



Oral versus intravenous antibiotics: Oral antibiotics are more cost-effective and may be safer than intravenous antibiotics for most infections in stable adults

**Authors:**

Davie Wong¹ 
Thomas Perry¹ 

Affiliations:

¹Department of Anaesthesiology, Pharmacology and Therapeutics, Faculty of Medicine, University of British Columbia, Vancouver, Canada

Corresponding author:

Michael Pather,
mpather@sun.ac.za

Dates:

Received: 24 Oct. 2025

Accepted: 27 Oct. 2025

Published: 13 Dec. 2025

How to cite this article:

Wong D, Perry T. Oral versus intravenous antibiotics: Oral antibiotics are more cost-effective and may be safer than intravenous antibiotics for most infections in stable adults. *Afr J Prm Health Care Fam Med.* 2025;17(1), a5282. <https://doi.org/10.4102/phcfm.v17i1.5282>

Copyright:

© 2025. The Authors. Licensee: AOSIS. This work is licensed under the Creative Commons Attribution 4.0 International (CC BY 4.0) license (<https://creativecommons.org/licenses/by/4.0/>).

Read online:

Scan this QR code with your smart phone or mobile device to read online.

Many clinicians perceive intravenous (IV) antibiotics as inherently more effective than their oral counterparts. However, randomised controlled trials (RCTs) have demonstrated that oral antibiotics are clinically equivalent to IV antibiotics for many severe bacterial infections. This includes pneumonia, skin and soft tissue infections, pyelonephritis, intra-abdominal infections, osteoarticular infections, bacteraemia and infective endocarditis. When clinically appropriate, oral treatment is more patient-friendly, cost-effective and environmentally friendly. But we still use the IV route much more than necessary. To address a historical practice that is often unwarranted, this *Therapeutics Letter* reviews evidence from RCTs and compares the advantages and disadvantages of oral and IV antibiotics. We suggest criteria to determine when oral therapy is appropriate.

Keywords: oral antibiotics; intravenous antibiotics; antibiotic overuse; efficacy; safety; therapeutics.

Vignette

A 65-year-old woman bumped her left leg on a chair at home. A day later, she developed a rapid onset of pain and swelling. She attends an emergency department with a temperature of 38.5 °C, heart rate 82/min and blood pressure 124/76. Her lower leg is diffusely red, hot and tender to palpation. She weighs 60 kg and has normal kidney function. You diagnose non-purulent cellulitis and decide that she can be treated as an outpatient with a cephalosporin. Should you prescribe an oral or an intravenous antibiotic?

Introduction

The discovery of penicillin revolutionised the treatment of bacterial infections. People who would otherwise have died experienced miraculous cures. Because penicillin was valuable and poorly absorbed when taken orally, it was often given by injection. Convenient intravenous (IV) infusion equipment soon made it easy to deliver drugs intravenously.

Subsequent development of several poorly absorbed oral antibiotics, which proved less efficacious than penicillin, led medical experts to conclude that IV therapy was inherently superior to oral treatment.¹ For decades, this dogma was unchallenged, and it underpinned many authoritative recommendations on infection management. But by the 1990s, randomised controlled trials (RCTs) began to provide high-quality evidence challenging the generalisation. By 2001, the British Thoracic Society recommended initial oral antibiotics for all but the most severe cases of pneumonia requiring hospitalisation.²

Evidence for oral antibiotic efficacy

No RCT has proven IV administration superior to an equivalent oral antibiotic.³ On the other hand, in appropriately selected patients, evidence from individual RCTs and systematic reviews and meta-analyses supports the clinical equivalence of oral administration, whether as initial treatment or as transitional therapy after initial IV treatment. This includes people hospitalised for *Staphylococcus aureus* bacteraemia,^{4,5} Gram-negative bacteraemia,⁶ bone and joint infections,^{7,8,9} complicated urinary tract infections,¹⁰ intra-abdominal infections,¹¹ skin and soft tissue infections,^{11,12,13} pneumonia,^{14,15} many people with febrile neutropenia¹⁶ and even for infective endocarditis.^{17,18} Surprisingly, but for reasons yet to be elucidated, oral therapy was associated in some RCTs with better outcomes in infective endocarditis,¹⁹ Gram-positive bacteraemia²⁰ and moderate-to-severe cellulitis.²¹

In contrast, for most central nervous system infections, there is currently no RCT evidence for oral therapy. One exception, in patients able to swallow or tolerate a gastric tube, is the standard four-drug oral regimen for tuberculous meningitis (rifampicin, isoniazid, pyrazinamide, ethambutol).²² Intrinsic chemical properties of a drug, not the route of administration, determine its ability to penetrate the blood–brain barrier and other tissues.²³ In RCTs, the oral and IV antibiotic comparators are often from different drug classes with different pharmacologic properties. When experiments randomise patients not only to the route of administration but also to different antibiotic classes, differences in outcomes can relate to either or both variables.^{24,25} To determine whether the mode of administration makes a difference, oral and IV antibiotics should be from the same drug class.

Is initial intravenous treatment or a minimum intravenous duration evidence based?

In severe bacterial infection (sepsis or septic shock), when cardiovascular collapse may be imminent, urgent delivery of antibiotics through the bloodstream remains imperative. The IV route guarantees not only speed but also complete absorption, and some IV antibiotics offer a broader spectrum of activity than their oral counterparts.

But what about infections that pose no immediate threat to life or limb? Many clinicians were taught and still prefer initial IV antibiotics, with some minimum duration before a change to oral treatment. However, treatment durations are inherently arbitrary, and we lack controlled trial evidence to support this practice.^{3,26} Many antibiotics have excellent oral bioavailability,²⁷ and evidence is mounting that initial oral treatment or a rapid switch from IV to oral is appropriate.²⁶ Recent examples include:

- An Australian RCT ($N = 47$) in adults with moderate-to-severe cellulitis and clinical evidence of systemic infection deemed to require IV therapy found similar cure rates with initial oral or IV treatment.²¹
- A European RCT ($N = 213$) in uncomplicated *S. aureus* bacteraemia, in which after 5–7 days of IV antibiotics, a switch to oral therapy produced outcomes similar to ongoing IV treatment.⁴
- A Swiss RCT ($N = 141$) in hospitalised patients with serious urinary tract infections (including bacteraemia) showed that initial empiric oral ciprofloxacin was as effective as IV ciprofloxacin.¹⁰
- A Dutch nested cohort study matched by propensity scores for complications in emergency department patients ($N = 173$) with moderate-to-severe community-acquired pneumonia. Results of oral antibiotic treatment did not differ from IV treatment.²⁸
- A Swiss RCT of diabetic foot osteomyelitis ($N = 93$) in which, after a median of 2 days of IV antibiotics, 3 weeks of oral antibiotics did not differ from 6 weeks.²⁹

These examples challenge an established belief about infection management that remains very influential: that systemically ill patients should initially receive antibiotics intravenously – with transition to oral antibiotics only once they have improved. However, in febrile patients who are not critically ill, the acute phase of infection neither impairs absorption of oral antibiotics nor reduces total antibiotic exposure measured as area under the curve (AUC), nor alters the probability of clinical success.³⁰ As for other drugs, vomiting sometimes necessitates parenteral administration.

It is now well recognised that the immune response greatly influences the clinical picture of patients during infection. This includes clinical signs (fever, tachycardia, chills and rigours) and laboratory markers (leucocytosis, elevated CRP [C-reactive protein]). But symptoms and signs correlate poorly with pathogen burden.^{31,32} Thus, the observed immune reaction can be misleading as to whether an infection is improving or not. For example, paucibacillary infections such as cellulitis can trigger a powerful inflammatory response with local redness, heat, pain and swelling, with or without fever.³³

In contrast, life-threatening invasive infections such as cryptococcal disease in acquired immunodeficiency syndrome (AIDS) patients can lack symptoms and signs of inflammation.³⁴ Is it logical to assume that the intensity of the immune response should dictate the route of drug delivery? It may seem inherently more likely that profound immunocompromise warrants IV over oral antibiotic therapy – but this has not been investigated in RCTs.

Intravenous antibiotics are overused

In Canada, the United States (US), Australia, South Africa, China and elsewhere, outpatient IV antibiotics are overused for both children and adults.^{35,36,37,38,39} A retrospective review of outpatients treated with IV antibiotics at a US Veterans Health Administration hospital in 2012 ($N = 148$) identified 30% who could have been managed with oral therapy. Another 11% received unneeded antibiotics. Even in those who received an infectious disease consultation, IV therapy was potentially avoidable in 22% of cases.³⁶

This suggests that even experts in infection overprescribe IV antibiotics. British Columbia is no exception. In our largest Health Authority, pharmacists audited 200 randomly selected charts of patients hospitalised during 2019–2020 who received 10 high bioavailability antibiotics or antifungals. They found that half the patients treated with IV antibiotics could have been treated orally.⁴⁰ During 2024, an infectious disease specialist audited a convenience sample of 100 outpatient IV antibiotic prescriptions from the emergency department at a single hospital. He concluded that for 59% of the patients, IV treatment could have been avoided.⁴¹

Comparative benefits and harms

In hospital, IV medications require pharmacy preparation and nursing administration, increasing clinical workload.⁴² Starting with oral antibiotics, or switching from IV to oral, may also allow earlier hospital discharge.^{4,43} Oral treatment improves patient convenience, as freedom from an IV line increases mobility. It avoids frequent trips for outpatient infusions and unnecessary medical services and costs. When used appropriately, oral medications are far more cost-effective.⁴⁴ Using oral rather than IV drugs also reduces their carbon footprint.^{45,46}

The instantaneous and complete bioavailability of IV antibiotics is believed to be critical for patients with sepsis or shock because of concern that the absorption or distribution of antibiotics can be altered by systemic inflammation.⁴⁷ But outside of critical illness, such pharmacokinetic advantages do not translate to better efficacy.

On the other hand, IV administration can cause harm. These include infusion rate errors, the use of an incorrect diluent and the volume of diluent infused, something particularly important in small children.⁴⁸ Peripherally inserted central lines for prolonged antibiotic treatment increase adverse events such as vein thrombosis, superficial thrombophlebitis, infection, drug extravasation and contact dermatitis from adhesives.⁴⁹ Intravenous treatment may cause fewer adverse events in the upper intestine. But with the exception of narrow-spectrum antibiotics like penicillin or aminoglycosides, it does not reduce antibiotic-associated diarrhoea nor spare the colonic microbiome.^{7,17} The intestine is not a sanctuary from antibiotics circulating in the bloodstream.

In Canadian public outpatient infusion clinics, unnecessary administration of IV antibiotics may displace or delay treatment of other patients for whom drug infusions are essential: for example, IV iron or biological drugs that cannot be taken by mouth.

Which route do patients prefer?

If clinicians recommend IV antibiotics as more effective than oral, most patients will be reluctant to disagree. But when advised of equal efficacy, most will choose the oral route.⁵⁰ An informed preference for oral treatment has also been shown for the treatment of rheumatoid arthritis and cancers.^{51,52} Patients prefer oral medications for the obvious advantages of convenience, earlier discharge from hospital and avoiding pain related to inserting and maintaining IV access.

When is oral therapy more appropriate than intravenous therapy?

A decision to prescribe oral or IV therapy is often arbitrary and based on a clinician's personal practice habits or local medical standards that are not evidence based.⁵³ When oral treatment is deemed safe and effective, *Choosing Wisely*

Canada recommends against IV treatment.⁵⁴ Published criteria for transition from IV to oral administration can assist in determining whether it is appropriate to start with oral therapy:^{55,56}

1. There is a safe and effective oral option.
2. Patient can swallow and absorb oral medication.
3. Patient is clinically stable: resolution of shock, no worsening symptoms and signs of infection (other than those expected from inflammation in conditions like cellulitis), clearance of blood cultures if relevant, inflammatory markers not increasing.
4. No source control problem requires intervention: abscess, foreign body or implant, infected heart valve.
5. No psychosocial reason to prefer IV therapy: patient cannot afford oral treatment or declines to take antibiotics by mouth.

An external reviewer of this *Therapeutics Letter* points out that – in programmes tailored to their specific needs – successful oral antibiotic therapy has been demonstrated even for unhoused people with multiple challenges.

Will we know more in future?

Results of Swiss RCTs in diabetic foot infections that randomised over 400 participants and used mostly oral antibiotics are expected during 2025.⁵⁷ And a major international RCT is assessing 90-day total mortality after early oral switch from IV antibiotics in uncomplicated and complicated *S. aureus* bacteraemia.⁵⁸ It aims to recruit at least 1000 participants. This may become a model for collaborative trials that improve our understanding of optimum antibiotic therapy for dangerous infections.

Recommendations

- For most stable patients, oral antibiotics should be the standard of care.
- Reserve IV therapy for critically ill patients and situations where oral administration is not possible or is not supported by evidence.
- In patients initially prescribed IV treatment, convert to oral therapy as soon as clinically appropriate.

Vignette resolution

Judging that your patient can safely and reliably take an oral antibiotic, you prescribe cephalexin 500 mg PO [orally] QID [6 hourly] for 5 days. Over the next 24 h, inflammation of her left leg worsens, and she returns to the emergency department for reassessment. Now she requests an IV antibiotic because she thinks the oral treatment is not working. But she is afebrile, and her other vital signs are normal. You advise continuing the oral cephalexin, pointing out that symptoms or signs of infection can worsen before they get better, as dying bacteria release their toxins. Elevating the leg and taking analgesics will reduce her inflammatory symptoms. Recognising that you reassessed her carefully, she accepts your recommendation. Her soft tissue infection resolves gradually – vindicating your evidence-based approach.

Summary and conclusions

Medical training and guidelines often still encourage unnecessary use of IV antibiotics, an obstacle to more efficient and patient-friendly therapy. The route of drug delivery is often overemphasised, distracting us from more important aspects of infection management. Strategies to promote oral therapy include education of clinicians and patients, prescription of antibiotics with infrequent dosing schedules to improve adherence, electronic medical record prompts for early IV to oral switch and easy access to local guidelines.⁵⁹

Removing financial incentives that encourage clinicians and hospitals to prescribe outpatient IV antibiotics could help, especially when oral treatment is publicly funded. When circumstances and evidence suggest that oral therapy could be preferable, this *Therapeutics Letter* may encourage more clinicians to consider moderating our historical preference for IV treatment of most serious infections:

- Oral antibiotics are as effective as IV antibiotics for most bacterial infections.
- For stable patients, oral antibiotics should be first-line therapy. Reserve IV treatment for people who cannot take pills or for infections for which effective oral therapy does not exist.
- Oral treatment improves patient experience, consumes fewer health system resources and generates a lower carbon footprint.

Acknowledgements

The article was originally published as Therapeutic Letter 155 (Letter 155) by the University of British Columbia, with authors Davie Wong and Thomas L. Perry (refer: <https://www.ti.ubc.ca/2025/05/20/155-oral-vs-iv-antibiotics/>). It has been edited for the African Journal of Primary Health Care & Family Medicine by Prof. Michael Pather and is published with permission from the Therapeutics Initiative at the University of British Columbia, Vancouver.

Disclaimer

The views and opinions expressed in this article are those of the authors and are the product of professional research. It does not necessarily reflect the official policy or position of any affiliated institution, funder, agency or that of the publisher. The authors are responsible for this article's results, findings and content.

References

1. Davar K, Clark D, Centor RM, et al. Can the future of ID escape the inertial dogma of its past? The exemplars of shorter is better and oral is the new IV. *Open Forum Infect Dis*. 2023;10(1):ofac706. <https://doi.org/10.1093/ofid/ofac706>
2. Lim WS, Baudouin SV, George RC, et al. BTS guidelines for the management of community acquired pneumonia in adults: Update 2009. *Thorax*. 2009;64 Suppl 3:iii1–iii55. <https://doi.org/10.1136/thx.2009.121434>
3. Wald-Dickler N, Holtom PD, Phillips MC, et al. Oral is the new IV. Challenging decades of blood and bone infection dogma: A systematic review. *Am J Med*. 2022;135(3):369.e1–79.e1. <https://doi.org/10.1016/j.amjmed.2021.10.007>

4. Kaasch AJ, López-Cortés LE, Rodríguez-Baño J, et al. Efficacy and safety of an early oral switch in low-risk *Staphylococcus aureus* bloodstream infection (SABATO): An international, open-label, parallel-group, randomised, controlled, non-inferiority trial. *Lancet Infect Dis*. 2024;24(5):523–534. [https://doi.org/10.1016/S1473-3099\(23\)00756-9](https://doi.org/10.1016/S1473-3099(23)00756-9)
5. Mourad A, Nwafo N, Skalla L, et al. Oral versus intravenous antibiotic therapy for *Staphylococcus aureus* bacteremia or endocarditis: A systematic review and meta-analysis of randomized, controlled trials. *Clin Infect Dis*. 2025;80(1):29–36. <https://doi.org/10.1093/cid/ciae476>
6. Omrani AS, Abujarir SH, Ben Abid F, et al. Switch to oral antibiotics in Gram-negative bacteraemia: A randomized, open-label, clinical trial. *Clin Microbiol Infect*. 2024;30(4):492–498. <https://doi.org/10.1016/j.cmi.2023.10.014>
7. Li HK, Rombach I, Zambellas R, et al. Oral versus intravenous antibiotics for bone and joint infection. *N Engl J Med*. 2019;380(5):425–436. <https://doi.org/10.1056/NEJMoa1710926>
8. Larrazabal Jr, RB, Chiu HHC, Arcegoni MS, Abad CLR. Oral versus intravenous antibiotic treatment for osteomyelitis in adults: A systematic review and meta-analysis. *Philipp J Intern Med*. 2020;58(4):146–153.
9. Sendi P, Lora-Tamayo J, Cortes-Penfield NW, Uçkay I. Early switch from intravenous to oral antibiotic treatment in bone and joint infections. *Clin Microbiol Infect*. 2023;29(9):1133–1138. <https://doi.org/10.1016/j.cmi.2023.05.008>
10. Mombelli G, Pezzoli R, Pinoja-Lutz G, et al. Oral vs intravenous ciprofloxacin in the initial empirical management of severe pyelonephritis or complicated urinary tract infections: A prospective randomized clinical trial. *Archiv Intern Med*. 1999;159(1):53–58. <https://doi.org/10.1001/archinte.159.1.53>
11. Molton JS, Chan M, Kalimuddin S, et al. Oral vs intravenous antibiotics for patients with *Klebsiella pneumoniae* liver abscess: A randomized, controlled noninferiority study. *Clin Infect Dis*. 2020;71(4):952–959. <https://doi.org/10.1093/cid/ciz881>
12. Dalen D, Fry A, Campbell SG, et al. Intravenous cefazolin plus oral probenecid versus oral cephalexin for the treatment of skin and soft tissue infections: A double-blind, non-inferiority, randomised controlled trial. *Emerg Med J*. 2018;35(8):492–498. <https://doi.org/10.1136/emermed-2017-207420>
13. Brindle R, Williams OM, Barton E, Featherstone P. Assessment of antibiotic treatment of cellulitis and erysipelas: A systematic review and meta-analysis. *JAMA Dermatol*. 2019;155(9):1033–1040. <https://doi.org/10.1001/jamadermatol.2019.0884>
14. Erard V, Lamy O, Bochud PY, et al. Full-course oral levofloxacin for treatment of hospitalized patients with community-acquired pneumonia. *Eur J Clin Microbiol Infect Dis*. 2004;23(2):82–88. <https://doi.org/10.1007/s10096-003-1060-x>
15. Teng GL, Chi JY, Zhang HM, et al. Oral vs. parenteral antibiotic therapy in adult patients with community-acquired pneumonia: A systematic review and meta-analysis of randomized controlled trials. *J Glob Antimicrob Resist*. 2023;32:88–97. <https://doi.org/10.1016/j.jgar.2022.12.010>
16. Vidal L, Ben dor I, Paul M, et al. Oral versus intravenous antibiotic treatment for febrile neutropenia in cancer patients. *Cochrane Database Syst Rev*. 2013;2013(10):CD003992. <https://doi.org/10.1002/14651858.CD003992.pub3>
17. Iversen K, Ihlemann N, Gill SU, et al. Partial oral versus intravenous antibiotic treatment of endocarditis. *N Engl J Med*. 2019;380(5):415–424. <https://doi.org/10.1056/NEJMoa1808312>
18. Barda B, Schindler C, Bernasconi E, Bongiovanni M. Breaking the dogma of intravenous treatment for infective endocarditis: A systematic review and meta-analysis. *J Clin Med*. 2024;13(24):7518. <https://doi.org/10.3390/jcm13247518>
19. Pries-Heje MM, Wiingard C, Ihlemann N, et al. Five-year outcomes of the Partial Oral Treatment of Endocarditis (POET) trial. *N Engl J Med*. 2022;386(6):601–602. <https://doi.org/10.1056/NEJMc2114046>
20. Wilcox M, Nathwani D, Dryden M. Linezolid compared with teicoplanin for the treatment of suspected or proven Gram-positive infections. *J Antimicrob Chemother*. 2004;53(2):335–344. <https://doi.org/10.1093/jac/dkh088>
21. Aboltins CA, Hutchinson AF, Sinnappu RN, et al. Oral versus parenteral antimicrobials for the treatment of cellulitis: A randomized non-inferiority trial. *J Antimicrob Chemother*. 2015;70(2):581–586. <https://doi.org/10.1093/jac/dku397>
22. Nahid P, Dorman SE, Alipanah N, et al. Official American Thoracic Society/Centers for Disease Control and Prevention/Infectious Diseases Society of America Clinical Practice Guidelines: Treatment of drug-susceptible tuberculosis. *Clin Infect Dis*. 2016;63(7):e147–e195. <https://doi.org/10.1093/cid/ciw376>
23. Landersdorfer CB, Gwee A, Nation RL. Clinical pharmacological considerations in an early intravenous to oral antibiotic switch: Are barriers real or simply perceived? *Clin Microbiol Infect*. 2023;29(9):1120–1125. <https://doi.org/10.1016/j.cmi.2023.04.009>
24. Spellberg B. Oral antibiotic RCTs [homepage on the Internet]. [cited 2025 Jan 27]. Available from: <https://www.bradspellberg.com/oral-antibiotics>
25. Reijnders TDY, Saris A, Schultz MJ, Van der Poll T. Immunomodulation by macrolides: Therapeutic potential for critical care. *Lancet Respir Med*. 2020;8(6):619–630. [https://doi.org/10.1016/S2213-2600\(20\)30080-1](https://doi.org/10.1016/S2213-2600(20)30080-1)
26. Phillips MC, Wald-Dickler N, Davar K, et al. Choosing patients over placebos: Oral transitional therapy vs. IV-only therapy for bacteraemia and infective endocarditis. *Clin Microbiol Infect*. 2023;29(9):1126–1132. <https://doi.org/10.1016/j.cmi.2023.04.030>
27. Lee K, Mercurio N. If the gut works, use it! Five important considerations when switching from IV to PO antibiotics [homepage on the Internet]. [cited 2025 Apr 1]. Available from: <https://www.idstewardship.com/gut-works-use-five-important-considerations-switching-iv-po-antibiotics/>
28. Kaal AG, Roos R, De Jong P, et al. Oral versus intravenous antibiotic treatment of moderate-to-severe community-acquired pneumonia: A propensity score matched study. *Sci Rep*. 2024;14(1):8271. <https://doi.org/10.1038/s41598-024-59026-2>

29. Gariani K, Pham TT, Kressmann B, et al. Three weeks versus six weeks of antibiotic therapy for diabetic foot osteomyelitis: A prospective, randomized, noninferiority pilot trial. *Clin Infect Dis*. 2021;73(7):e1539–e1545. <https://doi.org/10.1093/cid/ciaa1758>
30. Van Den Broek AK, Visser CE, Veenstra J, et al. The effect of the acute phase of infection on absorption of and exposure to orally administered antibiotics in non-critically ill, hospitalized patients. *J Antimicrob Chemother*. 2023;78(2):389–396. <https://doi.org/10.1093/jac/dkac401>
31. Meyer NJ, Prescott HC. Sepsis and septic shock. *N Engl J Med*. 2024;391(22):2133–2146. <https://doi.org/10.1056/NEJMra2403213>
32. Borek AJ, Ledda A, Pouwels KB, et al. Stop antibiotics when you feel better? Opportunities, challenges and research directions. *JAC Antimicrob Resist*. 2024;6(5):dlae147. <https://doi.org/10.1093/jacamr/dlae147>
33. Hepburn MJ, Dooley DP, Skidmore PJ, et al. Comparison of short-course (5 days) and standard (10 days) treatment for uncomplicated cellulitis. *Archiv Intern Med*. 2004;164(15):1669–1674. <https://doi.org/10.1001/archinte.164.15.1669>
34. Wake RM, Molloy SF, Jarvis JN, et al. Cryptococcal antigenemia in advanced human immunodeficiency virus disease: Pathophysiology, epidemiology, and clinical implications. *Clin Infect Dis*. 2023;76(4):764–770. <https://doi.org/10.1093/cid/ciac675>
35. Markham JL, Goldman JL. To discharge or not to discharge on outpatient parenteral antimicrobial therapy: That is the question. *Hosp Pediatr*. 2019;9(4):314–316. <https://doi.org/10.1542/hpeds.2018-0279>
36. Spivak ES, Kendall B, Orlando P, et al. Evaluation of outpatient parenteral antimicrobial therapy at a Veterans Affairs hospital. *Infect Control Hosp Epidemiol*. 2015;36(9):1103–1105. <https://doi.org/10.1017/ice.2015.131>
37. Wang X, Wu D, Xuan Z, et al. The influence of a ban on outpatient intravenous antibiotic therapy among the secondary and tertiary hospitals in China. *BMC Public Health*. 2020;20(1):1794. <https://doi.org/10.1186/s12889-020-09948-z>
38. McCarthy K, Avent M. Oral or intravenous antibiotics? *Aust Prescr*. 2020;43(2):45–48. <https://doi.org/10.18773/austprescr.2020.008>
39. Dlamini NN, Meyer JC, Kruger D, et al. Feasibility of using point prevalence surveys to assess antimicrobial utilisation in public hospitals in South Africa: A pilot study and implications. *Hosp Pract*. 2019;47(2):88–95. <https://doi.org/10.1080/21548331.2019.1592880>
40. Dulku M, Sekhon T, Tejani AM. Assessment of Intravenous versus Oral Antimicrobials in a Large Regional Health Authority. *Can J Hosp Pharm*. 2022;75(2):108–112. <https://doi.org/10.4212/cjhp.v75i2.3173>
41. Wong D. The unsubstantiated preference for outpatient IV antibiotics. *BCMJ* [serial online]. 2025;67(1):28–31. [cited 2025 Jan 27]. Available from: <https://bcmj.org/articles/unsubstantiated-preference-outpatient-iv-antibiotics>
42. Jenkins A. IV to oral switch: A novel viewpoint. *J Antimicrob Chemother*. 2023;78(10):2603–2604. <https://doi.org/10.1093/jac/dkad239>
43. Mouwen AMA, Dijkstra JA, Jong E, et al. Early switching of antibiotic therapy from intravenous to oral using a combination of education, pocket-sized cards and switch advice: A practical intervention resulting in reduced length of hospital stay. *Int J Antimicrob Agents*. 2020;55(1):105769. <https://doi.org/10.1016/j.ijantimicag.2019.07.020>
44. McMeekin N, Geue C, Briggs A, et al. Cost-effectiveness of oral versus intravenous antibiotics (OVIVA) in patients with bone and joint infection: Evidence from a non-inferiority trial. *Wellcome Open Res*. 2019;4:108. <https://doi.org/10.12688/wellcomeopenres.15314.4>
45. Walpole SC, Eii MN, Lyons T, Aldridge C. Improving antimicrobial use to protect the environment: What is the role of infection specialists? *Antibiotics*. 2023;12(4):640. <https://doi.org/10.3390/antibiotics12040640>
46. Eii MN, Walpole S, Aldridge C. Sustainable practice: Prescribing oral over intravenous medications. *BMJ*. 2023;383:e075297. <https://doi.org/10.1136/bmj-2023-075297>
47. Varghese JM, Roberts JA, Lipman J. Antimicrobial pharmacokinetic and pharmacodynamic issues in the critically ill with severe sepsis and septic shock. *Crit Care Clin*. 2011;27(1):19–34. <https://doi.org/10.1016/j.ccc.2010.09.006>
48. Westbrook JL, Li L, Woods A, et al. Risk factors associated with medication administration errors in the critically ill with severe sepsis and septic shock. *Drug Saf*. 2024;47(6):545–556. <https://doi.org/10.1007/s40264-024-01408-6>
49. Krein SL, Saint S, Trautner BW, et al. Patient-reported complications related to peripherally inserted central catheters: A multicentre prospective cohort study. *BMJ Qual Saf*. 2019;28(7):574–581. <https://doi.org/10.1136/bmjqs-2018-008726>
50. Bamford KB, Desai M, Aruede MJ, et al. Patients' views and experience of intravenous and oral antimicrobial therapy: Room for change. *Injury*. 2011;42 Suppl 5:S24–S27. [https://doi.org/10.1016/S0020-1383\(11\)70129-2](https://doi.org/10.1016/S0020-1383(11)70129-2)
51. Taylor PC, Betteridge N, Brown TM, et al. Treatment mode preferences in rheumatoid arthritis: Moving toward shared decision-making. *Patient Prefer Adherence*. 2020;14:119–131. <https://doi.org/10.2147/PPA.S220714>
52. Eek D, Krohe M, Mazar I, et al. Patient-reported preferences for oral versus intravenous administration for the treatment of cancer: A review of the literature. *Patient Prefer Adherence*. 2016;10:1609–1621. <https://doi.org/10.2147/PPA.S106629>
53. Li HK, Agweyu A, English M, Bejon P. An unsupported preference for intravenous antibiotics. *PLoS Med*. 2015;12(5):e1001825. <https://doi.org/10.1371/journal.pmed.1001825>
54. Canadian Society of Internal Medicine. Nineteen tests and treatments to question [homepage on the Internet]. *Choosing Wisely Canada*; 2024. [cited 2025 Apr 1]. <https://choosingwiselycanada.org/recommendation/internal-medicine/>
55. Spellberg B, Aggrey G, Brennan MB, et al. Use of novel strategies to develop guidelines for management of pyogenic osteomyelitis in adults: A WikiGuidelines group consensus statement. *JAMA Netw Open*. 2022;5(5):e2211321. <https://doi.org/10.1001/jamanetworkopen.2022.11321>
56. McDonald EG, Aggrey G, Aslan AT, et al. Guidelines for diagnosis and management of infective endocarditis in adults: A WikiGuidelines group consensus statement. *JAMA Netw Open*. 2023;6(7):e2326366. <https://doi.org/10.1001/jamanetworkopen.2023.26366>
57. Waibel F, Berli M, Catanzaro S, et al. Optimization of the antibiotic management of diabetic foot infections: Protocol for two randomized controlled trials. *Trials*. 2020;21(1):54. <https://doi.org/10.1186/s13063-019-4006-z>
58. De Kretser D, Mora J, Bloomfield M, et al. Early oral antibiotic switch in *Staphylococcus aureus* bacteraemia: The *Staphylococcus aureus* Network Adaptive Platform (SNAP) trial early oral switch protocol. *Clin Infect Dis*. 2024;79(4):871–887. <https://doi.org/10.1093/cid/ciad666>
59. Munting A, Van Singer M, Boillat-Blanco N. Standing on the Shoulders of Imperfect Humans: From IV dogma to oral antibiotic therapy for bone and joints infection. *CMI Commun*. 2025;2(3):105088. <https://doi.org/10.1016/j.cmicom.2025.105088>