

Are antibiotic courses for common infections simply too long?

From the beginning of antibiotic therapy, the length of prescription or days of therapy (DOT) was not evidence driven. Practice settled on 1 or more weeks, predicated on the *incorrect* belief that longer courses (well past clinical remission) might reduce the risk of relapse or of antibiotic resistance.^{1,2} There is increasing evidence that shorter durations of antibiotic therapy are as effective as longer ones for many common infections.³ In fact, extended courses that continue beyond resolution of the infection predictably increase the risk of antibiotic resistance. Here we report on the duration of therapy of community antibiotic prescriptions in British Columbia in the context of up-to-date guidelines from the Association of Medical Microbiology and Infectious Disease Canada.⁴

BC PharmaNet prescription data from our last pre-pandemic year (2019) were used to calculate the median duration (quartiles: Q1, Q3) of antibiotic prescriptions overall, by prescribing profession and drug. Physician prescriptions (~85% of total) were anonymously linked to MSP billing data to describe DOT distribution by indication.

In 2019, median DOT (Q1, Q3) per prescription in BC for all antibiotic prescriptions was 7 (7, 10) days, with the exception of naturopathic physicians where it was 14. Under-scoring practice's focus on 7 days as a standard measure, the median DOT per prescription was 7 days across all diagnoses. Distributions skewed further to the right (more long courses) for cellulitis, pyelonephritis, and acute bronchitis [Figure].

This article is the opinion of the BC Centre for Disease Control and has not been peer reviewed by the BCMJ Editorial Board.

The median DOT for community-acquired pneumonia was 7 days overall, but courses of 10 days duration remain common. Most treatments were prescribed for 7 to 10 days, except azithromycin, which was 5 days. Current guidance emphasizes the adequacy of 3 to 5 days of treatment, and this is not limited to long-acting macrolides.⁵

Cystitis also saw a 7-day median DOT overall. For uncomplicated infections in women (the majority), current guidance recommends 5 days of nitrofurantoin, 3 days of cotrimoxazole, or 1 day of fosfomycin.⁴ DOT for nitrofurantoin and other specific drugs often exceeded these recommendations.

Ciprofloxacin was the most commonly prescribed antibiotic for pyelonephritis, followed by cefixime. While median duration of treatment was appropriately 7 days, 10-day courses were almost as popular. While this is appropriate

in complicated or slowly responding cases, it is more than is needed to resolve most pyelonephritis cases.⁴

For cellulitis, current guidance emphasizes 5 to 7 days of treatment.⁴ Few prescribers in BC have adopted the shorter end of this range, and

10-day courses of cephalexin and clindamycin are common [Table].

In BC, durations of antibiotic therapy observed during 2019 frequently exceeded the evidence-based recommendations. Prescribers must be able to exercise clinical judgment in man-

aging complicated or atypical cases, but generally, should aspire to have population prescribing patterns that align with guidelines. The benefits include a reduced risk of immediate adverse effects and lower individual and population risk of selecting for resistant organisms. If we collectively update our prescribing practices to align with current evidence on duration of

In BC, durations of antibiotic therapy observed during 2019 frequently exceeded the evidence-based recommendations.

TABLE. Summary of recommendations for duration of therapy in selected common infections (excludes infants ≤ 2 months of age). Adapted from "Duration of antibiotic therapy for common infections."⁴

Infection	Population	Recommended duration
Community-acquired pneumonia	Children and adults	3–5 days ⁵
Uncomplicated cystitis	Women/adolescents	Nitrofurantoin–5 days TMP-SMX–3 days Fosfomycin–1 day
Pyelonephritis and urosepsis	Adults	<ul style="list-style-type: none"> Consider an initial dose of IV dose aminoglycoside or ceftriaxone at outset Quinolones or β-lactams 7 days
Uncomplicated non-purulent or purulent cellulitis	Children and adults	5–7 days unless hospitalized with extensive or severe disease

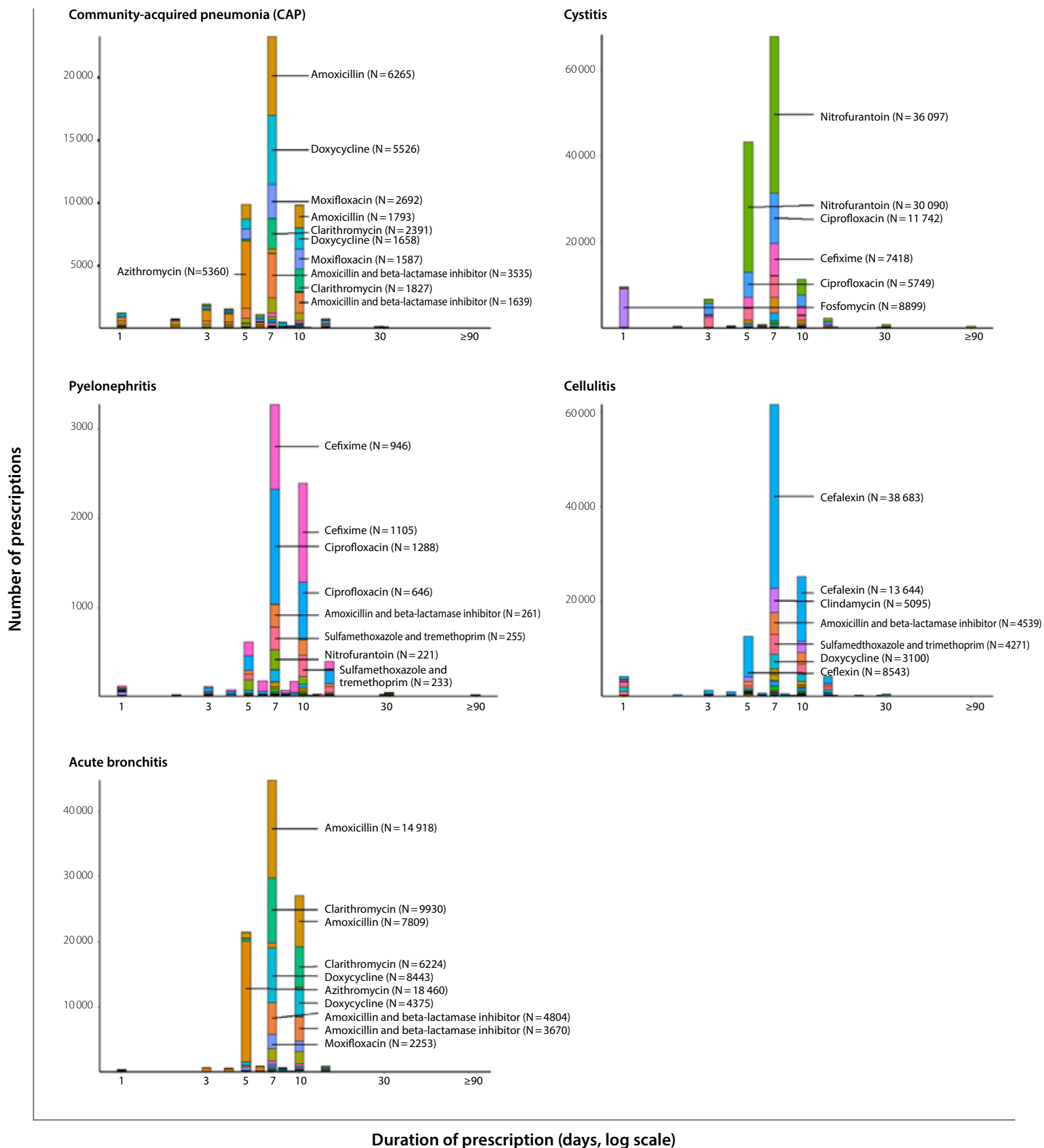


FIGURE. Duration of prescription for different drugs prescribed for common infections in 2019 in BC.

Article continued on page 85

Investments. If a company pays less tax on earnings, this leaves more money to invest and earn a return on. Although passive nonbusiness income (e.g., interest, rental income) is taxed at 50.67% in BC, the company would have more money to invest initially and, therefore, would produce a greater nest egg in the end. However, it should be noted that investment income of more than \$50 000 in a taxation year can reduce the amount of income subject to the 11% rate. Generally, the low rate is available on the first \$500 000 of taxable income from the medical business. Any medical income over the \$500 000 limit is subject to a tax rate of 27% in BC.

Refundable taxes. Investment income (passive nonbusiness income) is subject to a higher tax rate than business income (50.67% versus 11%), but a portion of the higher rate is refunded when the company distributes taxable dividends to its shareholders. A tax pool (refundable dividend tax on hand) is created at a rate of 30.67% for each \$1 of passive nonbusiness income earned. A tax refund is available to the company at a rate of 38.33 cents per \$1 of taxable dividends paid, limited to the balance in the refundable dividend tax pool. This refundable tax approximates the tax that would be paid personally if the passive nonbusiness income were earned personally. It also approximates the additional taxes that could be paid personally on a dividend.

Retirement. Once a physician reaches age 65, and assuming their tax professional advised them to have their spouse as a nonvoting participating shareholder of the company, they can income split with their spouse. Thus, in retirement years, when the cash that has been invested in the company is needed, a dividend can be paid to both the physician and their spouse. This results in paying tax at lower marginal rates than if the physician had to report the entire dividend personally.

The physician will have paid tax on the corporate business income at the lowest tax rates and have been able to defer the tax on funds not withdrawn. This is a huge advantage over most Canadians who are employees and are taxed on all their income at much higher marginal tax rates.

GST on contract work

When a physician is contracted to do work, they are typically charged an overhead fee by the third party. The overhead must have GST (5%) charged on it, and because medical services are a nontaxable supply, physician contractors are unable to recover the GST they pay. Over many years of working as a contract physician, this 5% charge can really add up. Other examples of businesses that cannot recover the GST paid include dentists, chiropractors, physiotherapists, insurance brokers, insurance companies, and banks (i.e., exempt businesses). However, as a contractor (versus an employee of a third party) a physician does receive other benefits, such as:

- Paying the low corporate tax rate of 11%, if incorporated.
- The ability to split income upon retirement (over age 65), if incorporated.
- The ability to deduct other expenses such as office supplies, medical dues, travel, and legal and accounting fees.

GST paid is also nonrecoverable if the physician operates their own medical practice directly or through a corporation. This applies to all exempt businesses and can represent a huge cost. In some cases, these businesses attempt to identify expenses that are not associated with the activity that is exempt from GST to try to recover some of the GST paid. However, this may be difficult in the context of a physician operating a medical practice. Contracting physicians are also not required to charge GST on their services, which is a benefit to patients.

The Canadian tax system is complex and can appear unfair to the average taxpayer. It is prudent to consult an accountant and tax advisor regularly to ensure you are minimizing your taxes today and planning for your future. See the **Box** for additional tax-reducing considerations. ■

Continued from page 83

treatment, we can make a difference against antimicrobial resistance. As with much drug treatment, shorter is often better. ■

—**Abdullah A. Mamun, MD**
BC Centre for Disease Control

—**Daniela Michel, MPH**
BC Centre for Disease Control

—**Max Xie, MSc**
BC Centre for Disease Control

—**Edith Blondel-Hill, MD**
Interior Health Authority, Kelowna

—**Säde Stenlund, MD**
BC Centre for Disease Control
University of British Columbia

—**Jennifer Grant, MD**
University of British Columbia
Vancouver General Hospital

—**Lynsey J. Hamilton, MSc**
BC Centre for Disease Control

—**David M. Patrick, MD**
BC Centre for Disease Control
University of British Columbia

References

1. Hanretty AM, Gallagher JC. Shortened courses of antibiotics for bacterial infections: A systematic review of randomized controlled trials. *Pharmacotherapy* 2018;38:674-687.
2. WHO. Evidence based review on optimal duration of antibiotic therapy for bacterial infections to support antimicrobial stewardship recommendations. Accessed 24 January 2022. www.who.int/selection_medicines/committees/expert/22/applications/ABWG_optimal_duration_AB.pdf.
3. Drekonja DM, Trautner B, Amundson C, et al. Effect of 7 vs 14 days of antibiotic therapy on resolution of symptoms among afebrile men with urinary tract infection: A randomized clinical trial. *JAMA* 2021;326:324-331.
4. Grant J, Saux NL. Duration of antibiotic therapy for common infections. *JAMMI* 2021;6:181-197.
5. Dinh A, Ropers J, Duran C, et al. Discontinuing β -lactam treatment after 3 days for patients with community-acquired pneumonia in non-critical care wards (PTC): A double-blind, randomised, placebo-controlled, non-inferiority trial. *Lancet* 2021;397(10280):1195-1203.