
Total Score[b]:	4

- 15-year-old female, 49 kg
- Allergy: penicillin
- Sore throat x 3 days accompanied by fever/chills and nausea. No cough, runny nose, or congestion. Best friend diagnosed with strep throat yesterday.
- On palpation: swollen anterior cervical lymph nodes
- Visual inspection: tonsillar inflammation & exudate
- Point of care throat swab: **positive GAS**

Antibiotic treatment indicated

Case #2

Scenario 1:

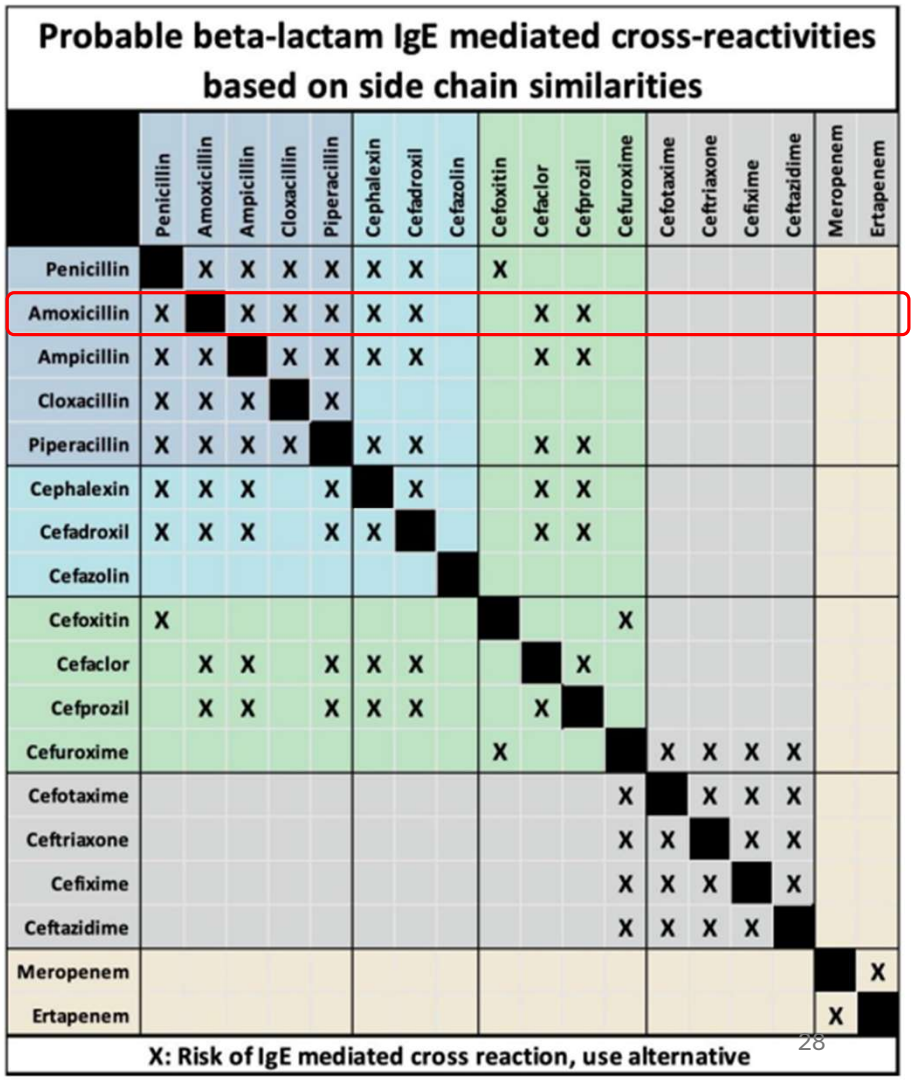
+++nausea and diarrhea after taking amoxicillin for ear infection as toddler

Poll Question 2:

What type of reaction did the patient experience and how would you treat?

a. IgE-mediated hypersensitivity;
   Rx: cefuroxime
b. Non-hypersensitivity;
   Rx: clarithromycin
c. Non-IgE mediated hypersensitivity;
   Rx: clarithromycin
d. Non-hypersensitivity;
   Rx: penicillin

Figure 1: Probable β-lactam IgE mediated cross-reactivities based on side chain similarities



Case #2

Scenario 2:

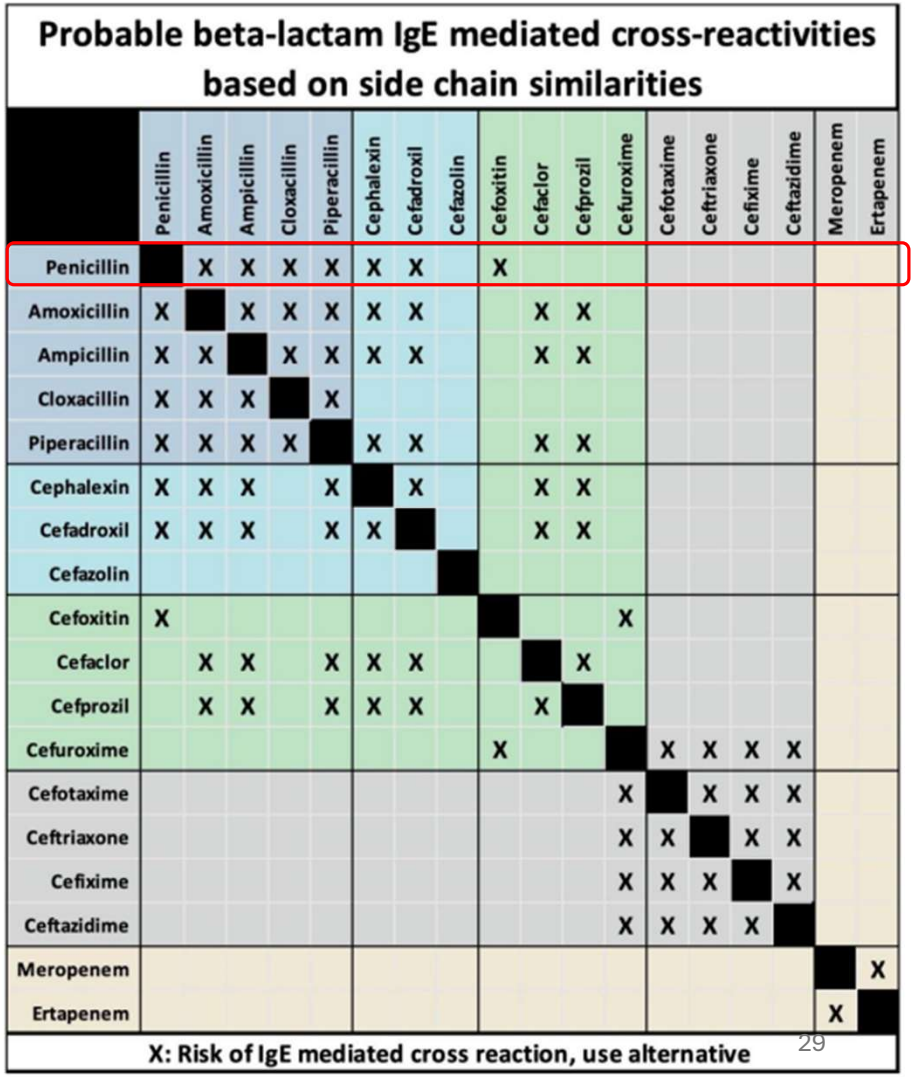
angioedema < 2 hours after taking penicillin for strep throat at age 10

Poll Question 3:

What type of reaction did the patient experience and how would you treat?

a. IgE-mediated; Rx: clarithromycin
b. Non-IgE-mediated; Rx: clarithromycin
c. Non-IgE-mediated; Rx: cefuroxime
d. IgE-mediated; Rx: cefuroxime

Figure 1: Probable β-lactam IgE mediated cross-reactivities based on side chain similarities



Acute Otitis Media (AOM)

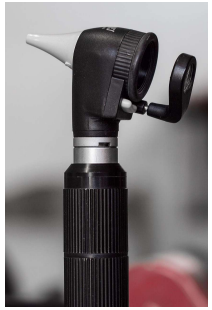
Most cases occur in pediatrics and are often viral, mild in presentation and resolve rapidly.

Common bacterial pathogens: *S. pneumoniae, H. influenzae, M. catarrhalis* (GAS less often).

Diagnosis of bacterial AOM by ear exam to confirm middle ear effusion & inflammation.

AOM with an acutely ruptured tympanic membrane (TM)

- Presume bacterial (usually GAS) - treat with *ORAL* antibiotics
- Current CPS guidelines *do NOT include use of topical antibiotics* as part of treatment of AOM with or without TM perforation.



Management of acute otitis media in children six months of age and older. Paediatr Child Health 2016;21(1):39-44: https://cps.ca/en/documents/position/acute-otitis-media

Antibiotic	PEDIATRIC Acute Otitis Media (≥ 6 months of age)	Cost/kg/day
Amoxicillin	45-60 mg/kg/day divided PO TID (max 3000 mg/day) 75-90 mg/kg/day divided PO BID (max 3000 mg/day) 80-90 mg/kg/day[a] divided PO BID-TID (max 4000mg/day)	$0.05 – 0.06 $0.08 – 0.10 $0.09 – 0.10
Amox/Clav[b] 80mg/mL *7:1 formulation*	45-60 mg/kg/day divided PO TID (max 1500 mg/day) *Dose based on amoxicillin component*	$0.09 – 0.12
Cefprozil	30 mg/kg/day divided PO BID (max 1000 mg/day)	$0.12
Cefuroxime[c]	30 mg/kg/day divided PO BID (max 1000 mg/day)	$0.22
Clarithromycin[d]	15 mg/kg/day divided PO BID (max 1000 mg/day)	$0.14
Ceftriaxone[c]	50 mg/kg/day IM or IV once daily x 3 days *Reserve for emergency department*	Variable
Duration: **5 days for age ≥2 years if no known complications** **10 days for age 6 months to <2 years, frequent, recurrent AOM, perforation or failed initial antibiotic**		

[a] Consider **high dose amoxicillin** for known or suspected drug-resistant *S. pneumoniae*: antibiotic use within past 3 months, daycare attendance and/or unimmunized or incompletely immunized.[2-3]

[b] Broader spectrum for amoxicillin treatment failure (symptomatic after 2-3 days of treatment).

[c] 1st line option if patient has experienced an IgE mediated amoxicillin reaction.

[d] If patient is unable to take any β-lactam (e.g., history of a delayed, severe, non-IgE mediated hypersensitivity reaction). **Increased *S. pneumoniae* resistance to macrolides.**

Why is amox-clav a "yellow" second line option?

The addition of clavulanate to amoxicillin
broadens spectrum of activity by coverage of beta-lactamase producing *H. influenzae (*22% of cases in NS) & *M. catarrhalis.*

- Dose based on amoxicillin component (ratios amoxicillin to clavulanate). Choose formulation with correct ratio based on dosing strategy
  - High clavulanate doses ↑ risk of severe diarrhea (do not exceed 10mg/kg/day or 125mg/dose)
- <u>Reserve for:</u>
  - Treatment failure to amoxicillin
  - High risk of resistance *(S. pneumoniae)*

Acute Rhinosinusitis

Most cases are VIRAL! Bacterial infections are often self-limiting.

Common bacterial pathogens: *S. pneumoniae, H. influenzae, M. catarrhalis*

Watchful waiting and symptom management reasonable for uncomplicated cases

- Delayed prescriptions can be helpful tools

Bacterial vs Viral: *Bacterial more likely* when symptoms:

- Persist >10 days and worsen >5-7 days initial improvement
- Severe onset or high fever and purulent nasal discharge or facial pain lasting 3-4 days

Individual symptoms (e.g., purulent nasal discharge, facial pain) are not accurate to differentiate

Antibiotic	PEDIATRIC Acute Bacterial Rhinosinusitis	Cost/kg/day
Amoxicillin	45-90 mg/kg/day divided PO TID (max 3000 mg/day)	$0.05 – 0.10
Amox/Clav[a] 80mg/mL, 7:1 formulation only	45-60 mg/kg/day divided PO TID (max 1500 mg/day) Dosing is based on the amoxicillin component	$0.09 – 0.12
Cefprozil	30 mg/kg/day divided PO BID (max 1000 mg/day)	$0.12
Cefuroxime[b]	30 mg/kg/day divided PO BID (max 1000 mg/day)	$0.22
Clarithromycin[c]	15 mg/kg/day divided PO BID (max 1000 mg/day)	$0.14
Duration[10]: 5-7 days 7-10 days may be considered if fever > 39°C or failure to respond to amoxicillin after 3-5 days.		

[a] For fever > 39°C or failure to respond to amoxicillin after 3-5 days.
[b] 1st line option if patient has experienced an IgE mediated amoxicillin reaction.
[c] If patient is unable to take any β-lactam (e.g., history of a delayed, severe, non-IgE mediated hypersensitivity reaction).
Increased *S. pneumoniae* resistance to macrolides.

Antibiotic	ADULT Acute Bacterial Rhinosinusitis	Cost/day
Amoxicillin	500 mg – 1000 mg PO TID[a]	$0.39 – 0.78
Amox/Clav[b]	875 mg PO BID	$1.11
Cefuroxime[c]	500 mg PO BID	$1.66
Clarithromycin[d]	500 mg PO BID	$1.66
Doxycycline[d]	100 mg PO BID	$0.93
Duration: 5 days in otherwise healthy individuals.[11]		

[a] Use higher dose if antibiotic use in past 3 months.[12]
[b] Broader spectrum for amoxicillin treatment failure.
[c] 1st line option if patient has experienced an IgE mediated amoxicillin reaction.
[d] If patient is unable to take any β-lactam (e.g., history of a delayed, severe, non-IgE mediated hypersensitivity reaction).
Increased *S. pneumoniae* resistance to macrolides and tetracyclines.

Expect symptoms to improve but not completely disappear at the end of therapy. Some persistence of symptoms is not an indication for immediate second antibiotic.

Acute Bronchitis

VIRAL infection → DOES NOT require antibiotics!

Diagnosis

- Presents with **acute cough** +/- sputum, lasting 10 days to 3 weeks (sometimes longer)

RED FLAGS: New-onset fever, difficulty breathing, symptoms lasting >3-4 weeks, bloody sputum

- Imaging *only* if concerns of pneumonia or comorbidities

Management: Supportive care, preventative strategies, other causes of cough >3 weeks

➢ **No evidence of pneumonia, no role for antibiotics**

Endpoint	RR (95% CI)[3]
Clinical improvement at follow-up	1.07 (0.99 to 1.15); no significant difference between antibiotics & placebo
Adverse effects in the antibiotic group	(1.05 to 1.36); NNH=24, primarily GI related
RR = relative risk; CI = confidence interval; NNH = numbers needed to harm; GI = gastrointestinal	

Smith SM et. al. Antibiotics for acute bronchitis. Cochrane Database of Systematic Reviews 2017. DOI: 10.1002/14651858.CD000245.pub4.

Acute Exacerbation of COPD (AECOPD)

Etiology

- Viral (30-50%)
- Bacterial (*H. influenzae, S. pneumoniae, M. catarrhalis)*
- Non-infectious (e.g., irritants, allergens, heart failure)

Pharmacological outpatient management *(if no red flags)*

- Inhalers, oral corticosteroids, +/- antivirals
- **ANTIBIOTICS if**
  - **↑ sputum purulence *AND***
  - **↑ dyspnea *OR* ↑ sputum volume**

Consider preventative startegies:

- Smoking cessation, vaccinations, INSPIRED Program, optimize inhaler technique.

RED FLAGS for hospitalization:

- Severe symptoms (e.g., sudden worsening of resting dyspnea, ↑respiratory rate, hypoxia, confusion)
- Acute respiratory failure
- Onset of new physical signs (e.g., cyanosis, peripheral edema)
- Failure to respond to initial treatment
- Presence of serious comorbidities (e.g. HF, newly occurring arrhythmias)

Antibiotic	ADULT AECOPD	Cost/day
< 4 exacerbations in the past year		
Amoxicillin	500 mg PO TID	$0.39
Cefuroxime[a]	500 mg PO BID	$1.66
SMX/TMP[b,c]	800 mg/160 mg (1 DS tablet) PO BID	$0.45
Doxycycline[b]	100 mg PO BID	$0.93
Clarithromycin[b,d]	500 mg PO BID	$1.66
≥ 4 exacerbations in the past year, or one of the following: Treatment failure[e], recent antibiotics, home oxygen, or chronic systemic steroid use		
Amox/Clav	875 mg PO BID	$1.11
Ceftriaxone[a]	1 g IV daily	$12.50
Levofloxacin[b,f]	750 mg PO once daily	$6.55
Moxifloxacin[b,f]	400 mg PO once daily	$1.52
Duration: 5 days[5-6] Expect symptoms to improve but not completely resolve at the end of therapy. Complete resolution may take several weeks.		

[a] 1st line option if patient has experienced an IgE mediated amoxicillin reaction.

[b] If patient is unable to take any β-lactam (e.g., history of a delayed, severe, non-IgE mediated hypersensitivity reaction).

[c] Regular monitoring of kidney function and electrolytes recommended for patients at risk of hyperkalemia, such as those with: baseline renal dysfunction, age > 65 years, prolonged duration of SMX/TMP therapy, concomitant therapy with ACE inhibitors, angiotensin receptor blockers, or potassium sparing diuretics.

[d] **Macrolides are less effective** against *H. influenzae* and *S. pneumoniae*; Reserve for when unable to use other options.

[e] Treatment failure defined as: Clinical deterioration over 72 hours or no improvement after completion of first line treatment.

[f] **Reserve fluroquinolones** for treatment failure or if patient is unable to take other treatment options and no fluroquinolone use in previous 3 months.

NS Health QEII HSC Antibiotic Susceptibility (Jan 1, 2023 – Dec 31, 2023)

Outpatients – Gram Positive Isolates: % Susceptible

	# tested**	Amoxicillin	Amoxicillin/Clavulanate	Ampicillin	Penicillin	Cloxacillin[8]	Ceftriaxone	Clindamycin	Erythromycin	Ciprofloxacin	Levofloxacin	Nitrofurantoin[9]	SXT/TMP	Doxycycline	Vancomycin
Staphylococcus aureus [1]	648	R	86[2]	R	R	86	-	76	65	81	-	99[9]	94	96[6]	99
MRSA	100	R	R	R	R	R	R	58	14	16	-	99[9]	91	88[6]	99
Staphylococcus lugdunensis	117	R	90[2]	R	R	90	-	90	90	100	-	100	100	98[6]	100
Coagulase negative Staphylococcus	207	R	52	R	R	52	-	78	54	68	-	99	71	89[6]	100
Enterococcus faecalis	322	98[2]	98[2]	98	-	-	R	-	-	79[9]	-[7]	100	R	29	100
Enterococcus faecium	93	17[2]	17[2]	17	-	-	R	-	-	14[9]	-	R	R	59	100
Streptococcus pyogenes [4] **(Group A Streptococcus)**	61	100[3]	100[3]	100[3]	100[3]	100[3]	100[3]	62	61	-	-	-	-	-	100[3]
Streptococcus pneumoniae (CSF infection) [4,5]	87	-	-	-	68[10]	-	99[5]	-	-	-	-	-	-	-	100[3]
Streptococcus pneumoniae (non-CSF infection with IV therapy) [4,5]	87	-	99[2,10]	-	100[10]	-	99	-	72	-	100	-	-	-	100[3]
Streptococcus pneumoniae (with oral therapy) [4,5]	87	99[10]	99[2,10]	-	68[10]	-	-	-	72	-	100	-	-	60	-

All results are rounded to the nearest whole number.
Some isolates may have duplicates included which may alter the results.
** approximate # tested as not all isolates tested against all antibiotics
"R" intrinsically resistant or susceptibility <10%
"-" either not tested or not active

Susceptibility <50% | 50-89% | ≥90%

https://library.nshealth.ca/AMS/Antibiograms

Question:

What is the evidence to support shorter antibiotic treatment duration for AECOPD?

Response:

Supported by GOLD 2025 guidelines, the Cold Standard Tool Kit from Choosing Wisely Canada, and a systematic review and meta-analysis of 8 RCTs and local AMS experts.[1-3]

2022 SR/MA (n=3670)[3] → Overall rates were similar between groups

Population	Adults aged ≥40 years with spirometry-confirmed COPD
Intervention/Control	Shorter (≤5 days) vs longer/standard (≥6 days) antibiotic course
Outcomes	Clinical cure: 88.5% vs 87.1%, OR 1.14 (95% CI 0.91-1.44) Bacterial eradication: 51% vs 48.9%, OR 1.16 (95% CI 0.91-1.48) Adverse events: 21.1% vs 22.8%, OR 0.83 (95% CI 0.62-1.11)

1. GOLD Report 2025: https://goldcopd.org/2025-gold-report/
2. Choosing Wisely Canada Toolkit: https://choosingwiselycanada.org/toolkit/the-cold-standard/
3. Llor C. et al. Pulm Pharmacol Ther. 2022 Feb;72:102111.

https://www.bradspellberg.com/

Question:
What is the rationale for amoxicillin 500 mg PO TID and no 1000 mg dose option for AECOPD?

Response:
Decision was based on local expert opinion, despite differing references.

Rationale:
AECOPD includes a mix of viral, bacterial, and non-infectious causes, and as such, may not be a bacterial infection in some cases. For this reason, local experts are not particularly aggressive in treatment recommendations.

Source: NSH AMS/ID expert opinion

Adult CAP

Usual bacterial pathogen: *S. pneumoniae* *(H. influenzae* uncommon)

- May be *intermittent periods* of ↑ atypical infections requiring antibiotic coverage.
  (Atypical pathogens: *Mycoplasma pneumoniae, Chlamydia pneumoniae, Legionella pneumoniae)*

Diagnosis is based on clinical presentation and chest X-ray infiltrate.

CRB-65 score can help guide need for hospitalization

Table 3: CRB-65 score[b] CAPNETZ Study Group. CRB-65 predicts death from community-acquired pneumonia. J Intern Med. 2006;260(1):93-101.

CRB-65	
Criteria	**Points**
Confusion: based on a specific mental test or new disorientation to person, place, time	1
Respiratory rate ≥ 30 breaths/minute	1
Low **B**lood pressure (systolic < 90 mm Hg; or diastolic ≤ 60 mmHg)	1
Age ≥ **65** years	1

Score[a]	**Management setting**
0 (plus O_2 sat > 92% on room air)	Can be treated as outpatients
1 - 2	Consider admission to hospital ward
3 - 4	Often require ICU care

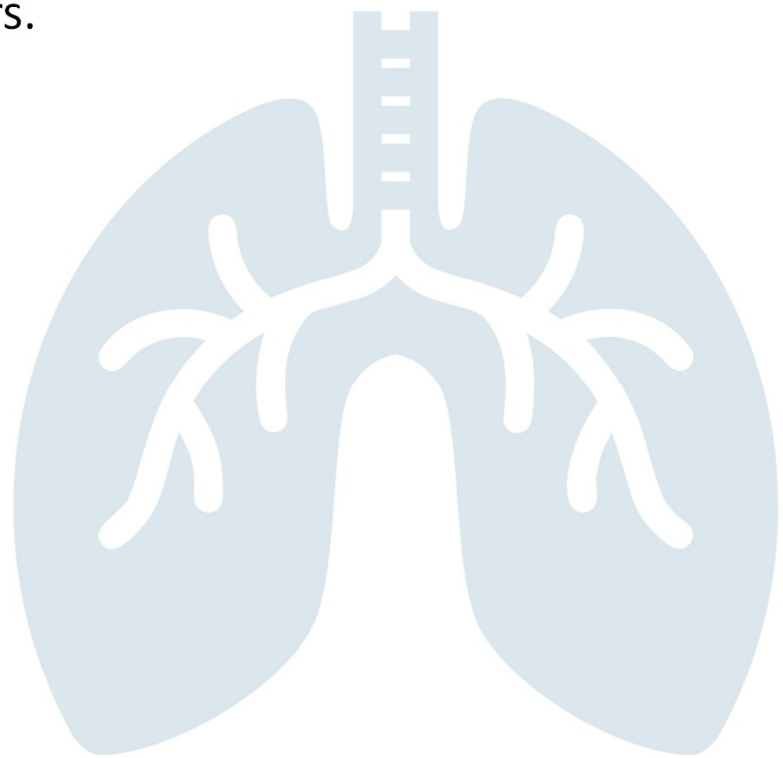
[a] Ratings may change over a short period of time and repeat assessments over several hours may be necessary.

Antibiotic	ADULT CAP	Cost/day
CRB-65 score 0 plus O_2 sat > 92% on room air → can be managed in **OUTPATIENT setting**		
Amoxicillin	500 mg to 1000 mg PO TID	$0.39 – 0.78
Cefuroxime[a]	500 mg PO BID	$1.66
Doxycycline[b,c]	100 mg PO BID	$0.93
Levofloxacin[b,d]	750 mg PO once daily	$6.55
Moxifloxacin[b,d]	400 mg PO once daily	$1.52
CRB-65 score 1-2 → *consider* admission to **HOSPITAL (NON-ICU)**		
Amoxicillin	500 mg to 1000 mg PO TID	$0.39 – 0.78
Ampicillin	2 g IV q6h	$44.92
Cefuroxime[a]	500 mg PO BID or 750 mg IV q8h	$1.66/$78.35
Ceftriaxone[a]	1 g IV once daily	$12.50
Levofloxacin[b,d]	750 mg PO/IV once daily	$6.55/$60.05
Moxifloxacin[b,d]	400 mg PO/IV once daily	$1.52/$43.54
Atypical coverage is NOT routinely required. Consider atypical coverage with the *addition of one of the following* if not receiving a fluoroquinolone and: Strong suspicion of atypical pathogens, not responding to β-lactams, age ≥ 65 years, or comorbidities (e.g., chronic heart, lung, liver, or renal disease, diabetes mellitus, alcohol dependence, or immunosuppression).		
Doxycycline	100 mg PO BID	$0.93
Clarithromycin[e]	500 mg PO BID	$1.66
Duration: 5 days[7]		

[a] 1st line option if patient has experienced an IgE-mediated amoxicillin reaction.
[b] If patient is unable to take any β-lactam (e.g., history of a delayed, severe, non-IgE mediated hypersensitivity reaction)
[c] **Increased *S. pneumoniae* resistance.**
[d] Reserve for treatment failure (worsening after 72 hours or no response after therapy completion) or unable to take other treatment options and no fluoroquinolone use in the previous 3 months.
[e] Macrolides *alone are not* a 1st line option due to **poor *S. pneumoniae* coverage.**

Pediatric CAP

- Viral infections most common etiology age ≤5 years.



Usual bacterial pathogen: *S. pneumoniae*

- *Mycoplasma pneumoniae & Chlamydophila pneumoniae* more common age > 5 years.

Diagnosis (bacterial pneumonia) is based on

- Clinical presentation & chest X-ray infiltrate.
  - Symptoms → acute onset fever, cough, dyspnea, lethargy, poor feeding, vomiting.
    - *M. pneumoniae* typically characterized by malaise and headache for 7-10 days before the onset of fever and cough, which then predominate.

Before starting antibiotics → confirm bacterial diagnosis with chest X-ray

Antibiotic	PEDIATRIC Outpatient CAP (age > 3 months)	Cost/kg/day
Amoxicillin[a]	45-90 mg/kg/day divided PO TID (max 4000 mg/day)	$0.05 – 0.10
Cefprozil[b]	30 mg/kg/day divided PO BID (max 1000 mg/day)	$0.12
Cefuroxime[c]	30 mg/kg/day divided PO BID (max 1000 mg/day)	$0.22
Azithromycin[d,e]	10 mg/kg/day on **day 1** (max 500 mg/day), then 5 mg/kg/day PO daily x **4 days** (max 250 mg/day)	$0.15 – 0.30
Duration: 5 days[3-4]		
ADD one of the following for suspected *Mycoplasma pneumoniae*:		
Azithromycin[e]	10 mg/kg/day on **day 1** (max 500 mg/day), then 5 mg/kg/day PO daily x **4 days** (max 250 mg/day)	$0.15 – 0.30
Doxycycline[f]	4 mg/kg/day divided PO BID (max 200 mg/day) x **7 days**	$0.93 or less

[a] Use **higher dose** (75-90 mg/kg/day) if patient has any of the following risk factors for resistant *S. pneumoniae*[5]: Unimmunized or incompletely immunized, daycare attendance, use of antibiotics in the preceding 3 months.

[b] Cefprozil does not cover *S. pneumoniae* as well as amoxicillin and is not effective against *C. pneumoniae* and *M. pneumonia*.

[c] 1st line option if patient has experienced an IgE-mediated amoxicillin reaction.

[d] If patient is unable to take any β-lactam (e.g., history of a delayed, severe, non-IgE-mediated hypersensitivity reaction).

[e] **Increased *S. pneumoniae* resistance to macrolides but covers *C. pneumoniae* and *M. pneumoniae*.**

[f] For children with macrolide allergy.

<u>Suggestive features:</u>

- Age > 5 years
- Features consistent with atypical pneumonia
- Not responding to β-lactam monotherapy

May resolve spontaneously; antibiotics not always required

No age restriction for doxycycline in this scenario

Poll Question 4:

If atypical pneumonia is suspected in a child based on presentation on x-ray, can you treat with azithromycin alone?

Response options:

a. Yes, a macrolide alone is an effective option in this clinical scenario.
b. No, atypical coverage should be ADDED to the beta-lactam regimen in this scenario rather than substituted because S. pneumonia remains a more common etiology for CAP than Mycoplasma despite the radiographic results.
c. Chest x-ray with bilateral patchy infiltrates may suggest atypical pneumonia but could also be viral pneumonia, in which case antibiotic use should be reassessed.
d. B and C

Source: IWK AMS/ID expert opinion

URINARY TRACT INFECTIONS

- Acute Uncomplicated Cystitis
- Recurrent Uncomplicated Cystitis
- Asymptomatic Bacteriuria

Urinary Tract Infections (UTIs)

Acute Uncomplicated Cystitis

Most common bacterial pathogen is *E. Coli*

Uncomplicated UTI defined as:

- Does *NOT* extend beyond the bladder
- In people *WITHOUT* complicated host factors
  (e.g., individuals who do not have a vagina, are not pregnant, have no structural or functional abnormalities)

RED FLAGS

- Fever/chills
- Nausea/vomiting
- Back/flank pain
- Penile/rectal pain/discharge
- Vaginal discharge

Clinical Diagnosis:

- Symptoms include **dysuria, urgency, frequency**, and suprapubic pain/tenderness.
- Urine dipstick *NOT* recommended
- Urine culture *in some cases* (e.g., recent UTI/antibiotics/hospitalization, in pregnancy)

Antibiotic[a]	ADULT & Post-Pubertal Girls (empiric) Acute Uncomplicated Cystitis	Cost/course
NO host risk factors for complicated infection[f]		
Nitrofurantoin Monohydrate/Macrocrystals[b,e]	100 mg PO BID x **5 days**	$3.98
SMX/TMP[c,e]	800 mg/160 mg (1 DS tablet) PO BID x **3 days**	$1.35
Cephalexin	500 mg PO QID x **5-7 days**	$3.46 – 4.85
Fosfomycin[d,e]	3 g PO x **1 dose**	$15.23
Amox/Clav *If high risk of resistance**	875 mg PO BID x **5-7 days**	$5.55 – 7.77
Host risk factors for complicated infection[f,] excluding pregnancy		
Nitrofurantoin Monohydrate/Macrocrystals[b,e]	100 mg PO BID x **7 days**	$5.58
SMX/TMP[c,e]	800 mg/160 mg (1 DS tab) PO BID x **7 days**	$3.15
Cephalexin	500 mg PO QID x **7 days**	$4.85
Fosfomycin[d,e]	3 g PO q72h x **2 to 3 doses**	$30.46 – 45.69
Amox/Clav *If high risk of resistance**	875 mg PO BID x **7 days**	$7.77

[a] Other antibiotics are appropriate if culture confirms susceptibility. Moxifloxacin should not be used because it does not attain sufficient concentration in the urine.

[b] Nitrofurantoin should not be used in patients with CrCl < 30 ml/min, or pyelonephritis or prostatitis due to poor distribution into serum and tissue

[c] Regular monitoring of kidney function and electrolytes are recommended for patients at risk of hyperkalemia, such as those with baseline renal dysfunction, age > 65 years, prolonged duration of SMX/TMP therapy, concomitant therapy with ACE inhibitors, angiotensin receptor blockers, or potassium sparing diuretics.

[d] Fosfomycin should not be used in patients with pyelonephritis due to poor distribution into serum and tissue.

[e] Option if patient has experienced an IgE-mediated amoxicillin reaction.

[f] Risk factors: Immunosuppression, poorly controlled diabetes, catheter use, delayed/impaired voiding, structural/functional abnormality of urinary tract, recent urogenital procedure, individuals with a penis

*Risk factors for resistance: Antibiotic use/hospitalization/resistant infection in past 3 months, recent travel from areas with high antibiotic resistance rates, failed to respond to/unable to take (due to contraindications) alternative appropriate options.

Amoxicllin NOT reliable empirically due to high *E. coli* resistance & no activity vs *klebsiella*

Antibiotic	PEDIATRIC (age > 2 months; empiric) Acute Uncomplicated Cystitis	Cost/kg/day
Cephalexin	50 mg/kg/day divided PO QID (max 2000 mg/day)	$0.26
Cefixime[a]	8 mg/kg/day PO once daily (max 400 mg/day)	$0.16
SMX/TMP[a]	8 mg/kg/day divided PO BID (max 160 mg TMP/dose) Dose based on trimethoprim (TMP) component	$0.21
Duration: 5 to 7 days[b]		

[a] Option if patient has experienced an IgE mediated amoxicillin reaction

[b] Recommended duration if afebrile, not systemically ill, not recurrent, normal urinary tract anatomy, normal renal function and no history of resistant pathogens.

Antibiotic	In PREGNANCY (empiric) Acute Uncomplicated Cystitis	Cost/Course
Cephalexin	500 mg PO QID x **7 days**	$4.85
Nitrofurantoin Monohydrate/Macrocrystals[a,b]	100 mg PO BID X **5 days** *DO NOT USE In Late 3rd Trimester*	$3.98
SMX/TMP[b]	800 mg/160 mg (1 DS tablet) PO BID x **3 days** *DO NOT USE in 1st OR 3rd trimester*	$1.35

[a] Nitrofurantoin should not be used in patients with CrCl < 30 ml/min.

[b] Option if patient has experienced an IgE-mediated amoxicillin reaction or is unable to take any β-lactam (e.g. history of a delayed, severe, non-IgE mediated hypersensitivity reaction).

- During pregnancy, it is important to repeat urine culture at appropriate interval for test of cure.

Amoxicllin NOT reliable empirically due to high *E. coli* resistance & no activity vs *klebsiella*

Question:
Why is nitrofurantoin not listed as an empiric treatment option for uncomplicated cystitis in the pediatric population?

Response:

- Nitrofurantoin is not included due to concerns in difficulty distinguishing between cystitis and pyelonephritis when assessing infants and younger children with febrile UTI.
  - Nitrofurantoin does not achieve renal/serum concentrations.
- For these concerns, nitrofurantoin
  - should NOT be used in infants/younger children with febrile UTI
  - may be used in older children/adolescents who are afebrile with no concern for systemic infection (cystitis only).

Note: Nitrofurantoin is not commercially available as a suspension, must be compounded

Source: IWK AMS/ID expert opinion, CPS statement https://www.cps.ca/en/documents/position/urinary-tract-infections-in-children

Question:
Can cephalexin be given twice daily for uncomplicated urinary tract infections (UTI)?

Response:

- Although twice daily (BID) cephalexin dosing is an option for uncomplicated UTI, four times daily (QID) dosing is preferred by local AMS/ID clinicians.
- Firstline (NSH & IWK)[1] , RxFiles[2], and Bugs & Drugs resources support QID dosing.[3]
- Micromedex reports that cephalexin may be dosed as 250 mg every six hours or 500 mg every 12 hours and references the FDA product information.[4]

1. IWK Firstline App. Available from: https://app.firstline.org/en/clients/7-iwk-health-centre
2. RxFiles "Urinary Tract Infections (UTI): Drug Comparison Chart" July 2025. https://www.rxfiles.ca/RxFiles/uploads/documents/members/CHT-UTI-Tx.pdf
3. Bugs and Drugs. https://www.bugsanddrugs.org/7399B374-C9F6-4044-9E03-86B1D11F2874 Cited January 16, 2026.
4. Cephalexin. Micromedex® (electronic version). Available at: https://www.micromedexsolutions.com/ (cited: January 2026).

Question:
Should nitrofurantoin be avoided in women > 80 years of age due to risk of lung toxicity?

Response:

- Health Canada Product Monograph[1]: Age is not listed as a contraindication but includes a warning of lung toxicity reactions (chronic reactions generally with ≥6 months use).
- 2023 American Geriatrics Society Beers Criteria[2]: Potentially inappropriate for use in older adults (≥65 years) with CrCl <30 mL/min or long-term use – use safer alternatives.
- Local ID/AMS expert opinion: *Chronic* use of nitrofurantoin is *not* recommended for people of *any age.*

Bottom Line: Avoid use with significant renal impairment (CrCl<60 mL/min)[1] due to reduced effectiveness and increased toxicity due to reduced drug excretion. Kidney function typically declines with increasing age. Avoid long-term use to avoid potential toxicity.

1. PMS-Nitrofurantoin BID product monograph https://pdf.hres.ca/dpd_pm/00057835.PDF
2. 2023 Beers Criteria J Am Geriatr Soc. 2023 Jul;71(7):2052-2081.

https://www.rxfiles.ca/RxFiles/uploads/documents/Nitrofurantoin-Pulmonary-Toxicity.pdf

Recurrent Uncomplicated UTI – *Adults*

Defined as ≥ 2 uncomplicated*, culture positive* UTIs in 6 months or ≥ 3 in 12 months.

- Relapse: A recurrent episode within 2 weeks of a previous UTI.

Risk factors:

- Sexual activity, spermicides, genetics, urinary incontinence, post void residual, vulvovaginal atrophy

Management

- Same as uncomplicated UTI
  → ***Tailor to culture results***
- Watch and wait approach
- "Pill-in-pocket" approach

Consider preventative strategies

- Adequate hydration (2-3L/day)
- Pelvic floor physiotherapy
- Avoid spermicides
- Vaginal estrogen (peri/post- menopausal)
- Cranberry products

Updates to Recurrent Uncomplicated Urinary Tract Infections in Women: AUA/CUA/SUFU Guideline. J Urol. 2022 Sep;208(3):536-541.

Asymptomatic Bacteriuria (ASB)

NOT an infection!

- Defined as bacteria in the bladder ***without*** **symptoms**

Screen/Treat *only in*

- Pregnancy[1]
  - Screen once at first pre-natal visit with urine culture.[1]
  - Antibiotic options same as empiric.
  - *Repeat culture for test of cure.*
- Prior to invasive genitourinary procedure.[1]

Clinical considerations

- *Pyuria* with ASB - NOT an indication for antibiotics[2]
- *Bacteriuria* is common with chronic indwelling catheter - *treat only if symptomatic*
- Urine characteristics *unreliable* predictor of UTI[3]
- *Older adults* (+/- catheter) with confusion, ↓ appetite, ↑ falls – *treat only if symptomatic*[3]
- *Delirium* - also consider dehydration, new medications/drug interactions, hypoglycemia, hypoxia, infections other than UTI[4]

1. Reproductive Care Program of Nova Scotia. July 2024: http://rcp.nshealth.ca/clinical-practice-guidelines/antenatal-laboratory-screening-testing.
2. Asymptomatic bacteriuria in adults. UpToDate; 2024: https://www.uptodate.com/contents/asymptomatic-bacteriuria-in-adults
3. AMMI Canada position statement on asymptomatic bacteriuria. Official Journal of the Association of Medical Microbiology and Infectious Disease Canada. March 2018;3(1):4-7.
4. Understanding Asymptomatic Bacteriuria: BC Provincial Academic Detailing Service; April 2016: https://www2.gov.bc.ca/assets/gov/health/practitioner-pro/provincial-academic-detailing-service/asymptomatic-bacteriuria-newsletter.pdf .

SKIN & SOFT TISSUE INFECTIONS

- Non-Purulent Cellulitis/Erysipelas
- Purulent Cellulitis (MSSA/MRSA)
- Impetigo

Skin & Soft Tissue Infections (SSTIs)

Diagnosis

- Characterized by heat, pain, tenderness, erythema, swelling.
  - Rule out other conditions with similar symptoms (e.g., DVT, gout, venous stasis).
  - Bilateral SSTI is rare.
  - Superficial skin swabs **NOT** recommended unless aspiration from purulent drainage.

Outpatient SSTI management for

- Uncomplicated (no red flags)
- Limited to skin/subcutaneous tissue

RED FLAGS for complicated SSTI:

- Signs of rapid deterioration, septicemia, shock or confusion
- Rapid onset of severe pain
- Loss of sensation in affected area
- Significant periorbital involvement
- Immunosuppression & asplenia
- Animal or human bite
- Rapid progression despite antibiotics
- Induration, necrosis, hemorrhagic bullae, crepitus

SSTI Classification

Mild	Moderate	Severe
• No systemic signs of infection	• Systemic signs of infection (e.g., fever, chills, nausea) • Lymphangitis and/or rapidly advancing edge	• SIRS* • Immunocompromise • Deep infection: bullae, skin sloughing • End organ dysfunction

*SIRS (Systemic Inflammatory Response Syndrome) = two or more of temp > 38°C or < 36°C, respiratory rate > 24 breaths per min, heart rate > 90 beats per min, WBC > 12 or < 4 x 10^9/L

Route of Administration

- **MILD cases: IV** antibiotics **rarely** needed.
- **MODERATE cases:** Transition from IV to oral therapy when systemic symptoms are resolved for at least 24 hours (in absence of *S. aureus* bacteremia).

TREATMENT CONSIDERATIONS

✓Systemic symptoms usually improve in 24-48 hours of appropriate treatment.

✓Localized symptoms often worsen initially in first 24 hours, and visible improvement may take up to 72 hours. Full skin healing may take weeks.

✓Keep affected area *elevated above heart* and hydrated. Treat underlying conditions.

X **Avoid oral cloxacillin** due to poor absorption and tolerability.

X **Avoid clindamycin**/use as last resort *in adults* due to poor efficacy and high risk of CDI.

Antibiotic	ADULT CELLULITIS/ERYSIPELAS	Cost/day
	MILD	
Cephalexin	500-1000 mg PO QID	$0.69 – 1.38
Cefuroxime[a]	500 mg PO BID	$1.66
Clarithromycin[b]	500 mg PO BID	$1.66
	Duration: 5 days if mild and quick response, otherwise **7 days**	
	MODERATE	
Cefazolin[a,c]	Inpatient: 2 g IV q8h Outpatient: 2 g IV q12-24h[d] & 1 g probenecid PO 30 min before	$16.18 $10.78 + probenecid
Cloxacillin[c]	2 g IV q4h	$191.28
Ceftriaxone[c]	1 g IV q24h	$12.50
Daptomycin[b,c]	4-6 mg/kg IV q24h Dose based on ABW* in people with obesity; Round to nearest 50 mg	$97.41 - 146.12/75 kg
Vancomycin[b,c]	15 mg/kg IV Q12H Round to nearest 250 mg; Max 2 g/dose	$219.32/75 kg
	Duration: 7 days	
	SEVERE: Immediate expert consultation, broad spectrum antimicrobials	

[a] 1st line option if patient has experienced an IgE-mediated amoxicillin reaction.
[b] Option if unable to take any β-lactam (e.g. history of a delayed, severe, non-IgE-mediated hypersensitivity reaction)
[c] May transition to PO therapy when systemic symptoms are resolved for at least 24 hours (unless *S. aureus* bacteremia).
NOTE: PO Cloxacillin is poorly absorbed and tolerated and should not be used.
[d] q12h interval preferred for people with obesity or significant inflammation

Question:
What factors should be considered in selecting cephalexin 1000 mg dose for treatment of adults with SSTI when antibiotics are indicated (e.g., severity of infection, patient body weight, or other factors)?

Response:

Antibiotic	ADULT CELLULITIS/ERYSIPELAS
	MILD
Cephalexin	500-1000 mg PO QID

Local AMS/ID expert opinion:

- Cephalexin 1000 mg dose is rarely required in the treatment of SSTIs.
- May be preferred for patients presenting with severe infections to improve the bioavailability and tissue penetration of the drug.
  - Extrapolated from data evaluating cephalexin use vs blood stream & joint infections.
- Cephalexin 1000 mg dosing may be used when treating patients with obesity.
  - Bugs and Drugs supports this recommendation bugsanddrugs.org/7F731AFC-68E7-45F0-B14E-D2B81E337140

CASE #3

25yo, 55kg, healthy female
NKDA, Meds: Oral contraceptive

- Ongoing toenail issues being treated with topical antifungal

- Toe is red, hot to touch, but not painful; x 3 days; does not recall injury/trauma to the area

Treatment/Management plan?

Poll Question 5:
What is the treatment/management plan?

Response Options:

a. Clindamycin 300mg po QID x 7 days
b. Cephalexin 500mg po QID x 5 days
c. Cephalexin 1000mg po QID x 5 days
d. Elevation of the foot above the heart, keep area hydrated and free from friction (wear loose footwear when needed) as much as possible throughout the day
e. b & d

CASE #3

- Patient returns after completing 5 days of cephalexin 500 mg po QID complaining of ongoing redness in toe area

- On exam: Still no pain, swelling has improved, otherwise overall appearance has improved.

Treatment/Management plan?

Poll Question 6:

What is the treatment/management plan?

Response Options:

a. Extend same Rx for 5 more days
b. Prescribe new antibiotic for 5 more days
c. No antibiotics required as full skin healing takes time and things have improved
d. None of the above

Antibiotic	ADULT Purulent SSTI I & D is the cornerstone of management	Cost/day
NO MRSA CONCERNS[a]		
MILD with abscess diameter ≤ 2 cm		
No antibiotics required		
MILD with abscess diameter > 2 cm or other indication for antibiotic[b]		
Cephalexin	500 mg – 1000 mg PO QID	$0.69 – 1.38
SMX/TMP[c]	1-2 DS tabs PO BID Higher dose preferred if weight > 70 kg & no contraindications	$0.45 – 0.90
Doxycycline[c]	100 mg PO BID	$0.93
Clindamycin[c]	300-450 mg PO QID	$1.88 – 2.82
MODERATE		
Cefazolin[d,e]	Inpatient: 2 g IV q8h Outpatient: 2 g IV q12h & 1 g probenecid PO 30 min before	$16.18 $10.78+ Probenecid
Vancomycin[c,e]	15 mg/kg IV q12h Round to nearest 250 mg; max 2 g/dose	$42.26/*75 kg*
Daptomycin[b,d]	4-6 mg/kg IV q24h Dose based on adjusted body weight[g] in people with obesity; round to nearest 50 mg	$97.41-146.12/*75/kg*
MRSA CONCERNS[a]		
MILD with abscess diameter ≤ 2 cm		
No antibiotics required		
MILD with abscess diameter > 2 cm or other indication for antibiotic[b]		
SMX/TMP[c]	1-2 DS tabs PO BID Higher dose preferred if weight > 70 kg & no contraindications	$0.45 – 0.90
Doxycycline[c]	100 mg PO BID	$0.93
Clindamycin[c,f]	300-450 mg PO QID	$1.88 – 2.82
MODERATE		
Vancomycin[c,e]	15 mg/kg IV q12hr Round to nearest 250 mg; max 2 g/dose	$42.26/*75 kg*
Daptomycin[c,e]	4-6 mg/kg IV q24h Dose based on adjusted body weight[g] in people with obesity; round to nearest 50 mg	$97.41-146.12/*75 kg*
SEVERE: Immediate expert consultation & broad-spectrum antibiotics		
Duration: 7-10 days		

a MRSA risk factors: history of MRSA colonization/infection, recent hospitalization, injection drug use, poor response to initial antibiotics

b May add antibiotic therapy if: Multiple abscesses, lack of response to I & D alone (current or in past), surrounding cellulitis located in area where I & D difficult (face, hands, groin), extremes of age, impaired host defenses, indwelling medical device at a non-contiguous site isolated from infected field (e.g. pacemaker, vascular graft)

c If unable to take any β-lactams

d 1st line option if patient experienced an IgE-mediated amoxicillin reaction.

e Transition to oral therapy when systemic symptoms resolved for at least 24 hours (in absence of *S. aureus* bacteremia)

f Clindamycin remains an option for community-acquired MRSA which is more susceptible than hospital-acquired strains.

Pediatric Uncomplicated SSTI

Antibiotic	PEDIATRIC (age > 3 months) Uncomplicated Outpatient CELLULITIS	Cost/kg/day
Cephalexin[a]	50 mg/kg/day divided PO QID (max 4000 mg/day)	$0.26
Cefuroxime[a,b]	30 mg/kg/day divided PO q12h (max 1000 mg/day)	$0.22
SMX/TMP[c]	8-12 mg/kg/day divided PO BID (max 320 mg TMP/dose) Dose based on TMP component	$1.66
Clindamycin[d]	20 mg/kg/day divided PO TID (max 1800 mg/day)	$1.66
Duration: 5 days if mild and quick response, otherwise **7-10 days**		

[a] For GAS and MSSA; does NOT cover MRSA.
[b] 1st line option if patient has experienced an IgE-mediated amoxicillin reaction; does not cover MRSA.
[c] For community acquired MRSA and MSSA (does NOT cover GAS) if patient has experienced an IgE-mediated amoxicillin reaction or is unable to take any β-lactams (history of a delayed, severe, non-IgE-mediated hypersensitivity reaction).
[d] For GAS if unable to take any β-lactam (e.g., history of delayed, severe, non-IgE-mediated hypersensitivity reaction).

Impetigo

Common in children aged 2-5 years

Classified as:

- Non-bullous (crusted lesions)
- Bullous (fluid-filled vesicles)

Pathogens: GAS and *S. aureus*

Treatment:

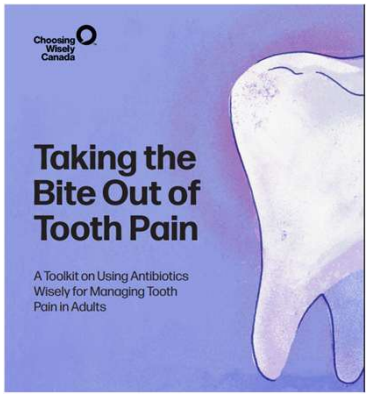
- **Topical antibiotic** for 5-7 days[1,2] preferred for few small areas
  - Mupirocin 2% (Bactroban)
  - Fusidic acid 2% (Fucidin)
  - Expect response in 24-48h

1. Clin Infect Dis. IDSA 2014 Jul 15;59(2):e10-52.
2. Bugs and Drugs: https://www.bugsanddrugs.org/91C12EDD-0C23-4EB8-B480-DACC5C1D3318

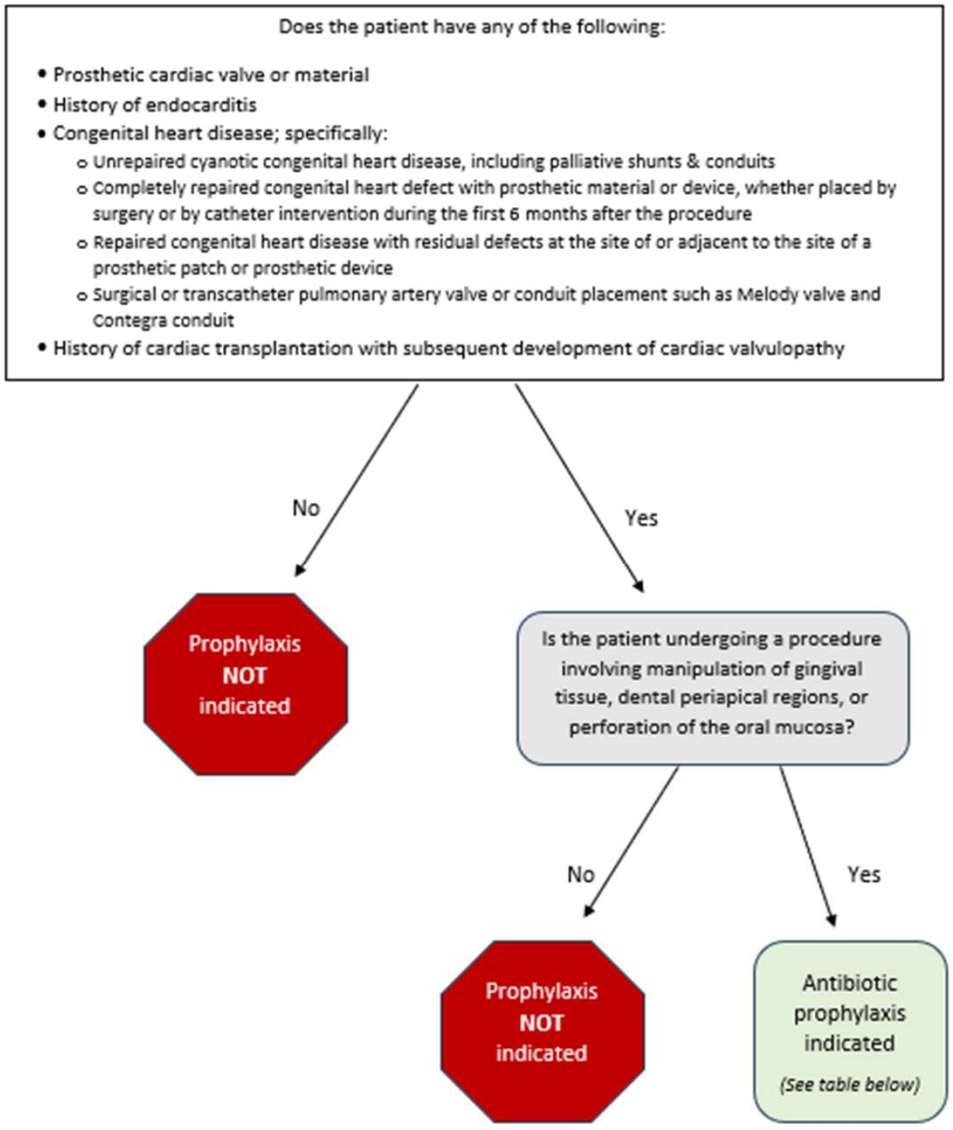
Infective Endocarditis Prophylaxis before Dental Procedures

X Not recommended in ***most*** people with a CV condition or prosthetic joint.

✓ Regular dental visits and daily oral hygiene to ↓ incidence of associated bacteremia.



https://choosingwiselycanada.org/toolkit/taking-the-bite-out-of-tooth-pain/



Antibiotic prophylaxis[1,3-4,6]

Give as a single dose 30 to 60 minutes pre-procedure.

Antibiotic	ADULT		PEDIATRIC	
	Dose	Cost	Dose	Cost
ORAL REGIMEN				
Amoxicillin	2 g PO	$0.52	50 mg/kg (max 2000 mg) PO	$0.05/kg
Cefuroxime[a]	500 mg PO	$0.83	10 mg/kg (max 500 mg) PO	$0.07/kg
Doxycycline[b]	100 mg PO	$0.47	2.2 mg/kg (max 100 mg) PO	$0.46 or less
UNABLE TO TAKE ORAL MEDICATION				
Ampicillin	2 g IV	$11.23	50 mg/kg (max 2000 mg) IV	$0.28/kg
Ceftriaxone[a]	1 g IV	$12.50	50 mg/kg (to max 1000 mg) IV	$0.62/kg
Clindamycin[b,c]	600 mg IV	$15.88	20 mg/kg (to max 600 mg) IV	$0.53/kg

[a] 1st line option if patient has experienced an IgE mediated amoxicillin reaction.

[b] Option if patient is unable to take any β-lactam (e.g., history of a delayed, severe, non-IgE-mediated hypersensitivity reaction).

[c] **Reserve** for when every alternative is contraindicated due to high risk of CDI associated with clindamycin use. **The American Heart Association no longer recommends clindamycin for this use.**

Dental Abscess in Adults

Mainstay therapy is *definitive, conservative dental treatment*

- *Antibiotics only* if systemic symptoms present or immunocompromised.

Antibiotic	ADULT - Dental Abscess with systemic symptoms	Cost/day
Amoxicillin	500 mg PO TID	$0.39
Penicillin VK	300-600 mg PO QID	$0.97 – 1.94
Cefuroxime[a]	500 mg PO BID	$1.66
Doxycycline[b,c]	100 mg PO BID	$0.93
If little improvement after 48 hours, consider additional anaerobic coverage		
Metronidazole	500 mg PO BID	$1.86
Duration[5]: 5 days as adjunct to DCDT[d] (may discontinue 24 hours after symptoms resolve[6])		

[a] 1st line option if patient has experienced an IgE mediated amoxicillin or penicillin reaction.

[b] Option if patient is unable to take any β-lactam (e.g., history of a delayed, severe, non-IgE-mediated hypersensitivity reaction).

[c] Doxycycline has less activity for oral pathogens compared to beta-lactams.

When possible, avoid:

- **Macrolides** (oral pathogens highly resistant)
- **Clindamycin** (high risk of CDI)
- **Amox/Clav** (excessively broad) - Amoxicillin + metronidazole preferred.
- **Cephalexin** (poor Viridans group streptococci coverage)*Local expert opinion*

Clostridioides difficile Infection (CDI) in Adults

Defined as:

- unexplained/new onset ≥3 watery stool/24h

AND

- stool tests positive for *C. difficile* toxin

OR

- colonoscopic/histopathologic findings of pseudomembranous colitis.

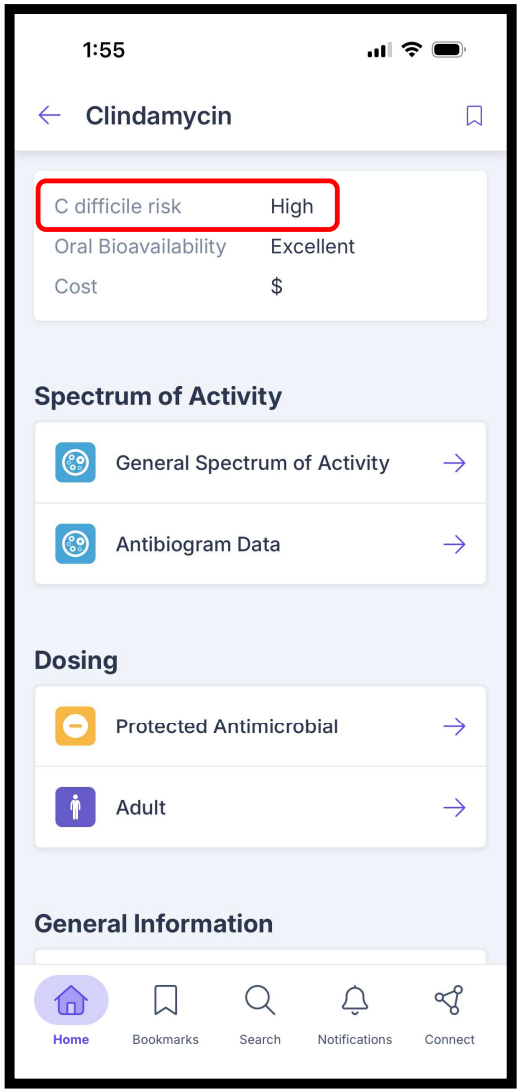
X Do not test asymptomatic patients or perform tests of cure.

✓ Consider other causes (I.e., Crohn's disease, ulcerative colitis, viral gastroenteritis).

Often associated with recent hospitalization & antimicrobial use

- ↑ risk with: High doses, longer duration, greater # antibiotics.
- Odds of CDI vary by drug class and are highest with clindamycin.[1]

  - **Clindamycin OR 16.8**
  - Cephalosporins and carbapenems OR 5.7
  - Fluoroquinolones OR 5.5
  - Macrolides & penicillins OR 2.7
  - Sulfonamides & trimethoprim OR 1.8
  - Tetracyclines OR 0.9



1. Meta-analysis of antibiotics and the risk of community-associated Clostridium difficile infection. Antimicrob Agents Chemother. 2013 May;57(5):2326-32.

Mild-Moderate
WBC ≤ 15 x 10^9/L and creatinine ≤ 1.5 times baseline and age ≤ 60y

Severe, uncomplicated
WBC > 15 x 10^9/L or creatinine > 1.5 times baseline or age > 60y or hypoalbuminemia

Severe, complicated
Hypotension, shock, ileus, megacolon

Category	Antibiotic	Dose & Duration	Cost/*Course*
First Episode	Vancomycin	125 mg PO QID for **10 days**	$207.20
	Metronidazole	500 mg PO TID for **10 days** For mild-moderate disease when cost of vancomycin is prohibitive	$27.90
First Recurrence (2^{nd} episode) Mild to moderate	Vancomycin	125 mg PO QID for **14 days**	$290.08
	Fidaxomicin[a]	200 mg PO BID for **10 days** For high risk of recurrence[b] and when cost not prohibitive	$2052.82
	Metronidazole	500 mg PO TID for **14 days** When initial episode was not treated with metronidazole and cost of vancomycin and fidaxomicin is prohibitive	$39.06
First Recurrence (2^{nd} episode) Severe, uncomplicated	Vancomycin	125 mg PO QID for **14 days**	$290.08
	Fidaxomicin[a]	200 mg PO BID for **10 days** For high risk for recurrence[b] and when cost not prohibitive	$2052.08
Second or Subsequent Recurrence (3^{rd} episode)	Vancomycin Taper	• 125 mg PO QID for 14 days then • 125 mg PO TID for 7 days then • 125 mg PO BID for 7 days then • 125 mg PO daily for 7-14 days then • 125 mg PO every 2 or 3 days for 2-8 weeks	$533.54 – 688.66
	Fidaxomicin[a]	200 mg PO BID for **10 days**	$2052.82

[a] There is increased risk of fidaxomicin hypersensitivity with history of macrolide allergy

[b] Risk factors for recurrent CDI include age greater than 60 years, significant immunocompromise, hospitalization for severe CDI within previous 3 months, and current use of antibiotics, proton pump inhibitors, antimotility agents and opioids.

Tick Borne Infections – Lyme Disease

Pathogen: *Borrelia burgdorferi* (transmitted by deer/blacklegged tick)

Prevention: The best risk reduction strategy is to avoid tick bites.

- Immediate & correct tick removal is key.

Antibiotic Prophylaxis

Recommended when all of the following criteria are met:

- ✓ Dose can be given within 72 hours of high-risk tick bite
- ✓ Tick was attached for ≥36 hours
- ✓ Identified as blacklegged tick

Antibiotic Options (single doses):

- *Adults:* Doxycycline 200 mg PO
- *Children (any age):* Doxycycline 4mg/kg to max 200 mg PO

⟷ Amoxicillin NOT recommended (short half-life)

General classification of Lyme disease and clinical manifestations[1]

Early localized 3 to 30 days	• Acute flu-like symptoms, lymphadenopathy, erythema migrans (EM) rash. • Serology tests are *not* recommended during first 4 weeks (poor sensitivity)
Early disseminated **<**3 months	• If untreated can disseminate with multiple secondary annular lesions and systemic symptoms (i.e., carditis, meningitis, cranial nerve abnormalities). • Multiple EM lesions may appear anywhere on the body.
Late disseminated **>**3 months	• Most commonly presents as chronic arthritis. • Intermittent episodes of pain and/or swelling in one or more joints (most often knees and large joints)

1. Public Health Agency of Canada. Lyme disease: For health professionals. November 2024. https://www.canada.ca/en/public-health/services/diseases/lyme-disease/health-professionals-lyme-disease.html

Erythema Migrans (EM)

- ✓ Large (> 5cm) red rash
- ✓ Not painful, non-pruritic
- ✓ Solid or target-like (bull's eye) lesion
- ✓ Within 3-30 days of bite

Images from: https://www.canada.ca/en/public-health/services/diseases/lyme-disease/health-professionals-lyme-disease.html

Syndrome	ADULT Lyme Disease	Duration	Cost/*Course*
Erythema migrans (EM)	Doxycycline* 100 mg PO BID	10 days	$9.30
	Amoxicillin 500 mg PO TID	14 days	$5.46
	Cefuroxime 500 mg PO BID	14 days	$23.24
	Azithromycin 500 mg PO once daily *Alternative if other antibiotics contraindicated*	7 days	$13.17
Cranial Nerve Palsy (e.g., Facial nerve palsy)	Doxycycline* 100 mg PO BID	14-21 days	$13.02 – 19.53
Meningitis or radiculopathy (IV therapy for severe disease, including encephalitis)	Doxycycline* 100 mg PO BID	14-21 days	$13.02 – 19.53
	Ceftriaxone 2g IV daily	14-21 days	$482.79 – 724.18
Lyme disease-related parenchymal involvement of the brain or spinal cord	**Consult Infectious Diseases (ID) Service**		
Carditis Consider ID consult	Ceftriaxone 2 g IV daily	14-21 days	$482.79 – 724.18
	Doxycycline* 100 mg PO BID	14-21 days	$13.02 – 19.53
	Amoxicillin 500 mg PO TID	14-21 days	$5.46 – 8.19
	Cefuroxime 500 mg PO BID	14-21 days	$23.24 – 34.86
Arthritis (initial)	Doxycycline* 100 mg PO BID	28 days	$26.04
	Amoxicillin 500 mg PO TID	28 days	$10.92
	Cefuroxime 500 mg PO BID	28 days	$46.48
Arthritis (recurrent or refractory) Referral to Rheumatology if no improvement after 8 weeks of total treatment including trial of IV therapy	Ceftriaxone 2 g IV once daily	14 days *(May extend to 28 days if inflammation not resolving)*	$482.79 – 724.18
	Doxycycline* 100 mg PO BID	28 days	$26.04
	Amoxicillin 500 mg PO TID	28 days	$10.92
	Cefuroxime 500 mg PO BID	28 days	$46.48

*A systematic review of doxycycline use in pregnancy found no increased risk of teratogenicity, permanent teeth staining, hepatoxicity or permanent inhibitory effects on bone growth in the developing fetus.[4]

Clinical Pearl

Patients who remain febrile after 48 hours of treatment with doxycycline should be investigated for other causes, including infection with anaplasmosis and babesia.

Syndrome	Age in Years	*Pediatric* Lyme Disease	Duration (days)	Cost/Course
Erythema migrans	≥ 8	Doxycycline 4.4 mg/kg/day PO divided q12h (max 200 mg/day) Round to nearest 25 mg = 1/4 tablet	10	$9.12 or less
	< 8	Amoxicillin 50 mg/kg/day PO divided q8h (max 1.5 g/day)	14	$0.76/kg
	All peds	Cefuroxime 30 mg/kg/day PO divided q12h (max 1 g/day)[a]	14	$3.08/kg
Isolated facial palsy[b] Consult ID	All peds	Doxycycline 4.4 mg/kg/day PO divided q12h (max 200 mg/day) Round to nearest 25 mg = 1/4 tablet	14	$12.77 or less
Meningitis Consult ID	All peds	Doxycycline 4.4 mg/kg/day PO divided q12h (max 200 mg/day) Round to nearest 25 mg = 1/4 tablet	14	$12.77 or less
	All peds	Ceftriaxone 50-75 mg/kg/day IV q24h (max 2 g/day)	14	$8.68 – 13.12/kg
Carditis or Atrioventricular block Consult ID	≥ 8	Doxycycline 4.4 mg/kg/day PO divided q12h (max 200 mg/day) Round to nearest 25 mg = 1/4 tablet	14-21	$6.38 (or less) – 19.15
	< 8	Amoxicillin 50 mg/kg/day PO divided q8h (max 1.5 g/day)	14-21	$0.76 – 1.14/kg
	< 8	Ceftriaxone[c] 50-75 mg/kg/day IV q24h (max 2g/day)	14-21	$8.68 – 19.68/kg
	All peds	Cefuroxime 30 mg/kg/day PO divided q12h (max 1 g/day)	14-21	$3.01 – 4.52/kg
	All peds	Ceftriaxone[c] 50-75 mg/kg/day IV q24h (max 2 g/day)	14-21	$8.68 – 19.68/kg
Lyme Arthritis, Initial Consult ID or Rheumatology	≥ 8	Doxycycline 4.4 mg/kg/day PO divided q12h (max 200 mg/day) Round to nearest 25 mg = 1/4 tablet	28	$25.52 or less
	< 8[d]	Amoxicillin 50 mg/kg/day PO divided q8h (max 1.5 g/day)	28	$1.52/kg
	All peds	Cefuroxime 30 mg/kg/day PO divided q12h (max 1 g/day)	28	$6.02/kg
Lyme Arthritis, Persistent Consult ID or Rheumatology	≥ 8	Doxycycline 4.4 mg/kg/day PO divided q12h (max 200 mg/day) Round to nearest 25 mg = 1/4 tablet	28	$25.52 or less
	< 8[d]	Amoxicillin 50 mg/kg/day PO divided q8h (max 1.5 g/day)	28	$1.52/kg
	All peds	Cefuroxime 30 mg/kg/day PO divided q12h (max 1 g/day)	28	$6.02/kg
	All peds	For *worsening* arthritis: Ceftriaxone 50-75 mg/day IV q24h (max 2 g/day)	14-28	$8.68 – 26.24/kg

[a] 1st line option if patient has experienced an IgE mediated amoxicillin reaction.
[b] Amoxicillin has not been studied for treatment of facial palsy related to Lyme disease.
[c] Once stable and symptoms have resolved, may change to oral therapy to finish the course.
[d] There are limited safety data on the use of doxycycline for more than 21 days in children < 8 years of age
Peds = Pediatrics

Clinical Pearl

Patients who remain febrile after 48 hours of treatment with doxycycline should be investigated for other causes, including infection with anaplasmosis and babesia.

Tick Borne Infections – Human Granulocytic Anaplasmosis (HGA)

Pathogen: *Anaplasma phagocytophilum*

- Transmitted by the blacklegged/deer tick

Presents within 7-14 days of tick bite as flu-like symptoms.[1]

Testing for HGA is automatic with all Lyme tests

Common in HGA, but NOT in Lyme disease:

- Mild to moderate ↑ in transaminases (usually 2-4-fold ↑)
- Thrombocytopenia, leukopenia, neutropenia or anemia
- *90% of patients have at least one of the **classic triad** signs:*
  - *Thrombocytopenia, leukopenia, or ↑ aminotransferase levels*

1. Public Health Agency of Canada. Anaplasmosis Symptoms and Treatment. 2024: https://www.canada.ca/en/public-health/services/diseases/ticks-tick-borne-diseases/anaplasmosis.html

PREVENTION: Antibiotic prophylaxis is NOT recommended for HGA

TREATMENT: *NOTE: Beta-lactams are NOT effective*

Adult HGA:

- Preferred: Doxycycline 100 mg PO BID x 10 days
- Alternate (mild cases): Rifampin 300 mg PO BID x 7-10 days

Pediatric HGA (including age < 8 years):

- Preferred: Doxycycline 4.4 mg/kg/day PO divided BID (max 100 mg/dose) x 10 days
- Alternate (mild cases): Rifampin 20 mg/kg PO divided BID (max 600 mg/day) x 7-10 days
- Consider ID consult

Expect rapid response within 24-48 hours. Fever persisting > 48 hours → consider other infections not susceptible to doxycycline (i.e., babesiosis)

Pediatric dose information for Rifampin and Doxycycline accessed from Lexi-Drugs App.

Question:
Should a patient avoid a PPI during cefuroxime treatment due to a drug interaction involving decreased absorption of cefuroxime?

Response:

Health Canada Product Monograph[1]:

- Drugs that lower gastric acidity may result in lower bioavailability of oral cefuroxime.
- Clinical significance is uncertain and based on theoretical risk.
- For optimal absorption, administer cefuroxime with food.

Lexidrugs[2]:

- When possible, avoid concomitant use as may decrease absorption of cefuroxime.
- If combined ensure cefuroxime is taken with food to help mitigate the interaction.

Consider strategies to avoid this combination such as holding PPI during oral cefuroxime treatment or switching to cephalosporin with no documented PPI interaction (e.g., cefprozil).[1-4]

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Thank you!

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For full list see academic detailing materials: https://medicine.dal.ca/departments/core-units/cpd/programs/academic-detailing-service/AC-Service-Resources.html

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2. Choosing Wisely Canada: https://choosingwiselycanada.org/primary-care/antibiotics/
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