



March/April 2026

The Journal

of the Pharmacy Society of Wisconsin

PHARMACIST & TECHNICIAN CE:

Penicillin G to be Syphilis Free: A Review of Common Sexually Transmitted Infections

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of the Pharmacy Society of Wisconsin

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Up Front: Peer Review is a Gift

by Katherine Rotzenberg, PharmD, MBA, BCPS

Has anyone ever told you that feedback is a gift? I've sometimes thought that this was a nice way of saying that something I didn't want to hear (but needed to) was on its way, but as I wrap up my first year as *JPSW* Pharmacist Editor, I am considering this phrase in a different light.

Peer reviewers ensure the integrity of scientific communication. Scientific findings are nuanced – conclusions are often limited to specific populations within specific constraints, and statistics can be misinterpreted and misapplied. Peer review is the filter through which scientific literature passes to ensure that what comes out the other side is the closest rendering of the truth we can achieve. So how do we do it?

First, we seek out reviewers with expertise in the topic whenever possible, those in the best position to recognize significant studies in the field and who can draw on their experience for practical application. According to a 2024 systematic literature review,¹ reviewer expertise is an important factor in the quality of feedback. We also strive to have at least two reviewers

for each manuscript to gather different perspectives. On a consistent basis, each reviewer identifies something unique to improve the paper.

On the reviewer side, one of their major responsibilities is to identify the manuscript's underlying value for advancing the field or our understanding of it. They also ensure accuracy in how published literature is interpreted and described, clarity and rationality in how authors synthesize data and draw conclusions, that notable literature is not omitted, especially when it can change the interpretation of results, and that limitations of a study are identified so that results are understood in the appropriate context. According to Chong and Lin,¹ the best reviews provide clear, actionable, and constructive feedback using professional and respectful language with the overall goal of improving the accuracy or clarity of the manuscript. This is no small task!

Peer reviewer feedback is then shared with the corresponding author, who considers each point and makes revisions as appropriate. Sometimes, more than one round of revisions is necessary; it can be a lengthy process, but it is well worth the

effort.

We share this process with you today, dear reader, because the Editorial Advisory Committee has revised PSW's Peer Review Expectations and Peer Reviewer Checklists to emphasize these considerations and evidence-based best practices during the peer review process. Starting this month, all current peer reviewers for the Journal will receive copies of the new documents, which will also be posted on the *JPSW* website.

In the first issue of *JPSW* this year, we recognized an impressive 42 peer reviewers, each of whom contributed hours of their time to improve the quality of what we published in 2025. We honor and appreciate their commitment, and through these revised guidance documents, hope to ensure this selfless gift keeps on giving.

Kate Rotzenberg is the Pharmacist Editor of *The Journal of the Pharmacy Society of Wisconsin*.

References

1. Chong SW, Lin T. Feedback practices in journal peer-review: a systematic literature review. *Assessment & Evaluation in Higher Education*. 2024;49(1):1-12. doi:10.1080/02602938.2022.2164757

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PHARMACIST & TECHNICIAN CE:

Penicillin G to be Syphilis Free: A Review of Common Sexually Transmitted Infections

by Chloe Kotrba, PharmD, Philip (Logan) Whitfield, PharmD, BCIDP, Allison Gibble, PharmD, BCIDP

Sexually transmitted infections (STIs) continue to be a major public health challenge in the United States. Provisional 2024 data shows an estimated 2,249,636 cases of total syphilis, gonorrhea, and chlamydia reported nationally.¹ Although down from 2023, this represents a 13% increase in nationally reported STIs from 2014.¹ This increase over the past decade can be attributed to a rise in disease transmission, but also an increased ability to capture true cases through improved reporting, increased screening of asymptomatic patients, and the use of more sensitive diagnostic tests.^{1,2} This continued burden of STIs highlights opportunities within the healthcare system to improve public education and treatment efforts. Understanding current patterns of STI prevalence is critical to developing effective prevention strategies and to patient outreach. Healthcare practitioners must remain informed on national guidelines regarding the screening and treatment of common STIs such as chlamydia, gonorrhea, and syphilis to combat this national public health challenge.

CE FOR PHARMACISTS & TECHNICIANS

Learning Objectives

- Describe the scope of the sexually transmitted infections (STI) epidemic (P,T)
- Summarize differences in diagnostic testing for chlamydia, gonorrhea, and syphilis (P,T)
- Identify important changes in STI treatment recommendations (P)
- Identify the different stages of syphilis and appropriate treatment recommendations for each stage (P,T)
- Explain the pharmacy's role in the furnishment of expedited partner therapy for chlamydia, gonorrhea, and trichomoniasis (P,T)
- Select appropriate STI treatment options for special populations such as pregnant women, patients with high body weight, and patients with antibiotic allergies (P)

Abstract

Sexually transmitted infections (STIs) include any bacterial, viral, or parasitic infections spread through sexual contact. These infections place a significant burden on healthcare systems due to the potential for disease progression, ease of transmission, and possibly complex treatment regimens. Despite improvements in testing, screening, and public education, common STIs such as chlamydia, gonorrhea, and syphilis continue to have substantial case numbers in the United States. This article aims to provide a detailed overview of each of these common STIs and their guideline-recommended treatment regimens, as well as the utility of expedited partner therapy (EPT) and post-exposure prophylaxis (PEP).

Chlamydia

Since 2000, *Chlamydia trachomatis* (CT) has remained the most common nationally notifiable STI, with 1,648,568 cases reported in 2023.³ Although relatively stable from the year prior, national chlamydia rates have steadily increased since it was first recognized as nationally notifiable in 1995.³ The continued high incidence of chlamydia demands attention from healthcare providers. In Wisconsin, chlamydia cases have historically followed national trends. Chlamydia accounted for 74% (24,992) of the state's 33,791 STI cases in 2023.⁴ Upon examination of this patient population, a marked racial disparity exists. White residents constitute 80% of the state's population and account for 36% of chlamydia infections, while Black residents account for 36% of the state's annually reported chlamydia infections (2023), despite representing only 6% of the state's population.⁴ The rate of chlamydia infections also increased among Black people (5.33%) from 2022 to 2023 while decreasing among White (7.32%) and Hispanic people (2.94%).⁴ Consistent with national data, younger females in Wisconsin are most affected by chlamydia. In 2023, the chlamydia case rate was 2.7 times higher among females aged 20–29 compared to males in the same age group.⁴ Therefore, younger females in Wisconsin, specifically those who identify as Black, are disproportionately impacted by chlamydia.

Screening and Testing

Since age is such a strong predictor of risk for chlamydia, the national screening recommendations (Table 1) emphasize testing patients based on age in addition to other risk factors.⁵ Most chlamydia cases present asymptotically (66% women; 50% men).⁶ These asymptomatic patients are still able to transmit disease, making screening a necessary tool in contributing to disease eradication. As mentioned, women are more likely to present asymptotically. If symptoms are present, patients with female anatomy can present with cervicitis, vaginal discharge, or abnormal vaginal bleeding.⁶ Pelvic inflammatory disease is a common complication in women if left untreated.⁶ The urethra is the most common site of infection in males. Patients with male anatomy may present with purulent discharge or dysuria from the urethra. Complications such as epididymitis, prostatitis, and urethral stricture are rare.⁶

Testing for chlamydia can be performed using several different methods. Gram stain or culture can be conducted; however, this method has fallen out of favor. Since chlamydia is an intracellular organism, invasive samplings are required for culture.⁷ In addition to a slow turnaround time, these samples can be challenging to extract properly, contributing to a low test sensitivity. Nucleic acid amplification tests (NAATs) have high sensitivity and specificity for urine samples and patient-collected specimens. Patient-collected

vaginal swab specimens are equivalent in sensitivity and specificity to those collected by a clinician when using NAATs.⁸ First catch urine sample is the preferred method for males, though rectal and oropharyngeal sites can also be tested based on patient exposure. Therefore, this non-invasive NAAT testing is the recommended method for detecting *C. trachomatis* infection.⁸ However, due to their sensitivity, NAATs can result in false positives for weeks after adequate treatment and are unable to provide resistance information. Therefore, clinical decision-making should be used to identify treatment failures due to resistance rather than false positives if testing is conducted after adequate treatment.

Treatment

In 2021, the Centers for Disease Control and Prevention (CDC) recommended a major change in its treatment guidelines for urogenital chlamydia (Table 2).⁹ Guidelines now recommend doxycycline as first-line therapy for infections of the urethra, rectum, or pharynx.⁹ A 2021 randomized, double-blind, placebo-controlled trial found that a single-dose regimen of azithromycin was not as effective as 7 days of doxycycline for the treatment of rectal infections in men who have sex with men (MSM).¹⁰ The primary endpoint of microbiological cure (CT-negative NAAT) at 4 weeks was 100% (70/70) in patients treated with doxycycline compared to those treated with azithromycin at 78% (48/65).¹⁰

TABLE 1. Screening Recommendations for Chlamydia and Gonorrhea

<i>Sexually Active Women ≤ 25 years of age</i>	<i>Sexually Active Women ≥ 25 years of age at Increased Risk (see below)</i>		<i>Men who have sex with Women</i>
<ul style="list-style-type: none"> • Test annually 	<ul style="list-style-type: none"> • New sexual partner • ≥ 1 sexual partner / partner has concurrent partners • Inconsistent condom use • Patient / patient's partner has a previous / co-existing STI 		<ul style="list-style-type: none"> • Insufficient evidence for recommendations • Screening based on available resources and local prevalence
<i>Pregnant Women</i>	<i>Men who have sex with Men</i>	<i>Transgender and Gender Diverse Persons</i>	<i>Persons with HIV</i>
<ul style="list-style-type: none"> • ≤ 25 years of age • ≥ 25 years of age if at increased risk • Retest in 3rd trimester for women ≤ 25 years of age or if at increased risk 	<ul style="list-style-type: none"> • Test annually at sites of contact (urethra, rectum) • Test every 3 - 6 months if at increased risk (On PrEP, HIV co-infection, multiple partners) 	<ul style="list-style-type: none"> • Test annually for all persons with a cervix • Persons ≥ 25 years of age with a cervix if at increased risk • Test alternative sites based on reported sexual behaviors 	<ul style="list-style-type: none"> • At first HIV evaluation, then test annually • Increase screening frequency depending on individual behaviors and local epidemiology
<p><i>HIV: human immunodeficiency virus, PrEP: pre-exposure prophylaxis, STI: sexually transmitted infections</i></p>			

A 2014 meta-analysis compared one time azithromycin dosing with 7 days of doxycycline for urogenital CT infections.¹¹ This meta-analysis assessed microbiological cure within 3 months of treatment and reported a pooled estimate of the difference in treatment efficacy in favor of doxycycline of 1.5% to 2.6%.¹¹ In a subgroup of men with symptomatic urethritis, the superiority of doxycycline increased to 7%.¹¹ However, the authors noted that if symptomatic men were removed from this meta-analysis, the difference between doxycycline and azithromycin regimens would not meet statistical significance.¹¹ Therefore, both studies cited a small but statistically significant improvement in efficacy with doxycycline over azithromycin. However, the greatest evidence in support of doxycycline was seen in men with symptomatic urethritis and in the treatment of rectal infections in MSM.

Given the increased duration of therapy with doxycycline, there is concern with patient compliance to this extended regimen. A 2024 prospective observational study examined patients treated with doxycycline for uncomplicated genitourinary chlamydia.¹² Through review of adherence reports, only 67% of younger and female patients reported adherence.¹² A 2025 Family Medicine Cohort Study reviewed the chlamydia treatment regimen in primary care settings.¹³ Of the 6,678 cases of chlamydia noted, only 14.0% of treated cases were given doxycycline.¹³ While these studies noted low adherence to CDC guideline recommendations, these studies

TABLE 2. Treatment Recommendations for Chlamydia

First Line	Alternative Regimen	Pregnancy Considerations
<ul style="list-style-type: none"> • Doxycycline - 100 mg by mouth twice daily x 7 days <ul style="list-style-type: none"> » Dispense with all doses » Directly observed first dose 	<ul style="list-style-type: none"> • Azithromycin - 1 g by mouth once <ul style="list-style-type: none"> » Use directly observed single-dose therapy when adherence is a considerable concern • Levofloxacin - 500 mg by mouth daily x 7 days 	<ul style="list-style-type: none"> • Azithromycin - 1 g by mouth once • Alternative: Amoxicillin 500 mg by mouth three times daily x 7 days • Test of cure performed 4 weeks after treatment, and retest within 3 months

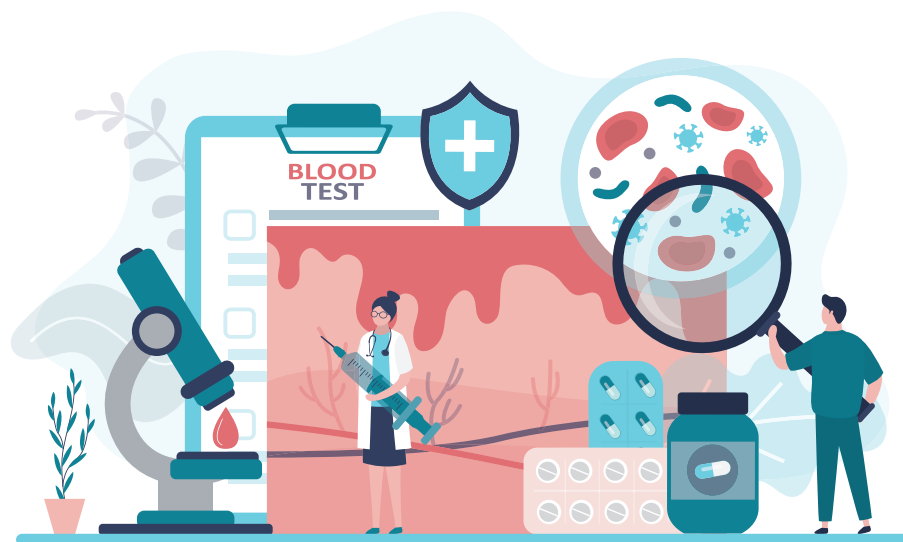
support the broad application of the CDC recommendation to “consider azithromycin when nonadherence is a considerable concern.”⁹ Therefore, the decision to provide directly observed treatment with a one-time dose of azithromycin remains desirable.

Practice Considerations

Overall, the burden of chlamydia in the state of Wisconsin remains significant. Proper screening is essential to minimize transmission. Using sensitive rapid diagnostic tests allows patients to collect their own samples and provides quick results, enabling efficient case capture. Much debate remains regarding the preferred treatment regimen. While the CDC recommends doxycycline as first-line therapy, azithromycin is still used to improve patient adherence. Healthcare providers across the nation must continue to act diligently in the screening and treatment of chlamydia to reduce the impact of this common STI.

Gonorrhea

Gonorrhea is a sexually transmitted infection caused by the Gram-negative diplococcus *Neisseria gonorrhoea*. It is second only to chlamydia as a reportable sexually transmitted infection across the United States, with an estimated 600,000 to 700,000 cases annually.¹⁶ The incidence was increasing year over year from 2014 until 2021. During the later pandemic years, the trend reversed dramatically. Most recently, in September 2025 the CDC in its annual report highlighted a 9.6% decline in gonorrhea cases from 2023-2024 and a 20% decline since 2020.¹⁴ Unfortunately, it is unclear if this decline is due to declining case numbers or lower rates of screening for disease after resource redirection during the COVID-19 pandemic that has not recovered.^{15,16} In the state of Wisconsin, the rates of gonorrhea are declining generally from a peak in 2021; however, the geographic spread has increased with many rural counties experiencing increasing case numbers. The largest of these increases exists in Menominee County among the Menominee Indian Tribe of Wisconsin, where the gonorrhea rate range is similar to the metropolitan areas of Madison and Milwaukee.⁴ Gonorrhea affects females and males in almost equal measure, and approximately two-thirds of cases are in the age range of 15-35 (20–24-year-olds being at the highest risk). Like other reportable STIs, gonorrhea infects a disproportionate number of Black people. In the state of Wisconsin, Black people compose 6% of the state’s population but acquire 59% of the reported gonorrhea infections.⁴ Rates nationwide are also highest in MSM compared to men who have sex with women only (MSW) or women generally.¹



Clinical Manifestations

Men with *Neisseria gonorrhoea* infection often present for testing due to symptomatic disease, though generally not early enough to prevent transmission to partners. The most common symptom of urethral infection is urethritis, with or without purulent discharge. In women, however, gonorrhea infections are most often asymptomatic until sequelae, some serious, have developed. It is for this reason that aggressive screening measures are recommended for sexually active young people and others at high risk of acquisition and transmission (Table 1).⁹ Women with symptomatic disease may complain of new or abnormal vaginal discharge, bleeding, dysuria, abdominal pain, or dyspareunia. Beyond urethral infection, *Neisseria gonorrhoea* may cause a wide array of primary clinical syndromes, including cervicitis, pharyngitis, conjunctivitis/keratitis, proctitis, and even disseminated disease manifesting as one or more of hepatitis, skin and soft tissue infections, or myocarditis. The most common of these are pharyngitis and proctitis, which are often related to a sexual history of receptive oral or anal sex in men.¹⁷ In women, literature supports the possibility of auto-inoculation, that is, genital infection leading to rectal infection without a history of receptive anal sex.^{18,19} It is believed this phenomenon is due to the proximity of the female genitalia to the rectum and possibly intra-coital/post-coital behaviors or cleaning after micturition.

Sequelae of primary gonococcal disease are relatively uncommon in men. The only exception may be epididymitis, where *Neisseria gonorrhoea* should be considered in sexually active men under 35 years of age.²⁰ In women, untreated or undertreated disease can have serious consequences. Approximately 10 to 20 percent of females with cervical disease will develop pelvic inflammatory disease, also placing the woman at risk of infertility if it remains untreated.²¹ Additionally, pregnant patients are placed at risk of premature labor, low-birth-weight infants, and spontaneous abortion.^{22,23} Vertical transmission of the untreated mother may also occur in up to half of deliveries.^{24,25}

Antimicrobial Resistance

In 2019, the CDC published an update to the Antimicrobial Resistance

TABLE 3. Treatment Recommendations for Uncomplicated Gonorrhea

<i>Uncomplicated Gonococcal Infections of the Cervix, Urethra, Rectum, and Pharynx</i>
Ceftriaxone 500 mg IM in a Single Dose; 1000 mg IM for patients ≥ 150 kg
<i>Alternatives</i>
Gentamicin 240 mg IM PLUS Azithromycin 2 g PO in Single Doses OR
Cefixime 800 mg PO in a Single Dose
<i>IM: intramuscular; PO: by mouth</i>

Threats Report.²⁶ The report was designed to both inform on the growing threat of antimicrobial resistance and to underscore where action is most needed in public policy, industry, and healthcare. *Neisseria gonorrhoea* was assigned the most critical designation, Urgent Threat, alongside other bacteria such as carbapenem-resistant *Enterobacteriales*, *Clostridioides difficile*, and carbapenem-resistant *Acinetobacter*. This places *Neisseria gonorrhoea* in a different category than any other reportable STI in that antimicrobial resistance is an immediate concern with undertreatment, treatment failures, and excess transmission. Though rare in the United States, *Neisseria gonorrhoea* isolates exist that are resistant to all currently recommended treatments. In the United Arab Emirates, for example, up to 10% of gonococcal isolates reported to the World Health Organization in 2023 had reduced susceptibility to ceftriaxone, the only reliable treatment recommended by the CDC.²⁷ Since the first publication of the comprehensive CDC treatment guidelines for STIs back in 1982, penicillin, tetracyclines, and fluoroquinolones have all lost sufficient susceptibility to be widely recommended. One recent and major response to the trend in antimicrobial-resistant *Neisseria gonorrhoea* was the CDC's 2010 recommendation for combination therapy with a cephalosporin plus a macrolide, even if chlamydia testing was negative.²⁸ The goal was to mitigate resistance through the use of two active antimicrobials with different mechanisms of action, hopefully reducing the minimum inhibitory concentrations (MICs) to cephalosporins. Unfortunately, this does not seem to have had its intended effect. There continue to be reports of treatment

failure with cephalosporins, especially with pharyngeal infection.²⁹⁻³¹ Additionally, the Gonococcal Isolate Surveillance Project (GISP), originally established in 1986, has detected a ten-fold increase in isolates with reduced susceptibility to macrolides.²⁷ Other unintended consequences include the increasing resistance of *S. pneumoniae*, *Staphylococci*, and other miscellaneous bacteria, at least in part, to the widespread use of macrolides in combination therapy for *Neisseria gonorrhoea*.³² Because of this, the CDC's 2021 guideline update no longer recommends cephalosporins in combination with macrolides. Significant data, however, has emerged regarding the appropriate dosing of cephalosporins for modern circulating *Neisseria gonorrhoea* isolates, with the goal of ensuring appropriate drug levels at the site of infection to both achieve clinical cure and prevent the development of resistant mutants.

Antimicrobial Treatment

Cephalosporins, namely intramuscular ceftriaxone, are at the core of all recommended treatment regimens. All efforts should be made to safely circumvent beta-lactam allergies and to procure ceftriaxone if not readily available (assuming it would not risk a lost opportunity for treatment). Pharmacists and prescribers can use guidance from the 2022 Joint Drug Allergy Update of the American Academy of Allergy, Asthma & Immunology (AAAAI) and the American College of Allergy, Asthma, and Immunology (ACAAI) to determine which patients with reported beta-lactam allergies can safely receive ceftriaxone.³³ It is important to note that ceftriaxone can be safely used in a majority of patients with reported penicillin allergies,

including previous anaphylaxis. Use of ceftriaxone has very high treatment success rates at the doses recommended, and treatment failure is rare. In the 2021 CDC STI Guidelines, the doses of ceftriaxone for uncomplicated infection were increased from 250 mg to 500 mg, and of cefixime from 400 mg to 800 mg (Table 3).⁹ This recommendation was born out of the observation that MICs to ceftriaxone and cefixime are increasing worldwide, and newer data demonstrates that higher doses may be required to reach preferred pharmacokinetic/pharmacodynamic targets, especially for mutant strains or at difficult-to-treat sites of infection (e.g., pharynx).³²

Ceftriaxone, a beta-lactam antibiotic, maximizes its bacterial kill when the free concentration of antibiotic at the site of infection exceeds the MIC of the organism for a period of time that is specific to the beta-lactam and bacteria in question ($fT_{>MIC}$). In the case of ceftriaxone and cefixime at the urogenital site, this seems to be maximized at approximately $fT_{>MIC}$ 20-24 hours.^{34,35} An important question is which MIC should be chosen as the target. The GISP reported that from 2018 to 2022, the MIC₉₀, or MIC at which 90% of the isolates were susceptible, was < 0.03 mcg/mL.²⁷ However, there are circulating strains with MICs approaching 0.125, and perhaps more importantly, mutant subpopulations that may propagate if patients are underdosed. The GISP has identified an MIC of ≥ 0.125

TABLE 4. Antimicrobial Recommendations for Expedited Partner Therapy

<i>Chlamydia</i>	<i>Gonorrhea</i>	<i>Trichomoniasis</i>
<ul style="list-style-type: none"> • Doxycycline 100 mg by mouth twice daily for 7 days • Alternative: azithromycin 1 gram by mouth once 	<ul style="list-style-type: none"> • Cefixime 800 mg by mouth once • If chlamydia has not been excluded, also treat with chlamydia regimen 	<ul style="list-style-type: none"> • Patients with female anatomy - metronidazole 500 mg by mouth twice daily x 7 days • Patients with male anatomy - metronidazole 2 grams by mouth once

mcg/mL as an “alert value,” which should be the target for most used cephalosporin regimens.²⁷ In most adult patients, the 250 mg dose of ceftriaxone and 400 mg dose of cefixime recommended prior to 2021 are unable to reliably maintain these drug levels above an MIC of 0.125 mcg/mL for an $fT_{>MIC}$ 20-24 hours.³² By doubling the dose of each, the total exposure is doubled, providing a sufficient concentration for most patients at 24 hours. This is especially important at other sites of infection where concentrations are less consistent, namely the pharynx.^{36,37} Persistent *N. gonorrhoea* despite preferred cephalosporin treatment is most likely due to reinoculation rather than cephalosporin-resistant strains. Since routine susceptibility testing of isolates is not performed, true treatment failure may be suspected in patients whose symptoms do not resolve within 3 to 5 days and who report no sexual contact during the post-treatment follow-up period. In this case, specimens should be obtained for culture prior to retreatment for susceptibility testing to the CDC. Susceptibility testing and follow-up treatment may be facilitated by coordination with a local health department (See www.dhs.wisconsin.gov/lh-depts).

Expedited Partner Therapy (EPT)

EPT is the act of providing empiric antimicrobials for the sexual partners of individuals who test positive for chlamydia, gonorrhea, and trichomoniasis.³⁸ 2009 Wisconsin Act 280 allows providers to prescribe and dispense EPT and allows pharmacists to dispense EPT, while protecting healthcare professionals from civil and professional liability.³⁸ The goal of EPT is to rapidly provide treatment to those exposed to STIs and prevent reinfection of the index patient. Reports suggest EPT may reduce chlamydia and gonorrhea prevalence by 20% and 50%, respectively, since 15 to 30% of STIs are reinfections caused by untreated partners.³⁹ The use of EPT also increases the likelihood that partners will be notified of exposure and provides assurance that partners have received treatment.

The treatment recommendations for EPT match first-line treatment recommendations for each infection (Table 4).³⁸ While EPT is a beneficial program, there are limitations to its use. EPT is not recommended for MSM as this patient population should be evaluated for other co-infections. EPT also does not apply to patients who test positive for syphilis due to the complexity of treatment regimens. Pregnant partners of those who test positive should also be referred for further evaluation, given the high risk of complications.

Prescribers must provide patients with the Wisconsin Department of Health Services information sheet, which includes facts about the disease and treatment information.³⁸ Pharmacists must review patient allergy information before dispensing and advise the person for whom the antibiotic has been prescribed to discontinue the agent if they develop



signs of an allergic reaction. The index patient's insurance cannot be billed for their partner's EPT therapy. Instead, the partner's insurance can be billed, or the patient can pay out of pocket. The prescription should be written under the partner's name or state "EPT" in place of a name.

Syphilis

Syphilis is a sexually transmitted infectious disease caused by a unique bacterium called *Treponema pallidum*.⁶ The incidence of syphilis infections has increased over the past 25 years in the United States.¹ In 2023, the number of newly reported syphilis cases per 100,000 persons was 62.5, which was an increase from 39.6 in 2019. Additionally, congenital syphilis cases have increased from 3,882 cases reported in 2023, as compared to 1,884 cases in 2019. This is likely reflective of the 112% increase in primary and secondary syphilis cases reported in females from 2019 to 2023. In 2023, American Indian or Alaska Native persons were the populations with the highest new diagnosis rates. Similar trends have been reported by surveillance data collected in Wisconsin. In 2022, 1,916 syphilis cases were reported, which was an increase from 511 cases in 2018. Men and women aged 20 to 35 are the most vulnerable population identified in this Wisconsin surveillance data.⁴

Disease Progression and Clinical Manifestation

Syphilis progresses through four different stages if the infection goes untreated or undertreated (Figure 1).⁴⁰ Each phase of the disease has unique clinical manifestations. Patients begin in the primary phase of the disease and progress into the secondary phase after two to eight weeks. In the primary phase, patients present with a painless ulcer, called a chancre, at the site of infection. The ulcer typically heals on its own, even without treatment, within

TABLE 5. Treatment Regimens for Syphilis

Population	First-line Treatment	Alternative Treatment
Primary, secondary, and early latent stage syphilis	Benzathine penicillin G 2.4 million units IM x 1 dose	<ul style="list-style-type: none"> • Doxycycline 100 mg orally twice daily x 14 days • Tetracycline 500 mg orally 4 times daily x 14 days • Ceftriaxone 1 g IM or IV daily x 10-14 days
Late latent and tertiary syphilis	Benzathine penicillin G 2.4 million units IM weekly x 3 doses	<ul style="list-style-type: none"> • Doxycycline 100 mg orally twice daily x 14 days • Tetracycline 500 mg orally 4 times daily x 14 days
Neurosyphilis, ocular syphilis, otosyphilis	Aqueous crystalline penicillin G 3-4 million units IV every 4 hours x 10-14 days	<ul style="list-style-type: none"> • Procaine penicillin G 2.4 million units IM daily plus oral probenecid 500 mg 4 times daily x 10-14 days • Ceftriaxone 1-2 g IM or IV daily x 10-14 days
<i>IM: intramuscular, IV: intravenous</i>		

one to three weeks. In the secondary phase, patients experience nonspecific symptoms including maculopapular rash, mucocutaneous lesions, generalized lymphadenopathy, fever, and malaise. Typically, four to ten weeks are spent in the secondary phase until transitioning into a latent phase. During the latent phase, patients are asymptomatic. Anywhere between ten and thirty years is spent in the latent phase before progressing into the tertiary phase, where end-organ involvement is seen. Tertiary syphilis can manifest in many ways, including advanced neurologic complications (i.e., general paresis, tabes dorsalis), cardiovascular complications (i.e., aortitis, aortic aneurysm, mucinous myocarditis), and the development of gummatous lesions of the skin, soft tissue, bones, or visceral organs.

Neurosyphilis is a complication that can develop during any stage of syphilis. It can present in various ways, including acute meningitis or cranial nerve dysfunction.⁴¹ Patients can also develop ocular syphilis, with presentations such as uveitis and optic neuritis, and otosyphilis, with presentations such as hearing loss or tinnitus. Neurosyphilis, ocular syphilis, and otosyphilis are all managed similarly, as will

be discussed.

Diagnosis

For the diagnosis of primary syphilis, a Darkfield exam can be done on the chancre exudate for direct identification of *T. pallidum*.⁴⁰ However, this approach is no longer commonly used in clinical practice. The diagnosis of syphilis in all other clinical scenarios requires the combination of both treponemal (TT) and non-treponemal (NTT) serologic testing.⁴² Non-treponemal tests include rapid plasma reagin (RPR) and venereal disease research laboratory (VDRL). These tests are reported quantitatively as titers. The titers are followed serially to monitor for treatment response. A four-fold or greater decrease in dilutions demonstrates clinical cure. These tests are limited by multiple factors that can cause false positive results, including human immunodeficiency virus (HIV) co-infection, pregnancy, autoimmune conditions, injection drug use, and older age. There are many treponemal tests available, including the *T. pallidum* particle agglutination assay and automated immunoassays, such as chemiluminescence and enzyme immunoassays. These tests are only reported as reactive or nonreactive and typically remain positive after treatment, so

FIGURE 1. Syphilis Disease Progression



they cannot be utilized to differentiate active versus historical infections. Because of the limitations of each test, a combination of tests is necessary to establish the diagnosis of syphilis. Traditional testing algorithms use NTT first and a positive test reflexes to TT for confirmation. However, some institutions use a reverse testing algorithm, utilizing TT first, which is then reflexed to an NTT. If the NTT result is negative, then a second manual TT is performed.

Neurosyphilis diagnosis relies on multiple factors, including clinical presentation, physical examination, diagnostic serologic testing, cerebral spinal fluid (CSF) analysis, and occasionally imaging.⁴¹ If it can be completed, a positive CSF VDRL is diagnostic of neurosyphilis. However, the test's sensitivity has been reported to be as low as 48%, so a negative result does not definitively rule out neurosyphilis. Guidance on which individuals should undergo CSF examination is beyond the scope of this article.

Treatment

The treatment approach for syphilis is dependent on the disease stage (Table 5). Penicillin is the drug of choice to treat syphilis; however, specific doses, durations, and formulations of penicillin are dependent on the clinical scenario.⁹ Primary and secondary syphilis are managed the same, with benzathine penicillin G 2.4 million units administered intramuscularly (IM) as a single dose being the recommended first-line treatment. To determine optimal management of latent syphilis, patients must first be classified as early or late latent syphilis. Patients are classified as early latent syphilis if it can be confirmed that they acquired the infection within the previous 12 months. Late latent syphilis includes patients who have acquired the infection more than 12 months prior or if it is unknown when the infection was acquired. Patients with early latent syphilis are managed the same as primary and secondary syphilis with benzathine penicillin G 2.4 million units IM as a single dose. Late latent syphilis requires a longer treatment course, which includes three doses of benzathine penicillin G 2.4 million units IM administered weekly. Tertiary syphilis is also managed with this same regimen. Neurosyphilis, otosyphilis, and

TABLE 6. Doxycycline Post-Exposure Prophylaxis Trials

<i>Trial</i>	<i>Population</i>	<i>Patients</i>	<i>Significant Reductions</i>
IPERGAY ⁴⁷	Adult MSM, HIV PrEP	232	Chlamydia – 67% Syphilis – 70%
DoxyPEP ⁴⁸	Adult MSM, HIV or HIV PrEP, STI within 12 months	501	Chlamydia – 74% Gonorrhea – 55%
DOXYVAC ⁴⁹	Adult MSM, HIV PrEP, STI within 12 months	502	Chlamydia – 82% Syphilis – 76% Gonorrhea – 23%
dPEP-KE ⁵⁰	Women, HIV PrEP	449	None

HIV: human immunodeficiency virus, MSM: men who have sex with men, PrEP: pre-exposure prophylaxis, STI: sexually transmitted infection

ocular syphilis are all treated with crystalline aqueous penicillin G 3–4 million units intravenously (IV) every four hours for a ten-to-fourteen-day duration.⁴¹

Penicillin is very effective for the treatment of syphilis, with reported success rates in early stages reported to be 90 to 100%.^{43,44} Therefore, it is important to appropriately assess penicillin allergies to determine whether safe use of the first-line treatment is possible. Assessing penicillin allergies utilizing targeted questions to determine the type of reported reaction is an important service provided by pharmacists and pharmacy extenders.⁴⁵ Patients with penicillin allergies may still be able to receive first-line treatment if, based on the allergy assessment, the patient's reaction is determined to be an adverse drug effect rather than an allergy. Additionally, based on the allergy assessment, it may be decided that the patient undergo an oral amoxicillin or penicillin challenge or penicillin skin testing to determine if it is safe for the patient to receive penicillin.³³ However, if a patient has a life threatening IgE mediated allergy and is not able to receive first-line treatment, doxycycline 100 mg orally twice daily for 14 days for early syphilis (primary, secondary, or early latent) or doxycycline 100 mg orally twice daily for 28 day for late syphilis (late latent or tertiary) can be utilized as an alternative regimen.⁹ It is important to know that pregnant patients being treated for syphilis should only receive first-line treatment with penicillin. If these patients have a life-threatening penicillin allergy, they must be desensitized to be able to receive penicillin. Treatment of neurosyphilis, otosyphilis, and ocular syphilis with alternative regimens is beyond

the scope of this review.

Additional Considerations

Patients may experience Jarisch-Herxheimer reactions after treatment, which is an inflammatory response that can include symptoms such as fever, chills, headache, myalgias, and rash.⁴⁰ These reactions most often happen in patients who are being treated in the primary or secondary stage of syphilis. The symptoms can often be managed with over-the-counter fever-reducing and pain management agents. If a multidose regimen is indicated for treatment, doses can be given up to 14 days apart, but any longer interval between doses warrants restarting the treatment regimen.⁹ Missed doses are not allowed when treating pregnant patients who warrant a multidose regimen. If a dose is missed, even by one day, the treatment regimen must be restarted. All patients diagnosed with syphilis should also be tested for HIV. Additionally, if they are diagnosed with early-stage syphilis (primary, secondary, or early latent), their recent sex partners should undergo necessary testing as well. The patient should have follow-up NTT testing at least 6 and 12 months after treatment to assess treatment response and clinical cure.

Post-Exposure Prophylaxis

In June of 2024, the CDC published new recommendations for the use of doxycycline as post-exposure prophylaxis (PEP) for bacterial STIs.⁴⁶ For gay, bisexual, other MSM, and transgender women (TGW) who have had at least one bacterial STI in the previous year, the potential benefits and harms of doxycycline PEP should be discussed. If prescribed,

doxycycline 200 mg PO once is to be taken by self-administration as soon as possible within 72 hours of having oral, vaginal, or anal sex with a maximum dose of 200 mg every 24 hours. A prescription should account for enough doses based on the patient's sexual history. Providers should reassess this need every 3 to 6 months.

This recommendation was based on the results of four randomized clinical trials, the IPERGAY, DoxyPEP, DOXYVAC, and dPEP-KE (Table 6).⁴⁷⁻⁵⁰ These trials (except dPEP-KE) largely focused on high-risk MSM and TGW. The only trial examining doxycycline PEP in cisgender women was the dPEP-KE trial, and it found no significant reduction in the acquisition of bacterial STIs.⁵⁰ In the dPEP-KE trial, adherence to the doxycycline intervention was low; however, it appears that the overall lower incidence of STIs in this population relative to the MSM and TGW community may have played a part.

These same trials (Table 6) examined the safety of doxycycline PEP, namely grade 1-3 adverse effects and treatment discontinuation. Apart from gastrointestinal adverse events, serious events were rare. The risk of collateral damage should also be considered, such as the development of resistance to other commensal organisms and to chlamydia and gonorrhea specifically. In practice, pharmacists should be generally aware of doxycycline PEP for STIs, the benefits documented in the literature, the potential harms, and, most importantly, the populations that may derive the greatest benefit. Each of these categories is ripe for further study that could potentially lead to changes in CDC recommendations moving forward.

Conclusion

STIs are frequently encountered infectious diseases in a variety of healthcare settings. Therefore, it is important for pharmacists to be familiar with the diagnosis and treatment of gonorrhea, chlamydia, and syphilis, no matter their practice site. Pharmacists can be especially influential in promoting and helping to access EPT. Pharmacists are well-positioned to optimize management of patients with sexually transmitted infections, which is important to minimize the public health impact of these diseases.

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References

1. STI - Cases by Year (US 2014-2023). Centers for Disease Control and Prevention. Sexually Transmitted Infections Surveillance 2023. Atlanta: US Department of Health and Human Services; 2024.
2. Leichter JS, Haderkhanaj LT, Obafemi OA. Increasing sexually transmitted infections among adolescents in the USA. *Lancet Child Adolesc Health*. 2021; 5(9):609-611. doi: 10.1016/S2352-4642(21)00191-7.
3. CT - Rates by Year (US 1984-2023) Centers for Disease Control and Prevention. Sexually Transmitted Infections Surveillance 2023. Atlanta: US Department of Health and Human Services; 2024.
4. Wisconsin Sexually Transmitted Infections (STIs) Surveillance Data. Wisconsin DHS 2023.
5. U.S. Preventive Services Task Force. Screening for chlamydia and gonorrhea: U.S. Preventive Services Task Force recommendation statement. *JAMA*. 2021
6. Knodel LC, Duhon B, Argamany J. Sexually Transmitted Diseases. In: DiPiro JT, Talbert RL, Yee GC, Matzke GR, Wells BG, Posey L, eds. *Pharmacotherapy: A Pathophysiologic Approach*, 10e. McGraw-Hill Education; 2017.
7. Meyer T. Diagnostic procedures to detect *Chlamydia trachomatis* infections. *Microorganisms*. 2016;4(3):25. doi: 10.3390/microorganisms4030025
8. Papp JR, Schachter J, Gaydos C, et al. Recommendations for the laboratory-based detection of *Chlamydia trachomatis* and gonorrhoeae—2014. *MMWR Recomm Rep*. 2014;63(RR02):1-19.
9. Workowski KA, Bachmann LH, Chan PA, et al. Sexually transmitted infections treatment guidelines. *MMWR Recomm Rep*. 2021;70(4):1-187.
10. Dombrowski JC, Wierzbicki MR, Newman LM, et al. Doxycycline versus azithromycin for the treatment of rectal chlamydia in men who have sex with men: A randomized controlled trial. *Clin Infect Dis*. 2021;73(5):824-831. doi: 10.1093/cid/ciab153.
11. Kong FY, Tabrizi SN, Law M, et al. Azithromycin versus doxycycline for the treatment of genital chlamydia infection: A meta-analysis of randomized controlled trials. *Clin Infect Dis*. 2014;59(2):193-205. doi: 10.1093/cid/ciu220.
12. Ridelman D, Heisler S, Groves A. Adherence to doxycycline for uncomplicated genitourinary chlamydia: A prospective observational study. *J Am Coll Emerg Physicians Open*. 2024;5(2):e13137. doi: 10.1002/emp2.13137.
13. Shiyong H, Tao G, Pearson WS, et al. Treatment of chlamydia and gonorrhea in primary care and its patient-level variation: an American family cohort study. *Ann Fam Med*. 2025;23(2):136-144. doi: 10.1370/afm.240164.
14. Centers for Disease Control and Prevention. Sexually Transmitted Infections Surveillance 2024 (Provisional). Atlanta: U.S. Department of Health and Human Services; 2025.
15. Pagaoa M, Grey J, Torrone E, Kreisel K, Stenger M, Weinstock H. Trends in nationally notifiable sexually transmitted disease case reports during the US COVID-19 pandemic, January to December 2020. *Sex Transm Dis*. 2021;48(10):798-804. doi: 10.1097/OLQ.0000000000001506.
16. Wright SS, Kreisel KM, Hitt JC, Pagaoa MA, Weinstock HS, Thorpe PG. Impact of the COVID-19 pandemic on Centers for Disease Control and Prevention-funded sexually transmitted disease programs. *Sex Transm Dis*. 2022;49(4):e61-e63. doi: 10.1097/OLQ.0000000000001506
17. Chan PA, Robinette A, Montgomery M, et al. Extragenital infections caused by *Chlamydia trachomatis* and *Neisseria gonorrhoeae*: a review of the literature. *Infect Dis Obstet Gynecol*. 2016;2016:5758387. doi: 10.1155/2016/5758387.
18. Van Liere GA, Hoebe CJ, Niekamp AM, Koedijk FD, Dukers-Muijers NH. Standard symptom- and sexual history-based testing misses anorectal *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections in swingers and men who have sex with men. *Sex Transm Dis*. 2013;40(4):285-9. doi: 10.1097/OLQ.0b013e31828098f8.
19. Peters RP, Dubbink JH, van der Eem L, et al. Cross-sectional study of genital, rectal, and pharyngeal chlamydia and gonorrhea in women in rural South Africa. *Sex Transm Dis*. 2014;41(9):564-9. doi: 10.1097/OLQ.000000000000175.
20. Pilatz A, Hossain H, Kaiser R, et al. Acute epididymitis revisited: impact of molecular diagnostics on etiology and contemporary guideline recommendations. *Eur Urol*. 2015;68(3):428-35. doi: 10.1016/j.eururo.2014.12.005.
21. Eschenbach DA, Buchanan TM, Pollock HM, et al. Polymicrobial etiology of acute pelvic inflammatory disease. *N Engl J Med*. 1975;293(4):166-71. DOI: 10.1056/NEJM197507242930403
22. Heumann CL, Quilter LA, Eastment MC, et al. Adverse birth outcomes and maternal *Neisseria gonorrhoeae* infection: a population-based cohort study in Washington state. *Sex Transm Dis*. 2017; 44(5):266-271. doi: 10.1097/OLQ.0000000000000592.
23. Gao R, Liu B, Yang W, et al. Association of maternal sexually transmitted infections with risk of preterm birth in the United States. *JAMA Netw Open* 2021; 4(11):e2133413. doi:10.1001/jamanetworkopen.2021.33413

24. Galega FP, Heymann DL, Nasah BT. Gonococcal ophthalmia neonatorum: the case of prophylaxis in tropical Africa. *Bull World Health Organ.* 1984;62(1):95-8.
25. Fransen L, Nsaze H, Klaus V, et al. Ophthalmia neonatorum in Nairobi, Kenya, the role of *Neisseria gonorrhoea* and *Chlamydia trachomatis*. *J Infect Dis.* 1986;153(5):862-9. doi: 10.1093/infdis/153.5.862.
26. Centers for Disease Control and Prevention. Antibiotic resistance threats in the United States, 2019. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2019
27. World Health Organization GLASS Dashboard. https://worldhealthorg.shinyapps.io/glass-dashboard/_w_d1860bdb6e6547c7ae5fb5d7340f3528/#/amr. Accessed 11/19/2025.
28. Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines. *MMWR.* 2010;59(No. RR-12):[49-55]
29. Chen MY, Stevens K, Tideman R, et al. Failure of 500 mg of ceftriaxone to eradicate pharyngeal gonorrhoea, Australia. *J Antimicrob Chemother.* 2013;68(6):1445-7. doi: 10.1093/jac/dkt017.
30. Tapsall J, Read P, Carmody C, et al. Two cases of failed ceftriaxone treatment in pharyngeal gonorrhoea verified by molecular microbiological methods. *J Med Microbiol* 2009;58(pt.5):683-7. doi: 10.1099/jmm.0.007641-0.
31. Ohnishi M, Saika T, Hoshina S, et al. Ceftriaxone-resistant *Neisseria gonorrhoeae*, Japan. *Emerg Infect Dis.* 2011;17(1):148-9. doi: 10.3201/eid1701.100397.
32. St. Cyr S, Barbee L, Workowski KA, et al. Update to CDC's Treatment guidelines for gonococcal infection, 2020. *MMWR Morb Mortal Wkly Rep* 2020;69:1911-1916. doi: <http://dx.doi.org/10.15585/mmwr.mm6950a6>
33. Khan DA, Banerji A, Blumenthal KG, et al. Drug allergy: A 2022 practice parameter update. *J Allergy Clin Immunol.* 2022;150(6):1333-1393. doi: 10.1016/j.jaci.2022.08.028
34. Chisholm SA, Mouton JW, Lewis DA, et al. Cephalosporin MIC creep among gonococci: time for a pharmacodynamic rethink? *J Antimicrob Chemother.* 2010;65(10):2141-8. doi: 10.1093/jac/dkq289
35. Connolly KL, Eakin AE, Gomez C, et al. Pharmacokinetic data are predictive of in vivo efficacy for cefixime and ceftriaxone against susceptible and resistant *Neisseria gonorrhoeae* strains in the gonorrhea mouse model. *Antimicrob Agents Chemother.* 2019;63(3):e01644-18. doi: 10.1128/AAC.01644-18.
36. Blumer JL, Reed MD, Kaplan EL, Drusano GL. Explaining the poor bacteriologic eradication rate of single-dose ceftriaxone in group A streptococcal tonsillopharyngitis: a reverse engineering solution using pharmacodynamic modeling. *Pediatrics.* 2005;116(4):927-32. doi: 10.1542/peds.2004-2294.
37. Moran JS, Levine WC. Drugs of choice for the treatment of uncomplicated gonococcal infections. *Clin Infect Dis.* 1995;20(Suppl 1):S47-65. doi: 10.1093/clinids/20.supplement_1.s47
38. Wisconsin Department of Health Services. Expedited Partner Therapy for Chlamydia Trachomatis Infection, Neisseria Gonorrhoeae Infection, and Trichomoniasis: Guidance for Health Care Professionals in Wisconsin. Published October 2023. Updated July 16, 2025. Accessed November 18, 2025. <https://www.dhs.wisconsin.gov/std/health-pros.html>
39. Golden MR, Kerani RP, Stenger M, et al. Uptake and population-level impact of expedited partner therapy (EPT) on Chlamydia trachomatis and Neisseria gonorrhoeae: the Washington State community-level randomized trial of EPT. *PLoS Med.* 2015;12(1):e1001777. doi: 10.1371/journal.pmed.1001777
40. Chevalier FJ, Bacon O, Johnson KA, Cohen SE. Syphilis: A review. *JAMA.* 2025;334(21):1927-1940. doi:10.1001/jama.2025.17362
41. Hamill MM, Ghanem KG, Tuddenham S. State-of-the-Art review: Neurosyphilis. *Clin Infect Dis.*2024;78(15): e57-e68. doi: 10.1093/cid/ciad437.
42. Satyaputra F, Hendry S, Braddick M, Sivabalan P, Norton R. The laboratory diagnosis of syphilis. *J Clin Microbiol.* 2021;59(10):e0010021. doi: 10.1128/JCM.00100-21.
43. Clement ME, Okeke NL, Hicks CB. Treatment of syphilis: a systematic review. *JAMA.* 2014;312(18):1905-1917. doi: 10.1001/jama.2014.13259.
44. Janier M, Unemo M, Dupin N, Tiplica GS, Potočník M, Patel R. 2020 European guideline on the management of syphilis. *J Eur Acad Dermatol Venereol.* 2021;35(3):574-588. doi: 10.1111/jdv.16946.
45. Harper HM, Sanchez M. Review of pharmacist driven penicillin allergy assessments and skin testing: a multi-center case-series. *Hosp Pharm.* 2022;57(4):469-473. doi: 10.1177/00185787211046862.
46. Bachmann LH, Barbee LA, Chan P, et al. CDC clinical guidelines on the use of doxycycline postexposure prophylaxis for bacterial sexually transmitted infection prevention, United States, 2024. *MMWR Recomm Rep.* 2024;73(No. RR-2):1-8. doi: <http://dx.doi.org/10.15585/mmwr.r7302a1>
47. Molina JM, Charreau I, Chidiac C, et al.; ANRS IPERGAY Study Group. Post-exposure prophylaxis with doxycycline to prevent sexually transmitted infections in men who have sex with men: an open-label randomised substudy of the ANRS IPERGAY trial. *Lancet Infect Dis.* 2018;18(3):308-17. doi: 10.1016/S1473-3099(17)30725-9
48. Luetkemeyer AE, Donnell D, Dombrowski JC, et al. Postexposure doxycycline to prevent bacterial sexually transmitted infections. *N Engl J Med.* 2023;388(14):1296-306. doi: 10.1056/NEJMoa2211934.
49. Molina JM, Bercos B, Assoumou L, et al. Doxycycline prophylaxis and meningococcal group B vaccine to prevent bacterial sexually transmitted infections in France (ANRS 174 DOXYVAC): a multicentre, open-label, randomized trial with a 2x2 factorial design. *Lancet Infect Dis.* 2024;24(10):1093-1104. doi: 10.1016/S1473-3099(24)00236-6.
50. Stewart J, Oware K, Donnell D, et al. dPEP Kenya Study Team. dPEP Kenya Study Team. Doxycycline prophylaxis to prevent sexually transmitted infections in women. *N Engl J Med.* 2023;389(25):2331-40. doi: 10.1056/NEJMoa2304007.
- a. True
b. False
2. HS is a 19-year-old female with no past medical history who presents with complaints of dysuria. A Chlamydia NAAT from a urogenital site is positive. Which of the following would be the best treatment regimens for patient HS per the 2021 CDC guidelines?
a. Azithromycin 1 g by mouth once
b. Azithromycin 500 mg by mouth once, then 250 mg by mouth daily for days 2-5
c. Doxycycline 100 mg by mouth twice daily for seven days
d. Ceftriaxone 500 mg intramuscularly once
3. In which of the following scenarios would it be **inappropriate** to furnish a patient with an expedited partner therapy (EPT) prescription?
a. A patient being treated for syphilis
b. A patient with multiple sexual partners
c. A patient with trichomoniasis
d. A patient with a partner who has an allergy to azithromycin
4. **True or False:** The Gonococcal Isolate Surveillance Project (GISP) has established an "alert value" MIC of ≥ 0.125 mcg/mL for *Neisseria gonorrhoea* and IM Ceftriaxone.
a. True
b. False
5. Which of the following is the first-line treatment option for a 75 kg male with uncomplicated urethral gonorrhoea according to the CDC?
a. Ceftriaxone 250 mg IM ONCE
b. Ceftriaxone 500 mg IM ONCE
c. Ceftriaxone 750 mg IM ONCE
d. Ceftriaxone 1 g IM ONCE
6. You believe that you have a patient experiencing treatment failure for *Neisseria gonorrhoea* of the urethra and pharynx after receiving a 500 mg IM dose of ceftriaxone. Which of the following is NOT one of the next steps to take?
a. Immediately administer gentamicin 240 mg IM ONCE and azithromycin 2g PO ONCE
b. Notify your local health department
c. Prepare to obtain cultures in coordination with your local health department
d. Retreat with 500 mg IM ONCE after obtaining cultures
7. Which of the following correctly describes the prevalence of sexually transmitted infections in the state of Wisconsin from highest prevalence to lowest prevalence?

Assessment Questions

Pharmacist Assessment Questions

1. **True or False:** All sexually active women under 25 years of age should be routinely screened for *Chlamydia trachomatis* regardless of symptoms.
7. Which of the following correctly describes the prevalence of sexually transmitted infections in the state of Wisconsin from highest prevalence to lowest prevalence?

- a. Chlamydia, Gonorrhea, Syphilis
 - b. Chlamydia, Syphilis, Gonorrhea
 - c. Syphilis, Chlamydia, Gonorrhea
 - d. Gonorrhea, Chlamydia, Syphilis
8. Which of the following clinical presentations matches appropriately with the stage of syphilis?
- a. Primary syphilis: gummatous lesions
 - b. Secondary syphilis: maculopapular rash
 - c. Latent syphilis: chancre at site of infection
 - d. Tertiary syphilis: asymptomatic
9. What is the treatment of choice for a pregnant patient diagnosed with secondary syphilis who reports a penicillin allergy, but upon further questioning, her reaction is that she gets yeast infections when receiving antibiotics?
- a. Doxycycline 100 mg PO twice daily x 14 days
 - b. Benzathine penicillin G 2.4 million units IM x 1 dose
 - c. Benzathine penicillin G 2.4 million units IM weekly x 3 doses
 - d. Ceftriaxone 2 g IV q 24 hours x 14 days

Technician Assessment Questions

1. **True or False:** All sexually active women under 25 years of age should be routinely screened for *Chlamydia trachomatis* regardless of symptoms.
- a. True
 - b. False
2. In which of the following scenarios would it be **inappropriate** to furnish a patient with an expedited partner therapy (EPT) prescription?
- a. A patient being treated for syphilis
 - b. A patient with multiple sexual partners
 - c. A patient with trichomoniasis
 - d. A patient with a partner who has an allergy to azithromycin
3. **True or False:** The Gonococcal Isolate Surveillance Project (GISP) has established an "alert value" MIC of ≥ 0.125 mcg/mL for *Neisseria gonorrhoea* and IM Ceftriaxone.
- a. True
 - b. False
5. Which of the following correctly describes the prevalence of sexually transmitted infections in the state of Wisconsin from highest prevalence to lowest prevalence?
- a. Chlamydia, Gonorrhea, Syphilis
 - b. Chlamydia, Syphilis, Gonorrhea
 - c. Syphilis, Chlamydia, Gonorrhea
 - d. Gonorrhea, Chlamydia, Syphilis

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FACT or FALLACY

Co-administration of Albumin with Furosemide to Overcome Diuretic Resistance in Critically Ill Patients

by Meagan Macalalag, PharmD, Jeffrey Fish, PharmD, BCCCP, FCCM

QUESTION

Should albumin be co-administered with furosemide to overcome diuretic resistance in critically ill patients?

One of the many complexities of critically ill patients is their dynamic fluid requirements, making fluid management a challenging aspect in the intensive care unit (ICU). While patients may present with volume overload, some may develop it as a result of fluid resuscitation, a common ICU intervention. Volume restriction and diuretics are the mainstay for fluid management in critically ill patients. Nearly 50% of ICU admissions will receive diuretics, most commonly loop diuretics, with furosemide accounting for more than 90%.¹ Patients will have varying degrees of volume overload and diuretic response, two considerations that will dictate the ability to optimize fluid balance. Diuretic resistance may occur in critically ill patients and is often observed in patients with congestive heart failure, liver cirrhosis, and chronic kidney disease. It is generally defined as the failure to achieve therapeutically desired outcomes, such as urine output, given an inadequate response to diuretics.²⁻⁴ Despite this consensus, there is no universally accepted metric to quantify diuretic resistance.

Studies have proposed various mechanisms of diuretic resistance in critically ill patients. One proposed mechanism is that low intravascular volume can lead to diminished renal perfusion, ultimately decreasing the concentration of drug delivered to its site of action.⁵⁻⁷ Organic acids, such as nonsteroidal anti-inflammatory drugs or lactic acid, can contribute to couple mechanisms of diuretic resistance. Accumulation of organic acids can decrease the concentration of drug delivered to its site of action by reducing renal perfusion through vasoconstriction of afferent arterioles and by impairing diuretic secretion through competitive inhibition of organic anion transporters.⁶ The most referenced mechanism of diuretic resistance in critically ill patients is hypoalbuminemia. Loop diuretics primarily enter the renal tubule via proximal tubular secretion rather than glomerular filtration, given their high plasma protein-binding affinity.² Despite both processes requiring unbound drug, each process handles it differently. Glomerular filtration is a passive process that freely filters unbound drug in the glomerulus. However, proximal tubular secretion is a selectively active process

that requires transporters. Although only unbound drug can be transported, protein-bound drug serves as a reservoir, preventing rapid drug clearance, maintaining the release of drug for secretion, and ensuring delivery of effective drug concentrations to its site of action. Since loop diuretics are highly protein-bound, there is a decrease in diuretic concentration that is secreted in the proximal tubule in patients who have low serum albumin concentrations.⁵⁻⁸ As a result of the increase in unbound drug, glomerular filtration becomes more prominent, and the diuretic response is paradoxically reduced. While all loop diuretics are highly protein-bound, current evidence largely explores the effects of serum albumin specifically on furosemide.

Literature Review and Evidence Summary

The proposal that co-administration of furosemide and albumin could increase the diuretic response in hypoalbuminemic patients stemmed from an earlier 1987 study that demonstrated a parallel relationship between serum albumin concentration and furosemide potency

in both animal and human models.⁹ Approximately 95% of furosemide binds to albumin, therefore increasing serum albumin concentration may facilitate diuresis with furosemide. Albumin prevents filtration of furosemide in the glomerulus, which may decrease its volume of distribution and increase its renal delivery, maximizing the concentration of furosemide delivered to the proximal tubule.⁷ Albumin may also expand intravascular volume through regulation of intravascular oncotic pressure. Given the physiological theories and the high utilization of furosemide in the ICU, co-administration of albumin with furosemide is frequently employed in clinical practice. However, the census of high-quality, prospective, randomized controlled trials is limited. Much of the evidence exploring this proposed strategy has been done in specific patient populations, including those with liver cirrhosis, nephrotic syndrome, acute lung injury, hypoalbuminemia of various etiologies, and critically ill patients.

A 2005 prospective study by Martin et al., including forty hypoalbuminemic patients with acute lung injury, sought to determine whether co-administration of furosemide and albumin would improve respiratory function compared with furosemide alone.¹⁰ It included mechanically ventilated patients with a serum total protein concentration < 6 g/dL. The treatment protocol entailed patients receiving 25 g of 25% albumin intravenously, a loading dose of furosemide 20 mg intravenously, followed by a continuous infusion of furosemide for 72 hours, titrated to a net negative fluid balance and weight loss of at least 1 kg/day. Subsequent doses of albumin were administered every 8 hours for the duration of the treatment period. The initial mean serum albumin concentration was 1.7 g/dL. Patients receiving albumin had a mean increase of 1.3 g/dL in serum albumin concentration over 72 hours, compared with a mean increase of 0.3 g/dL in the control group ($p < 0.001$). Patients who received albumin and furosemide experienced a significant improvement in oxygenation, evidenced by the increase in PaO₂/FiO₂ ratio at 24 hours (+43 mmHg vs -24 mmHg; $p < 0.01$). Despite demonstrating that patients who received albumin had a greater net negative fluid balance at the end of the

treatment period (-5480 mL vs -1490 mL; $p < 0.01$), it is difficult to postulate whether albumin augmented diuretic response since patients in the control group received an equivalent volume of 0.9% sodium chloride as placebo with furosemide and required more fluid boluses to compensate for hypotensive episodes. Notably, there were no statistically significant effects on ventilator-free days or mortality.¹⁰

A 2014 systematic review by Oczkowski and Mazzetti evaluated whether colloids administered with diuretics improved diuresis in critically ill patients without shock.¹¹ Only two randomized controlled trials met their inclusion criteria. Despite already having a small sample size of forty patients, the prospective study by Martin et al. was the larger of the two studies.¹⁰ The second study by Makhoul et al. dates to 1997 and included thirty mechanically ventilated patients with congestive heart failure.¹² Patients were randomized to receive either intermittent doses of furosemide 1 mg/kg, continuous infusion of furosemide at 0.1 mg/kg/hour with an initial 1 mg/kg dose, or continuous infusion of furosemide 250 mg diluted with 12.5 g albumin at 0.1 mg/kg/hour. There was no statistically significant difference in urine output between groups.¹² Based on these two trials alone, there was insufficient evidence to support a clinically significant benefit with routine co-administration of albumin. Given the specific patient population of these trials and the paucity of evidence, the FADE trial was completed in 2018 by Oczkowski et al. to investigate the feasibility of a larger randomized controlled trial assessing whether albumin co-administered with furosemide would enhance diuresis and facilitate liberation from mechanical ventilation in critically ill patients with hypoalbuminemia, defined as a serum albumin concentration < 3 g/dL.¹³ Forty-five patients were randomized to receive furosemide with either 25% albumin or 0.9% sodium chloride twice daily for 72 hours. Furosemide dosing and route of administration were at the discretion of the clinical team. Unfortunately, the study did not meet its feasibility criteria, but the limited data provided no evidence that co-administration of albumin improved clinical outcomes, such as fluid balance, urine output, ventilator-free days, or mortality, despite increasing serum albumin

concentrations.¹³

Systematic reviews and meta-analyses have been conducted to assess the clinical efficacy of co-administering albumin with furosemide to overcome diuretic resistance. A 2014 meta-analysis by Kitsios et al. systematically reviewed 10 randomized controlled trials.¹⁴ It included heterogeneous patient populations in terms of index disease, ranging from patients with chronic kidney disease, nephrotic syndrome, liver cirrhosis, and acute lung injury. It demonstrated a statistically significant increase in urine output at 8 hours after co-administration of furosemide with albumin. The net difference in urine output at 8 hours was 231 mL (95% CI 135.5-326.5). However, there was no statistically significant difference in urine output at 24 hours after co-administration of furosemide with albumin, suggesting that there may be no difference in fluid balance at the end of the day despite a dose of albumin. Furosemide was administered at doses ranging from 20 mg to 220 mg, and albumin at doses ranging from 6 g to 40 g. Seven of the studies specified the albumin concentration, which varied between 20% or 25%. Notably, studies that detected significant diuretic effects used doses of furosemide below 60 mg, whereas those that used higher doses failed to report significant findings.¹⁴

A 2021 updated systematic review and meta-analysis by Lee et al. exploring the diuretic effect of furosemide and albumin co-administration compared to furosemide alone reviewed 13 randomized controlled trials.¹⁵ Reported furosemide doses ranged between 20 mg and 160 mg, and albumin doses ranged between 6 g and 40 g of either 20% or 25% concentrations. Co-administration of albumin with furosemide increased the mean hourly urine output rate by 31.45 mL/hour (95% CI 19.30-43.59). Lee et al. performed a sensitivity analysis to assess the strength of their findings and a subgroup analysis to explore treatment heterogeneity. Based on their subgroup analysis, there was a significantly greater diuretic effect after co-administration of albumin with furosemide in patients with a baseline serum albumin concentration < 2.5 g/dL compared with those with ≥ 2.5 g/dL ($p = 0.04$). The subgroup analysis further showed that the hourly urine output rate was significantly higher during

the initial 12 hours compared with after 12 hours of administration ($p = 0.01$).¹⁵ The most recent study included in this systematic review and meta-analysis was a 2020 prospective study by Mahmoodpoor et al. that aimed to determine whether co-administration of albumin with furosemide enhances diuretic effect in critically ill patients with hypoalbuminemia, defined as a serum albumin concentration < 4 g/dL.⁶ Forty-nine patients received either 20 mg furosemide mixed with 100 mL of 0.45% sodium chloride or 100 mL of 20% albumin. Urinary excretion of furosemide, measured as an indicator of diuretic efficacy, was significantly higher in patients who received albumin at 2 hours post-infusion; however, this effect was not sustained at 4 hours, 6 hours, or 8 hours post-infusion.⁶

The International Collaboration for Transfusion Medicine Guidelines (ICTMG) released a guideline on the use of intravenous albumin in 2024, which sought to provide evidence-based recommendations for the appropriate use of albumin in specific patient populations.¹⁶ There were 3 recommendations made for adult critical care patients, all of which were against the use of albumin. In critically ill adult patients, albumin was not recommended as first-line volume replacement, to increase serum albumin levels, or in conjunction with diuretics to remove extravascular fluid. Given the paucity of supportive evidence, the recommendation from ICTMG does not support routine co-administration of furosemide and albumin to overcome diuretic resistance in all patients.¹⁶

It is important to acknowledge significant disparities across these studies, including patient populations, definitions of hypoalbuminemia, furosemide and albumin regimens, placebo fluid administration, and volume status. However, there are still a few clinical takeaways. Current evidence highlights that volume expansion and diuresis were transient. Despite the prominent diuretic effect that was demonstrated shortly after co-administration of albumin with furosemide, the increase in urine production was not sustained. Based on available studies, diuresis was notably more pronounced when lower doses of furosemide were administered with albumin. At higher doses of furosemide (> 60 mg), the benefit of albumin diminished. There are two

plausible physiological theories to support this: saturation of transporters for proximal tubular secretion or the ceiling effect of furosemide.⁴ There is insufficient evidence demonstrating that all patients will benefit from co-administration of furosemide and albumin. However, patients with a baseline serum albumin concentration < 2.5 g/dL experienced a more pronounced diuretic effect, suggesting that this patient population may be appropriate for co-administration of albumin with furosemide. Findings from these studies also suggest strategies that may mitigate the need for albumin, such as optimizing furosemide dosing and frequency, switching to a different loop diuretic, or combining diuretics from different classes. In addition to these clinical insights, current evidence has not demonstrated a correlation between the physiological rationale supporting this strategy and patient-important outcomes. Available studies had small sample sizes and brief durations, both of which limit the ability to evaluate ventilator-free days, length of stay, mortality, and other long-term effects. Large-scale clinical trials are necessary to determine whether these findings translate into improved, sustained long-term outcomes. Furthermore, a cost-effectiveness analysis would address economic considerations given the high cost of albumin.

Evidence-Based Recommendation

Studies have not conclusively demonstrated a clinically significant diuretic effect when albumin is co-administered with furosemide for overcoming diuretic resistance. Co-administration of furosemide and albumin should not be a routine practice to augment diuresis, which aligns with the recommendation from ICTMG. Albumin might be considered in hypoalbuminemic patients with a serum albumin concentration < 2.5 g/dL. Hyper-oncotic albumin solutions with a concentration of 20% or 25% would be most appropriate when considering albumin for diuretic resistance in this patient population. There are many variations in albumin dosing based on these studies, including both fixed and weight-based dosing (0.5 g/kg), but it may be reasonable to use fixed dosing (12.5 g

or 25 g) from a cost perspective, given its limited benefit.¹⁰⁻¹⁵ Albumin administration has limitations, including the risk of hypersensitivity reactions, concerns about hypervolemia or hemodilution, and higher cost.¹⁷ There are strategies that may mitigate the need for albumin and may be more cost-effective than the addition of albumin, such as optimizing furosemide dosing and frequency, switching to a different loop diuretic, or combining diuretics from different classes. Critically ill patients may require higher doses of furosemide as a consequence of the pathophysiological changes associated with critical illness that impair the secretion of furosemide in the proximal tubule. If higher intermittent bolus doses of furosemide are insufficient, transitioning to a continuous infusion of furosemide may be considered to achieve sustained diuresis. Different loop diuretics, such as bumetanide and torsemide, can potentially overcome diuretic resistance because of their higher potency compared to furosemide. Sequential nephron blockage from combination diuretic therapies may be an effective strategy if loop diuretics as monotherapy are ineffective. A common combination is a loop diuretic and a thiazide diuretic, but other classes of diuretics to consider include aldosterone antagonists and carbonic anhydrase inhibitors.

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References

1. McCoy IE, Chertow GM, Chang TIH. Patterns of diuretic use in the intensive

care unit. *PLoS One*. 2019;14(5):e0217911. doi:10.1371/journal.pone.0217911

2. Hoorn EJ, Ellison DH. Diuretic resistance. *Am J Kidney Dis*. 2017;69(1):136-142. doi:10.1053/j.ajkd.2016.08.027

3. Mullens W, Damman K, Harjola VP, et al. The use of diuretics in heart failure with congestion: a position statement from the Heart Failure Association of the European Society of Cardiology. *Eur J Heart Fail*. 2019;21(2):137-155. doi:10.1002/ehf.1369

4. Wilcox CS, Testani JM, Pitt B. Pathophysiology of diuretic resistance and its implications for the management of chronic heart failure.

Hypertension. 2020;76(4):1045-1054. doi:10.1161/HYPERTENSIONAHA.120.15205

5. Duffy M, Jain S, Harrell N, Kothari N, Reddi AS. Albumin and furosemide combination for management of edema in nephrotic syndrome: a review of clinical studies. *Cells*. 2015;4(4):622-630. doi:10.3390/cells4040622

6. Mahmoodpoor A, Zahedi S, Pourakbar A, et al. Efficacy of furosemide-albumin compared with furosemide in critically ill hypoalbuminemia patients admitted to intensive care unit: a prospective randomized clinical trial. *DARU J Pharm Sci*. 2020;28(1):263-269. doi:10.1007/s40199-020-00339-8

7. Vipler BS, Barelski AM, Vipler EE. Things We Do for No Reason™: furosemide-albumin co-administration for diuretic resistance. *J Hosp Med*. 2024;19(11):1053-1056. doi:10.1002/jhm.13297

8. Joannidis M, Wiedermann CJ, Ostermann M. Ten myths about albumin. *Intensive Care Med*. 2022;48(5):602-605. doi:10.1007/s00134-022-06655-8

9. Inoue M, Okajima K, Itoh K, et al. Mechanism of furosemide resistance in analbuminemic rats and hypoalbuminemic patients. *Kidney Int*. 1987;32(2):198-203. doi:10.1038/ki.1987.192

10. Martin GS, Moss M, Wheeler AP, Mealer M, Morris JA, Bernard GR. A randomized, controlled trial of furosemide with or without albumin in hypoproteinemic patients with acute lung injury. *Crit Care Med*. 2005;33(8):1681-1687. doi:10.1097/01.CCM.0000171539.47006.02

11. Oczkowski SJW, Mazzetti I. Colloids to improve diuresis in critically ill patients: a systematic review. *J Intensive Care*. 2014;2(1):37. doi:10.1186/2052-0492-2-37

12. Makhoul N, Riad T, Friedstrom S, Zveibil FR. Frusemide in pulmonary oedema: continuous versus intermittent. *Clin Intensive Care*. 1997;8(6):273-276. doi:10.3109/tcic.8.6.273.276

13. Oczkowski SJW, Klotz L, Mazzetti I,

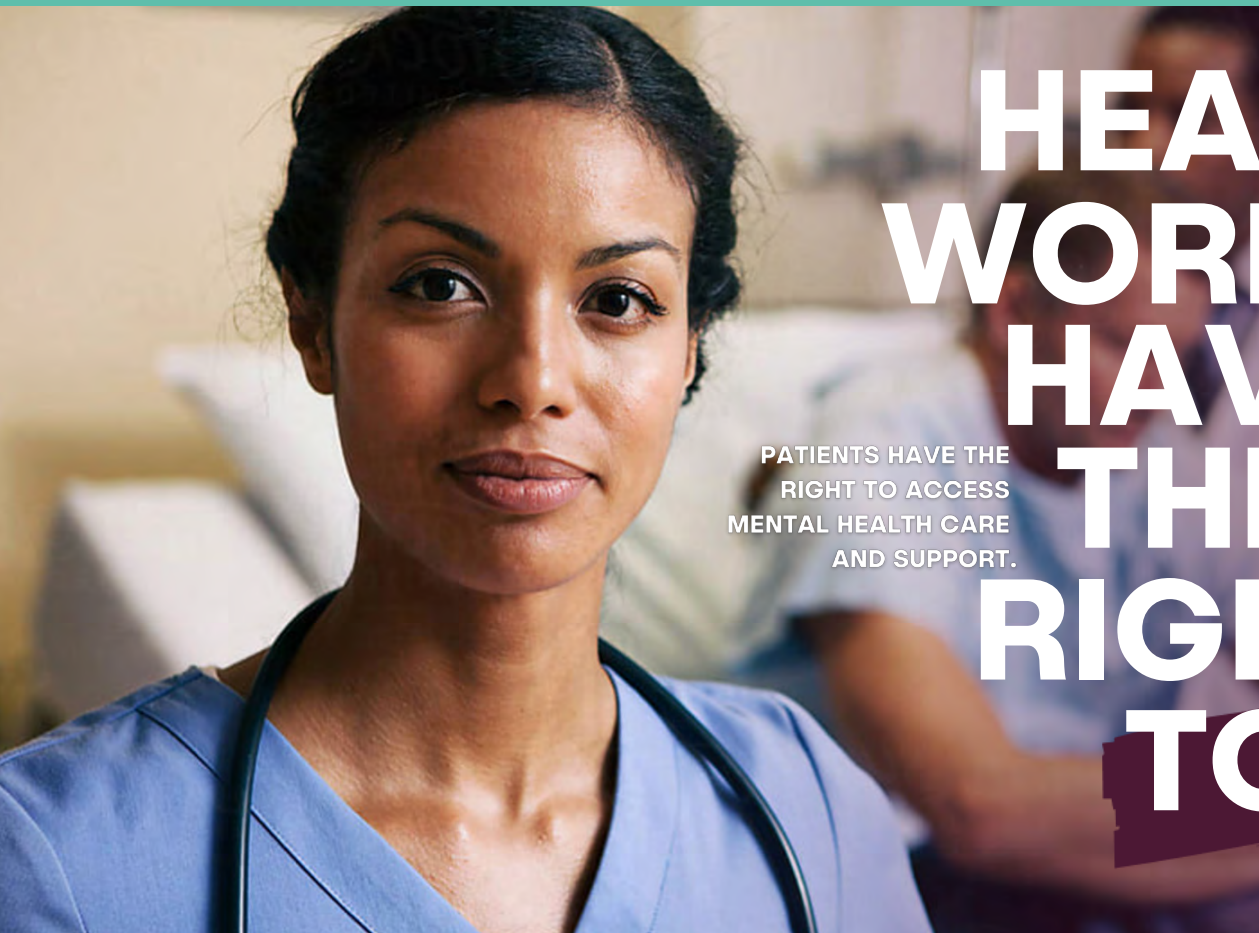
et al. Furosemide and albumin for diuresis of edema (FADE): a parallel-group, blinded, pilot randomized controlled trial. *J Crit Care*. 2018;48:462-467. doi:10.1016/j.jcrc.2018.07.020

14. Kitsios GD, Mascari P, Ettunsi R, Gray AW. Co-administration of furosemide with albumin for overcoming diuretic resistance in patients with hypoalbuminemia: a meta-analysis. *J Crit Care*. 2014;29(2):253-259. doi:10.1016/j.jcrc.2013.10.004

15. Lee TH, Kuo G, Chang CH, et al. Diuretic effect of co-administration of furosemide and albumin in comparison to furosemide therapy alone: an updated systematic review and meta-analysis. *PLoS One*. 2021;16(12):e0260312. doi:10.1371/journal.pone.0260312

16. Callum J, Skubas NJ, Bathla A, et al. Use of intravenous albumin: a guideline from the International Collaboration for Transfusion Medicine Guidelines. *CHEST*. 2024;166(2):321-338. doi:10.1016/j.chest.2024.02.049

17. Gales BJ, Erstad BL. Adverse reactions to human serum albumin. *Ann Pharmacother*. 1993;27(1):87-94. doi:10.1177/106002809302700119



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ID CORNER

What's New in the cUTI World?

by Bessma Dabaan, PharmD, MBA, Stacy Combs, PharmD, BCIDP, Amolee Patel, PharmD, BCPS, BCIDP

The 2025 Infectious Diseases Society of America (IDSA) guideline on complicated urinary tract infections (cUTI) represents a substantial evolution from earlier IDSA guidance, which focused primarily on uncomplicated cystitis and pyelonephritis in women. This new guideline reflects current antimicrobial stewardship principles and prioritizes patient-centered outcomes, including clinical response, recurrence of infection, adverse drug events, and the development and spread of antimicrobial resistance. This update also provides evidence-based support for optimized antimicrobial selection and duration of therapy in cUTI management.

A key foundational change in the 2025 guideline is the redefinition of uncomplicated versus complicated UTI, which directly influences antibiotic choice. Historically, uncomplicated UTI was limited to acute cystitis in afebrile, nonpregnant, premenopausal women with no diabetes and no urologic abnormalities. The new guidelines replace this definition with a site- and severity-based classification, recognizing uncomplicated UTI as an infection confined to the bladder in afebrile women or men. A complicated UTI is now defined as an infection beyond the bladder in either sex, including pyelonephritis, febrile or bacteremic UTIs, catheter-associated UTIs, and prostatitis. Importantly, comorbidities such as diabetes, advanced age, and immunocompromised status alone do not classify a UTI as complicated. The intent of this definition shift is to guide more appropriate antibiotic selection and duration, representing a major literature-based transition from earlier frameworks.

The four-step process for empiric therapy selection is a novel addition to the 2025 guideline and is particularly relevant to pharmacy-driven stewardship

interventions. This process is intended to serve as a framework for empirical antibiotic selection. The first step is assessing illness severity and determining whether sepsis is present. Step two builds on this by evaluating patient-specific risk factors, such as a history of multidrug-resistant organisms isolated from the urine in the previous 3-6 months. Step three focuses on patient-specific safety concerns, such as antibiotic allergies, contraindications, and drug-drug interactions, that are important to consider to prevent treatment-associated adverse drug events. The final step is the utilization of recent local antibiograms to guide further empiric selection, reserved for patients with sepsis. This is the first formal decision-making algorithm for empiric antimicrobial therapy in UTIs developed by the IDSA.

Empiric antibiotic recommendations are stratified within the guideline based on sepsis status, as seen in Table 1 (adapted from Trautner et al., 2025). In patients presenting with sepsis, with or without shock, the preferred antibiotics include third- or fourth-generation cephalosporins (ceftriaxone, ceftazidime, cefotaxime, and cefepime), carbapenems (meropenem, ertapenem, doripenem, and imipenem-cilastatin), piperacillin-tazobactam, or fluoroquinolones. The alternatives include newer agents (novel β -lactam/ β -lactamase inhibitors such as ceftolozane-tazobactam, ceftazidime-avibactam, meropenem-vaborbactam, and imipenem-cilastatin-relebactam; cefiderocol; or plazomicin), or older aminoglycosides (amikacin, tobramycin, gentamicin). On the other hand, in patients without sepsis, the preferred antibiotics are similar to those listed above, except that carbapenems are listed as an alternative agent. Narrower-spectrum agents, including oral options such as fluoroquinolones and trimethoprim-sulfamethoxazole when feasible, are preferred.

The guideline also provides explicit

guidance on intravenous-to-oral transition and antibiotic de-escalation, where pharmacists play an integral role. The guideline supports transitioning patients with a complicated UTI with or without an associated gram-negative bacteremia who are clinically improving and can take oral medication with effective options available to oral antibiotics. For bacteremic patients, appropriate candidates are afebrile, hemodynamically stable, and have achieved source control. Definitive therapy should be selected promptly based on urine culture and susceptibility results, recognizing that de-escalation opportunities may differ between inpatient and outpatient settings. These recommendations underscore the importance of antimicrobial stewardship practices.

Another major update to the IDSA guideline is the recommendation for shortened durations of antimicrobial therapy. Specifically, in patients who are improving clinically on effective therapy, a shorter course of antibiotics is recommended. The panel further defines effective therapy as an agent that achieves therapeutic levels in the urine and relevant tissue and is active against the causative pathogen. Treatment duration should be counted from the first day of active therapy. It is recommended to use either 5-7 days of a fluoroquinolone or 7 days of a non-fluoroquinolone antibiotic. Additionally, a total antibiotic course of 7 days is recommended for those with source-controlled Gram-negative bacteremia secondary to a cUTI who are afebrile and hemodynamically stable. These duration recommendations differ drastically from previous ones and are excellent means to support stewardship efforts.

The guideline acknowledges important limitations in the supporting evidence, noting that many clinical trials excluded patients with indwelling urinary catheters, sepsis or septic shock, immunocompromised



states, severe renal insufficiency, and functional or structural abnormalities of the urinary tract. As such, clinical judgement remains essential in applying the data and recommendations to these populations. The overarching intent of these recommendations is to reduce avoidable intravenous catheter-related adverse effects, excess costs, and healthcare resource utilization.

In summary, the 2025 IDSA complicated UTI guideline represents a significant paradigm shift from prescribing practices based on anatomy and comorbidities toward a severity-driven, stewardship-focused, and evidence-based approach. Its reclassification of UTI definitions, shorter treatment duration recommendations, clear empiric decision-making approach, and IV-to-oral transition workflow mark a substantial update to urinary tract infection guidance. This evolution positions pharmacists as central contributors to antimicrobial stewardship-driven, high-value complicated UTI care.

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TABLE 1. Empiric Antibiotic Therapy Choices

<i>Condition of the Patient</i>	<i>Preferred Antibiotic</i>	<i>Alternative Antibiotic</i>
Sepsis (with or without shock)	Third or fourth generation cephalosporins, carbapenems, piperacillin-tazobactam, fluoroquinolones	Newer agents (novel beta lactam-beta lactamase inhibitors, cefiderocol, plazomicin), or older aminoglycosides (amikacin, tobramycin, gentamicin)
Without sepsis, parenteral route of antibiotics	Third or fourth generation cephalosporins, piperacillin-tazobactam, fluoroquinolones	Carbapenems, newer agents, or older aminoglycosides
Without sepsis, oral route of antibiotics	Fluoroquinolones or trimethoprim-sulfamethoxazole	Amoxicillin-clavulanate or oral cephalosporins (cefixime, cefpodoxime, cefuroxime, ceftibuten, cephalexin)

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References

1. Trautner BW, Cortés-Penfield NW, Gupta K, et al. 2025 Guideline on Management and Treatment of Complicated Urinary Tract Infections. Infectious Diseases Society of America (IDSA). July 17, 2025. <https://www.idsociety.org/practice-guideline/complicated-urinary-tract-infections>

Evaluation of Single-dose Aminoglycoside Therapy for Treatment of Urinary Tract Infections

by Grace Mortrude, PharmD, BCIDP, Alexis Bozich, PharmD, Courtney Pagels, PharmD, BCIDP



Historically, aminoglycoside antibiotics were not preferred for the treatment of urinary tract infections (UTIs) due to their toxicities associated with prolonged use.¹ However, due to poor patient adherence and increasing prevalence of multidrug-resistant organisms (MDRO), interest regarding use of aminoglycosides in this setting is increasing.² Specifically, single-dose aminoglycosides may be advantageous for a variety of reasons, including improved patient compliance and reduced length of stay or the need for hospital admission due to a lack of oral antibiotic options.

The 2024 Infectious Diseases Society of America (IDSA) guidance on antimicrobial resistant (AMR) gram-negative infections state that single-dose IV aminoglycosides are an appropriate alternative treatment strategy for uncomplicated cystitis caused by extended-spectrum β -lactamase-producing *Enterobacteriales* (ESBL-E), AmpC β -lactamase-producing *Enterobacteriales* (AmpC-E), carbapenem-resistant *Enterobacteriales* (CRE), and *Pseudomonas aeruginosa* with difficult-to-treat resistance (DTR-P. *aeruginosa*) (tobramycin and amikacin only), however they note that robust clinical data are lacking.³ The IDSA recommendations stem from a systematic review by Goodlet et al., in which researchers sought to investigate the efficacy of single-dose aminoglycoside antibiotics for the treatment of UTI. Of the 13,804 patients across 13 studies, 94.5% \pm 4.3% achieved microbial cure, and 73.4% \pm 9.6%

Abstract

Purpose: Patients with cystitis due to multidrug-resistant organisms often have few outpatient treatment options. The Infectious Diseases Society of America 2024 Guidance on the Treatment of Antimicrobial Resistant Gram-Negative Infections recommends single-dose aminoglycoside treatment as an alternative for cystitis caused by multidrug-resistant organisms, however robust evidence is lacking. This treatment strategy is used at a Veterans Affairs Medical Center (VAMC), and thus, the purpose of this project is to describe our experience.

Methods: This retrospective descriptive cohort included patients at this VAMC who were treated with a single-dose of aminoglycoside for urinary tract infection between April 2019 and April 2024. The primary outcome assessed was successful treatment, defined as no urinary tract infection recurrence within 90 days of single-dose aminoglycoside treatment. Secondary outcomes included microbial cure and adverse effects.

Results: Nine patients met the inclusion criteria over the studied period. Five patients received gentamicin, 4 received amikacin, and 0 patients received tobramycin. All patients were treated for uncomplicated urinary tract infection, except one, who was treated for pyelonephritis. Treatment was successful in 6 of the 9 patients. Microbial cure occurred in 1 of the 4 patients in whom it could be assessed. No adverse effects were reported in the electronic health record.

Conclusions: Treatment of cystitis with single-dose aminoglycoside therapy is a reasonable treatment consideration for those without other outpatient treatment options. More robust clinical data is needed to further assess the efficacy and safety of this treatment.

had no recurrence at 30 days. Regarding safety, only 0.5% of cases reported an adverse reaction such as nephrotoxicity, vestibular toxicity, and injection site

reactions. The results of this study support the use of single-dose aminoglycosides as both a safe and effective choice for patients with UTIs. Of the thirteen studies included

in this review, 3 used gentamicin and 4 used amikacin. The rest were either netilmicin or kanamycin.⁴

At this Veterans Affairs Medical Center (VAMC), aminoglycosides are currently restricted, with orders requiring a recommendation from the infectious diseases service or a prior authorization drug request submitted for review by an infectious diseases pharmacist. The findings of this medication use evaluation will provide insight into the utility of aminoglycosides for UTIs and further justify their use.

Objectives

The purpose of this project is to characterize patients who received single-dose aminoglycosides for treatment of cystitis at a VAMC by evaluating treatment success and adverse effects.

Methods

This project was determined to be quality improvement project and was exempt from institutional review board review. A report was generated of all patients who received a one-time dose of an aminoglycoside antibiotic (i.e., gentamicin, tobramycin, or amikacin) for a urinary tract infection in an inpatient unit, the emergency department, or the ambulatory infusion clinic at this VAMC between April 2019 and April 2024. Retrospective chart reviews were conducted to collect patient demographic information, admission/visit diagnoses, microbial culture results, antibiotics administered, and reported adverse effects. The primary outcome assessed was successful treatment, defined as no urinary tract infection recurrence within 90 days of single-dose aminoglycoside treatment. Secondary outcomes included microbial cure and adverse effects. Microbial cure was defined as a subsequent urine culture obtained within 90 days of the initial culture showing no isolated organism, or, if an organism was present, it was not the same organism as on the initial culture. Thirty- and 90-day recurrence of cystitis (documentation of symptoms consistent with cystitis) was also assessed. Patients were eligible for inclusion if they received an antibiotic prior to single-dose aminoglycoside, but were excluded if they continued antibiotic treatment with an additional agent after single-dose

aminoglycoside treatment for the same genitourinary organism. Descriptive statistics were performed using Microsoft Excel.

Results

A total of nine patients received a single-dose aminoglycoside for the treatment of urinary tract infection within the specified time frame. The average patient age was 72 years, with a range of 60 to 77 years. Most patients were white (89%), male (89%), and not Hispanic or Latinx (100%). Additional patient information is detailed in Table 1. . The most common comorbidity was a history of recurrent UTIs, followed by chronic catheter use and neurogenic bladder. Approximately half of the patients had a reported antibiotic allergy to sulfamethoxazole/trimethoprim. The degree of kidney function varied; most had normal kidney function, but two patients had chronic kidney disease, with one in end-stage renal disease on dialysis. The single-dose aminoglycosides were prescribed in a variety of settings, including inpatient, emergency department, ambulatory care

clinics, and long-term care facilities. An infectious diseases pharmacist or physician recommended all but one treatment regimen.

Of the nine patients, five received gentamicin, four received amikacin, and no patients received tobramycin. All patients were treated for urinary tract infection except for one, who was treated for pyelonephritis. Treatment results are detailed in Table 2. For the primary outcome of treatment success, defined as no UTI recurrence within 90 days of single-dose aminoglycoside treatment, six of nine patients achieved it. Secondary outcomes included microbial cure and adverse effects. Microbial cure could not be assessed in five patients. Of the four patients in whom microbial cure could be assessed, one achieved it, while the other three did not. Two patients received susceptible antibiotics prior to single-dose aminoglycoside treatment; Patients 2 (P2) and 9 (P9) received 3 and 1 days of antibiotics, respectively. No adverse effects were documented in any of the patients' electronic health records.

TABLE 1. Baseline Characteristics

Patient	ABW (kg)	AdjBW (kg)	Antibiotic Allergies	Pertinent Past Medical History	CrCl (ml/min)
P1	77	76	None	Type 2 Diabetes, Prostate cancer, recurrent UTIs, kidney stones	60
P2	68	57	None	Lewy body dementia, recurrent UTIs	81
P3	91	83	Sulfamethoxazole/trimethoprim (GI) Vancomycin	Multiple Sclerosis, Neurogenic bladder, BPH, Chronic indwelling catheter	84
P4	92	86	Sulfamethoxazole/trimethoprim (SJS)	Suprapubic catheter, Blindness, Chronic retention of urine	67
P5	76	74	Sulfa drugs (rash) Minocycline (GI) Ciprofloxacin (GI)	Neurogenic bladder, End stage renal disease, Type 2 diabetes	Dialysis
P6	135	109	None	Kidney stones, Recurrent UTIs	100
P7	96	79	Sulfa drugs (muscle pain/weakness)	BPH, neurogenic bladder, neurocognitive disorder, MDRO P. aeruginosa infection, Recurrent UTIs	102
P8	94	80	None	Recurrent UTIs, Chronic catheter	69
P9	167	120	None	CKD, Left nephrectomy	48

Abbreviations: ABW, actual body weight; AdjBW, adjusted body weight; BPH, benign prostatic hypertrophy; CKD, chronic kidney disease; CrCl, creatine clearance; GI, gastrointestinal; SJS, Stevens-Johnson syndrome.

Discussion

This medication use evaluation revealed that single-dose aminoglycosides may be a useful strategy in patients with UTIs caused by multidrug-resistant organisms. Of the patients who had unsuccessful treatment, patient 4 (P4) was treated for pyelonephritis with amikacin, which is not supported by current guidelines. Additionally, the susceptibility of the bacterial organism, ESBL *K. pneumoniae*, demonstrated resistance to both gentamicin and tobramycin. Patients 6 (P6) and 7 (P7) demonstrated susceptibility to gentamicin and tobramycin; however, due to a history of recurrent UTIs, these patients were inherently at a higher risk of recurrence regardless of the antibiotic used. Several patients avoided hospital admission or were discharged from the inpatient unit sooner due to the convenience of a single-dose antibiotic. This benefited patients by reducing length of stay and the risk of nosocomial infection, while also reducing costs to the healthcare system.

Cure Rates

Cure rates of urinary tract infections due to CRE or ESBL-producing organisms are not precisely quantified in guidelines, but observational data for ESBL-producing

Enterobacterales suggest clinical cure rates of approximately 83%, microbial cure rates around 64%, and recurrence rates of 15% overall. The systematic review by Goodlet et al. found high microbiologic cure rates and low recurrence rates within the 30-day timeframe.³ Our evaluation was able to assess treatment success by noting recurrence of patient symptoms, which the Goodlet et al. paper could not. A recent retrospective cohort study by Bouwman et al. evaluated the rate of relapse for patients with an ESBL-E or *P. aeruginosa* UTI who received a single-dose aminoglycoside compared to those who received 3 or more days of standard of care (SOC) antibiotics. The authors found no difference in relapse rate between a single dose of an aminoglycoside and the standard of care (1/33, 3.03% vs. 3/33, 9.09%; 95% CI 0.03–3.04; $p = 0.6$). The SOC group received antibiotics for a mean duration of 6.91 ± 2.35 days. Of importance, 45% of patients in the aminoglycoside group received effective antibiotics for a mean duration of 3.2 ± 1.4 days prior to receiving the single-dose aminoglycoside. Additionally, there were significant differences in baseline characteristics between groups. Differences included more patients requiring a higher level of

care and more patients with complicated UTI (defined as male, urinary catheter, obstruction, renal tract calculi, colovesical fistula, or uncontrolled diabetes) in the SOC group. No difference in adverse effect rates was found, and microbiologic cure was not assessed.⁶ We were unable to establish microbiologic cure for most patients in our evaluation due to lack of follow-up culture; however, this is consistent with current practice, as follow-up cultures as a test of cure are not routinely recommended. While these findings provide insight into the use of single-dose aminoglycosides for UTI, the small sample size and predominance of male patients, with only one female included, limit the generalizability of our conclusions and indicate a need for future studies with larger, more diverse populations to validate these findings. It should also be noted that patients that did not report recurrent symptoms to the ZVAMC either via phone call or visit were determined to be treatment successes, thus the success could have been overstated if the patient did in fact have persistent or recurrent symptoms but did not report them to our institution.

A potential limitation to our project is that our patient population does not strictly fit the guideline definition of uncomplicated urinary tract infection

TABLE 2. Outcomes and Treatment Information

Patient	Location	Antibiotics prior to AG?	Reason for Antibiotic	ID Rec?	Antibiotic and Dosing	Microbial Cure	Recurrence within 30 Days?	Recurrence within 90 Days?	Adverse Effects Reported
P1	Inpatient	No	UTI	Yes	Amikacin 1000 mg (13 mg/kg ABW)	Unable to assess	No	No	No
P2	Inpatient	Yes – 3 days piperacillin/tazobactam	UTI	Yes	Gentamicin 340 mg (5 mg/kg ABW)	Unable to assess	No	No	No
P3	ED	No	UTI	Yes	Gentamicin 300 mg (3.6 mg/kg AdjBW)	Unable to assess	No	No	No
P4	ED	No	Pyelonephritis	Yes	Amikacin 1250 mg (15 mg/kg AdjBW)	No	Yes	Yes	No
P5	Long Term Care	No	UTI	No	Gentamicin 375 mg (5 mg/kg ABW)	Yes	No	No	No
P6	Long Term Care	No	UTI	Yes	Gentamicin 500 mg (4.6 mg/kg AdjBW)	No	Yes	Yes	No
P7	Clinic	No	UTI	Yes	Amikacin 1200 mg (15 mg/kg AdjBW)	No	Yes	Yes	No
P8	Clinic	No	CA-UTI	Yes	Gentamicin 400 mg (5 mg/kg AdjBW)	Unable to assess	No	No	No
P9	Clinic	Yes – 1 day ciprofloxacin	UTI	Yes	Amikacin 1000 mg (8 mg/kg AdjBW)	Unable to assess	No	No	No

Specific treatment information, as well as primary and secondary outcomes, is listed above for each patient. Abbreviations: ABW, actual body weight; AdjBW, adjusted body weight; CA-UTI, catheter-associated urinary tract infection; ED, emergency department.

according to the IDSA AMR guidance nor the newly published IDSA complicated urinary tract infection guidelines. Of note, the complicated urinary tract infection guidelines were published after the completion of this project. The IDSA AMR guidance defines complicated UTIs as those “occurring in association with a structural or functional abnormality of the genitourinary tract, or any urinary tract infection in an adolescent or adult male”.³ However, the only paper cited in these guidelines for recommending a single dose of aminoglycosides for uncomplicated urinary tract infection is the paper by Goodlet et al., which has been previously discussed. This paper included male patients (~20%), patients with urinary malformations, and some patients with pyelonephritis; thus, the infectious diseases service at our VAMC often felt comfortable applying the findings to a broader population than recommended by the IDSA AMR guidance.⁴ Additionally, the IDSA published complicated urinary tract infection guidelines in July 2025, providing updated classifications for complicated and uncomplicated UTIs. Uncomplicated UTIs are now defined as “infection confined to the bladder in afebrile women or men,” whereas complicated urinary tract infection is defined as infection beyond the bladder in women or men, including pyelonephritis, febrile or bacteremic UTI, catheter-associated UTI, and prostatitis. They further note that patients with neurogenic bladder may also be considered complicated.⁵ In our patient population, a single IV aminoglycoside dose is often used as a last resort for patients with non-severe infections deemed treatable in the outpatient setting when no oral options are available. Thus, while patients may not have strictly met the guideline-recommended population, the benefits of providing an outpatient therapy were often deemed to outweigh the risks of providing prolonged inpatient IV antimicrobials. Ultimately, many of the patients included in this project had neurogenic bladder or catheters and thus represent a more complicated population; however, the findings of this project provide insight into the use of this intervention in a patient population similar to that which was previously studied and more closely match a real-world application of this intervention.

The IDSA AMR guidance recommends

FIGURE 1. Initial Culture Results

KEY		P1	P2	P3	P4	P5	P6	P7	P8	P9
Susceptible	Green									
Intermediate	Yellow									
Resistant	Red									
Not Reported	Black									
ANTIBIOTIC	AMIKACIN									
	AMOXICILLIN/K CLAVULANATE									
	AMPICILLIN									
	AMPICILLIN/SULBACTAM									
	AZTREONAM									
	CEFAZOLIN									
	CEFEPIME									
	CEFOTAXIME									
	CEFOXITIN									
	CEFTAZIDIME									
	CEFTAZIDIME/AVIBACTAM									
	CEFTOZANE/TAZOBACTAM									
	CEFTRIAXONE									
	CEFUROXIME									
	CIPROFLOXACIN									
	ERTAPENEM									
	FOSFOMYCIN									
	GENTAMICIN									
	LEVOFLOXACIN									
	IMIPENEM									
	MEROPENEM									
	MEROPENEM/VABORBACTAM									
	NITROFURANTOIN									
	PENICILLIN									
	PIPERACILLIN/TAZOBACTAM									
	TETRACYCLINE									
	TOBRAMYCIN									
	TRIMETHOPRIM/SULFAMETHOXAZOLE									
	VANCOMYCIN									

Individual susceptibility results for isolated bacteria are depicted above for initial cultures.

FIGURE 2. Repeat Culture Results

KEY		P1	P2	P3	P4	P5	P6	P7	P8	P9
Susceptible	Green									
Intermediate	Yellow									
Resistant	Red									
Not Reported	Black									
ANTIBIOTIC	AMIKACIN									
	AMOXICILLIN/K CLAVULANATE									
	AMPICILLIN									
	AMPICILLIN/SULBACTAM									
	AZTREONAM									
	CEFAZOLIN									
	CEFEPIME									
	CEFOTAXIME									
	CEFOXITIN									
	CEFTAZIDIME									
	CEFTAZIDIME/AVIBACTAM									
	CEFTOZANE/TAZOBACTAM									
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	MEROPENEM/VABORBACTAM									
	NITROFURANTOIN									
	PENICILLIN									
	PIPERACILLIN/TAZOBACTAM									
	TETRACYCLINE									
	TOBRAMYCIN									
	TRIMETHOPRIM/SULFAMETHOXAZOLE									
	VANCOMYCIN									

Individual susceptibility results by isolated bacteria are depicted above for repeat cultures.

a dose of gentamicin 5 mg/kg/dose and amikacin 15 mg/kg/dose as a single dose for uncomplicated cystitis.³ These are consistent with the recommendations from Goodlet et al.³ Most of the doses used in our project were consistent with these recommendations. Of note, if patients were obese, adjusted body weight was used rather

than actual body weight per local dosing protocols. As discussed above, utilizing the IDSA AMR guidance definition or the new IDSA complicated urinary tract infection guidelines, many of our patients could have been classified as complicated, and thus the dosing scheme (dose and duration) could have been considered too low.^{3,5}

Conclusion

Overall, the majority of patients achieved treatment success and did not have a recurrence of UTI within 90 days, demonstrating that single-dose aminoglycosides may be a reasonable option for the treatment of UTIs caused by multidrug-resistant organisms, but further research is warranted.

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Previous Affiliations: At the time of writing, Dr. Bozich was affiliated with Clement J Zablocki VAMC.

References

1. Ababneh M, Harpe S, Oinonen M, Polk RE. Trends in aminoglycoside use and gentamicin-resistant gram-negative clinical isolates in US academic medical centers: implications for antimicrobial stewardship. *Infect Control Hosp Epidemiol*. 2012 Jun;33:594-601. doi: 10.1086/665724
2. Centers for Disease Control and Prevention. Antimicrobial resistance threats in the United States, 2021-2022. Atlanta, GA: U.S. Department

of Health and Human Services, CDC; 2024.

3. Tamma PD, Heil EL, Justo JA, Mathers AJ, Satlin MJ, Bonomo RA, Infectious Diseases Society of America 2024 guidance on the treatment of antimicrobial resistant gram-negative infections. *Clin Infect Dis*. 2024 Aug 7:ciae403. doi: 10.1093/cid/ciae403
4. Goodlet KJ, Benhalima FZ, Nailor MD. A systematic review of single-dose aminoglycoside therapy for urinary tract infection: Is it time to resurrect an old strategy? *Antimicrob Agents Chemother*. 2018 Dec;63(1):e02165-e02218. doi: 10.1128/AAC.02165-18
5. Trautner BW, Cortes-Penfield NW, Gupta K, et al. "Complicated Urinary Tract Infections (cUTI): Clinical Guidelines for Treatment and Management." The Infectious Diseases Society of America, 17 Jul. 2025, <https://www.idsociety.org/practice-guideline/complicated-urinary-tract-infections/>.
6. Montelin H, Camporeale A, Hallgren A, et al. Treatment, outcomes and characterization of pathogens in urinary tract infections caused by ESBL-producing *Enterobacteriales*: a prospective multicentre study. *J Antimicrob Chemother*. 2024 Mar 1;79(3):531-538. doi: 10.1093/jac/dkad402
7. Bouwman K, George M. Clinical outcomes in patients who received a one-time aminoglycoside dose for extended-spectrum beta-lactamase-producing *Enterobacteriales* or *Pseudomonas aeruginosa* cystitis. *Antibiotics (Basel)*. 2024 Jun 13;13(6):552. doi: 10.3390/antibiotics13060552



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OCTOBER 21, 2026 | VIRTUAL

Impact of a Collaborative Ambulatory Diabetes Outreach Pathway Using Clinical Pharmacists and Registered Nurse Certified Diabetes Care and Education Specialists

by Amy M. Wolff, PharmD, Calloway S. Van Epern, PharmD, BCACP, Amanda E. Mauerman, PharmD, BCACP, Sarah K. Lopina, PharmD, BCACP, Kathryn L. Henry, PharmD, BCACP, Mindy M. Deura, RN, CDCES, Jill P. O'Lena, RN, CDCES, Ryan D. Conrardy, MS

Diabetes is a chronic condition that, if not properly managed, may result in complications such as cardiovascular disease, retinopathy, and nephropathy – driving up healthcare costs and increasing rates of morbidity and mortality.¹ In 2021, the Centers for Disease Control and Prevention estimated that more than 38 million adults had diabetes, highlighting the substantial burden diabetes management services can have on the healthcare system.² While primary care providers (PCPs) have historically been the main route for patients to receive diabetes care, projections indicate a potential shortage of 13,500 to 86,000 physicians by 2036.³⁻⁴ The American Diabetes Association (ADA) strongly promotes team-based care, emphasizing the need to expand roles for qualified professionals such as primary care clinical pharmacists and Registered Nurse Certified Diabetes Care and Education Specialists (RN CDCES) to ensure continued access to diabetes management services.⁵

Pharmacist-led diabetes management services in primary care clinics have been proven to provide safe and effective care to patients with diabetes while maintaining high patient satisfaction rates.⁶ With expertise in medication management, pharmacists are uniquely positioned to initiate patients on guideline-recommended therapies and address barriers to medication access (e.g., cost).⁷ Similarly, RN CDCES focus on educating patients on lifestyle changes (e.g., diet and activity) and/or titrating medications.⁸⁻⁹ While the ADA Standards of Care highlights the importance of multidisciplinary care in diabetes management, there has been minimal

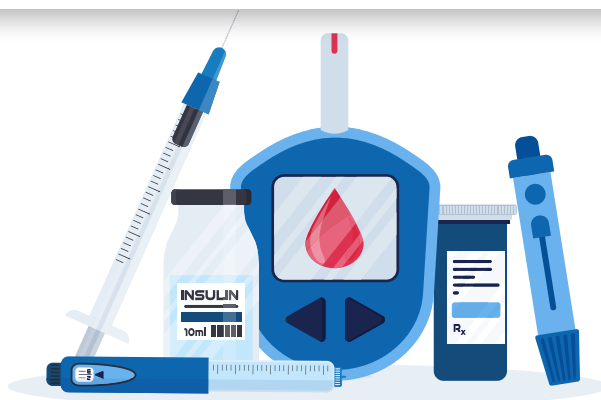
Abstract

Background: Clinical pharmacists and Registered Nurse Certified Diabetes Care and Education Specialists (RN CDCES) at Froedtert & the Medical College of Wisconsin provide type 2 diabetes management services within primary care clinics via the Ambulatory Diabetes Outreach Program (ADOP). In 2023, ADOP launched a pilot, known as the Collaborative ADOP pathway (CAP), to enhance collaboration between pharmacists and RN CDCES. This pilot allowed clinical pharmacists to transition patient care to an RN CDCES in select scenarios. CAP aimed to reduce pharmacist time spent on tasks that are manageable by an RN CDCES. This study was designed to determine the potential efficiency gains with CAP, while ensuring optimal patient outcomes.

Methods: A retrospective chart review was conducted to compare pre-specified outcomes between patients in ADOP versus CAP. The primary outcome was the difference in the median number of 30-minute pharmacist-led appointments per patient between ADOP and CAP. Secondary objectives were designed to further evaluate efficacy, quality, safety, and efficiency.

Results: Pharmacists saved an average of four appointment slots per patient managed via CAP, compared with ADOP, a difference that was statistically significant (six vs. two slots in ADOP and CAP, respectively; $p < 0.001$). Efficacy and safety outcomes were similar between the two groups.

Conclusion: Patients enrolled in CAP had safety and efficacy outcomes similar to those in ADOP, and implementation of CAP significantly reduced the time primary care clinical pharmacists spent, allowing them to focus on the management of other complex patients.



literature published to date that explores the use of a team-based approach specifically between pharmacists and RN CDCES.⁵

Primary care clinical pharmacists at Froedtert & the Medical College of Wisconsin (F&MCW) practice under collaborative practice agreements (CPAs) that allow them to manage medications for patients with chronic conditions such as diabetes, hypertension, and hyperlipidemia. Currently, clinical pharmacists at F&MCW spend most of their time managing patients with diabetes through the Ambulatory Diabetes Outreach Program (ADOP), established in 2016 to enhance collaboration among pharmacists, RN CDCES, and PCPs. Under the CPA for diabetes management, clinical pharmacists are able to initiate, modify, or discontinue diabetes-related medications,

FIGURE 1. ADOP vs. CAP Workflow

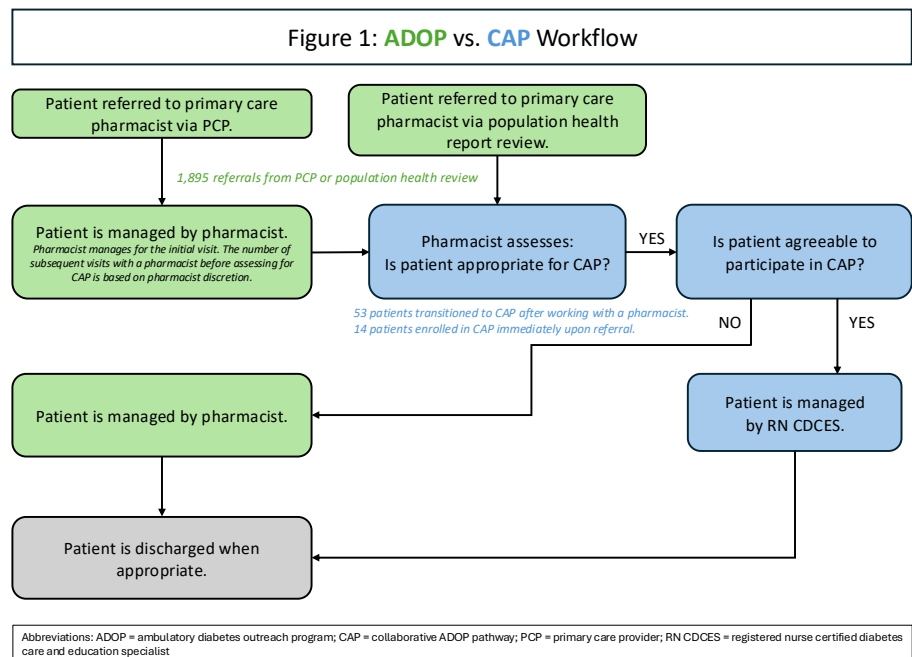


TABLE 1. Secondary Objectives and Outcomes

Secondary Objective	Associated Secondary Outcome(s)*
To analyze the efficacy and quality of utilizing a collaborative, team-based approach to managing patients with uncontrolled diabetes.	Difference between patient's A1c at time of enrollment to service and patient's A1c at time of discharge from service
	Number and percentage of patients meeting A1c goal at time of discharge from each service
	Number and percentage of patients discharged from each service for reasons other than meeting A1c goal
	Reasons for discharging patients from each service other than meeting A1c goal
	Number and percentage of patients with diabetes medications in the following categories, at enrollment and discharge: insulin, metformin, SGLT2i, sulfonylureas, thiazolidinediones, DPP-IV inhibitors, or GLP-1 and GIP/GLP-1 RAs
	Number and percentage of patients utilizing a CGM or a digital health tool that allows patients to share blood glucose readings with a healthcare provider at time of enrollment to each service
	Number and percentage of patients utilizing a CGM or a digital health tool that allows patients to share blood glucose readings with a healthcare provider at time of discharge from each service
To assess the safety of utilizing a collaborative, team-based approach to managing patients with uncontrolled diabetes.	Number and percentage of patients with an urgent care visit, emergency department visit, or hospitalization due to hypo- or hyperglycemia from each service
To evaluate the efficiency of utilizing a collaborative, team-based approach to managing patients with uncontrolled diabetes, while comparing qualitative and quantitative metrics of CAP and ADOP.	Weighted average of productivity level by RN CDCES per patient referred to CAP
	Weighted average of productivity level by pharmacist per patient referred to ADOP compared to CAP
	Average duration of patient enrollment in CAP as compared to ADOP, measured from time of enrollment to time of discharge or end of study period
	Number and percentage of patients involved in CAP who also had an appointment with a CDCES outside of CAP
	Amount of time from referral placement to first appointment within CAP or ADOP
	Percentage of ADOP referrals transitioned to CAP pathway during study period
*Service = ADOP and CAP Abbreviations: SGLT2i = sodium glucose cotransporter 2 inhibitor; DPP-IV = dipeptidyl peptidase 4; GLP-1 = glucagon-like peptide-1; GIP/GLP-1 RA = glucose-dependent insulinotropic polypeptide/glucagon-like peptide-1 receptor agonist; CGM = continuous glucose monitor; RN CDCES = registered nurse certified diabetes care and education specialist; CAP = collaborative ADOP pathway; ADOP = ambulatory diabetes outreach program	

assess patient adherence, order relevant labs or immunizations, and place referrals for additional diabetes care. RN CDCES practice under a protocol that allows them to perform similar functions, with a notable difference being that RN CDCES are able to modify or adjust existing diabetes-related medications, but not initiate new therapies without conferring with the patient's PCP. At F&MCW, patient involvement in ADOP has been shown to result in an average A1c reduction of 1.74% regardless of a patient's baseline A1c.¹⁰ For patients with an A1c $\geq 9\%$ at baseline, ADOP has been shown to result in an average A1c reduction of 2.32%.

At F&MCW, pharmacists receive diabetes management referrals from PCPs and a monthly population health report, which identifies patients who may benefit from ADOP based on their most recent A1c. Clinical pharmacist follow-up visits for diabetes management often consist of medication titration and lifestyle counseling – tasks that an RN CDCES can accomplish. In April 2023, the ADOP team designed a pilot pathway to transition patients from working with a pharmacist to working with an RN CDCES, when appropriate (Figure 1). This pilot pathway is known as the Collaborative ADOP Pathway (CAP). When patients are referred to ADOP by a PCP, the patient's first visit will be with a clinical pharmacist. The pharmacist will then use their discretion at subsequent visits to determine whether a patient is appropriate for CAP. For patients referred to ADOP via the population health report, the pharmacist will review the patient's clinical need at the time of referral. Based on this review, the pharmacist may choose to schedule an initial visit with the patient or transition them directly to CAP. For example, for patients who are referred to ADOP on the population report but only require assistance with medication titration and/or lifestyle management, the pharmacist can directly hand off care to the RN CDCES without seeing the patient for an initial visit. Alternatively, for patients who require pharmacist intervention, a pharmacist can initiate new therapies (e.g., guideline-recommended therapies with compelling indications) or resolve drug therapy problems (e.g., cost barriers, tolerability issues), and then transition care to an RN CDCES at a later date, using their

TABLE 2. Baseline Characteristics

Characteristic	ADOP N = 67 ¹	CAP N = 67 ¹	p-value
Sex			0.081 ²
Female	24 (36)	34 (51)	
Male	43 (64)	33 (49)	
Age (years)	62 (51, 71)	61 (53, 71)	1 ³
Race			0.4 ⁴
Asian	5 (7.5)	1 (1.5)	
Black or African American	14 (21)	18 (27)	
White	43 (64)	45 (67)	
Other	4 (6.0)	2 (3.0)	
Decline to Answer	1 (1.5)	1 (1.5)	
A1c (%) at Enrollment	9.20 (8.20, 10.40)	9.20 (8.60, 10.85)	0.2 ³
Duration of Enrollment (days)	146 (104, 204)	223 (137, 334)	<0.001 ³
Time from Referral to Initial Visit (days)	19 (10, 33)	20 (13, 29)	0.8 ³
Discharged	38 (57)	39 (58)	0.9 ²

¹n (%); median (Q1, Q3); ²Pearson's chi-squared test; ³Wilcoxon rank sum test; ⁴Fisher's exact test
Abbreviations: ADOP = ambulatory diabetes outreach program; CAP = collaborative ADOP pathway

discretion.

The objective in designing CAP was to reduce the time pharmacists spend on tasks that could be handled by an RN CDCES, allowing them to focus on managing more complex patients or other chronic conditions, such as hypertension or hyperlipidemia. Additionally, CAP creates an escalation pathway that allows the RN CDCES to initiate medication therapies in collaboration with a pharmacist, rather than requiring a PCP's involvement, with the intent of improving medication management efficiency. The overarching goal of this project was to determine the potential efficiency gains with CAP, while ensuring optimal patient outcomes in terms of efficacy and safety.

Methods

This retrospective cohort study was conducted at F&MCW from April 17, 2023, to July 31, 2024. Given that this study was classified as a quality

improvement project and not human subjects research, Institutional Review Board approval was not required. To be included in the study, patients had to be at least 18 years old, diagnosed with type 2 diabetes, and eligible for diabetes management by a pharmacist per CPA. The study excluded patients who met any of the following criteria: the provider declined patient participation, were currently pregnant, were prescribed U-500 insulin, and/or were followed by endocrinology. To maximize sample size, patients were included regardless of whether they were still enrolled in ADOP or CAP, or had been discharged from either service, at the end of the study period.

Pre-specified outcomes were compared between a simple random sample of patients in ADOP and all patients enrolled in CAP throughout the study period. Data was collected via retrospective chart review and was extracted from the institution's electronic health record. Baseline

demographics collected for each patient included age, sex, and race.

The primary outcome was the difference in the median number of 30-minute pharmacist-led appointments per patient between ADOP and CAP. Notably, secondary outcomes comparing the weighted average of productivity level per clinician type between ADOP and CAP were included in this study. The intention of these outcomes was to address limitations of the primary outcome in assessing the time clinicians (pharmacists or RN CDCES) spend on patient care activities outside of scheduled appointments. Productivity level is a standardized measurement of provider productivity based on a formalized evaluation and management (E&M) grid at F&MCW. The E&M grid is divided into levels ranging from 1 to 5 based on the categories of interventions made during a patient encounter (e.g., vitals taken, reviewing test results, amount of time spent on teaching/education, and care coordination). A higher productivity level demonstrates more comprehensive care provided. The weighted average productivity level per patient by clinician type was calculated by dividing the sum of productivity levels for each encounter a patient had (including scheduled and unscheduled encounters) with a specific clinician type by the number of scheduled appointments a patient had with that clinician. A list of all secondary objectives and outcomes is included in Table 1.

Descriptive statistics were used to summarize baseline characteristics. Categorical variables were summarized as counts and percentages, whereas continuous variables were summarized as medians and interquartile ranges. Wilcoxon rank sum test was used to compare continuous measurements between ADOP and CAP, while Pearson's chi-squared test or Fischer's exact test were used for comparisons of categorical variables. McNemar's chi-squared test was used to compare paired binary variables. Analysis was conducted using R software version 4.5.0.¹¹

Results

In total, 134 patients were included in the study, comprising 67 patients from each comparator group (ADOP and CAP). The median age of patients in ADOP was 62 years old, as compared to 61 years old in

TABLE 3. Comparison of Appointment Use and Productivity Level

<i>Outcome</i>	<i>ADOP N = 67¹</i>	<i>CAP N = 67¹</i>	<i>p-value</i>
30-min appointment slot use per patient by clinician type			
Pharmacist	6.0 (3.0, 8.0)	2.0 (2.0, 4.0)	<0.001 ²
RN CDCES	N/A	6.0 (4.0, 8.0)	N/A
Weighted average of productivity level used per patient visit by clinician type			
Pharmacist	2.81 (2.25, 3.13)	2.67 (2.33, 3.00)	0.6 ²
RN CDCES	N/A	2.75 (2.25, 3.60)	N/A

¹Median (Q1, Q3); ²Wilcoxon rank sum test
Abbreviations: ADOP = ambulatory diabetes outreach program; CAP = collaborative ADOP pathway; RN CDCES = registered nurse certified diabetes care and education specialist

TABLE 4. Comparison of A1c (%) Reduction

<i>Outcome</i>	<i>ADOP N = 67¹</i>	<i>CAP N = 67¹</i>	<i>p-value</i>
Reduction in A1c (%)	-1.20 (-2.60, 0.00)	-1.60 (-3.00, -0.30)	0.8 ²

¹Median (Q1, Q3); ²Wilcoxon rank sum test
Abbreviations: ADOP = ambulatory diabetes outreach program; CAP = collaborative ADOP pathway

TABLE 5. Reasons for Discharge

<i>Characteristic</i>	<i>ADOP</i>	<i>CAP</i>	<i>p-value</i>
Reason for Discharge	38¹	39¹	0.5²
Graduated with A1c at goal	19 (50)	20 (51)	-
Graduated with BG at goal	7 (18)	3 (7.7)	-
Patient declined further follow-up	0 (0)	2 (5.1)	-
Patient expired	0 (0)	1 (2.6)	-
Patient transferred care to outside organization	2 (5.3)	2 (5.1)	-
Resources exhausted	2 (5.3)	0 (0)	-
Patient transferred care to specialist	1 (2.6)	2 (5.1)	-
Unable to be reached after 3 attempts	7 (18)	9 (23)	-

¹n (%); ²Fisher's exact test
Abbreviations: BG = blood glucose; ADOP = ambulatory diabetes outreach program; CAP = collaborative ADOP pathway

CAP (p=1). At enrollment, both patients in ADOP and CAP had a median A1c of 9.20% (p=0.2). Median duration of enrollment in CAP was longer than ADOP (223 vs. 146 days, respectively; p<0.001). The time difference from when a patient was

referred to CAP or ADOP to their initial visit with a pharmacist or RN CDCES was similar between the two groups (median: 20 vs. 19 days, respectively; p=0.8). Baseline characteristics are listed in Table 2.

Primary Outcome

For patients enrolled in ADOP, pharmacists used a median of six 30-minute appointment slots per patient managed (Table 3). In comparison, pharmacists used a median of two 30-minute appointment slots per patient managed in CAP ($p < 0.001$). These pharmacist appointments in CAP were then supplemented by a median of six 30-minute appointment slots with an RN CDCES. ADOP patients were not seen by an RN CDCES.

Secondary Outcomes

Median productivity level per patient visit from a pharmacist in ADOP was 2.81, compared to 2.67 in CAP ($p = 0.6$; Table 3). For a CDCES in CAP, the median productivity level was similar at 2.75 per patient visit. As shown in Table 4, participation in ADOP resulted in a median A1c reduction of 1.2%, compared with 1.6% for CAP participants ($p = 0.8$). Prior to the end of the study period, 38 patients in ADOP and 39 patients in CAP had been discharged (57% vs. 58%, respectively; $p = 0.9$). Of the patients discharged, 50% in ADOP and 51% in CAP met their A1c goal, and 18% and 7.7% met their patient-specific blood glucose targets (as assessed by the clinician using continuous glucose monitoring (CGM) or fingerstick monitoring data) in ADOP and CAP, respectively. Patients discharged due to being unable to reach despite three attempts comprised 18% of patients discharged from ADOP and 23% from CAP. Table 5 provides a complete list of reasons for discharge from ADOP and CAP.

A comparison of medication class utilization at enrollment and at discharge (or at the end of the study period) for patients in ADOP versus CAP is provided in Table 6. No statistically significant differences were found. Table 7 demonstrates medication prescribing trends within ADOP and CAP from enrollment to discharge. An increase in utilization of glucagon like peptide-1 receptor agonists (GLP-1 RAs) or gastric inhibitor polypeptide (GIP)/GLP-1 RAs, dipeptidyl peptidase 4 (DPP-IV) inhibitors, and pioglitazone was found in ADOP, while an increase in utilization of GLP-1 RAs or GIP/GLP-1 RAs, sodium glucose cotransporter 2 inhibitor (SGLT2i), and DPP-IV inhibitors was found in CAP.

TABLE 6. Comparison of Medication Use between ADOP and CAP

Medication or Medication Class	ADOP N = 67 ¹	CAP N = 67 ¹	p-value
Insulin			
At Enrollment	27 (40)	25 (37)	0.7 ²
At Discharge or End of Study	22 (33)	22 (33)	1 ²
GLP-1 and GIP/GLP-1 RA			
At Enrollment	19 (28)	18 (27)	0.8 ²
At Discharge or End of Study	32 (48)	31 (46)	0.9 ²
Sulfonylurea			
At Enrollment	16 (24)	19 (28)	0.6 ²
At Discharge or End of Study	13 (19)	17 (25)	0.4 ²
DPP-IV Inhibitor			
At Enrollment	1 (1.5)	6 (9.0)	0.12 ³
At Discharge or End of Study	5 (7.5)	6 (9.0)	0.8 ²
SGLT2i			
At Enrollment	16 (24)	20 (30)	0.4 ²
At Discharge or End of Study	16 (24)	23 (34)	0.2 ²
Metformin			
At Enrollment	51 (76)	49 (73)	0.7 ²
At Discharge or End of Study	50 (75)	49 (73)	0.8 ²
Pioglitazone			
At Enrollment	2 (3.0)	2 (3.0)	1 ³
At Discharge or End of Study	3 (4.5)	3 (4.5)	1 ³

¹n (%); ²Pearson's chi-squared test; ³Fisher's exact test
Abbreviations: ADOP = ambulatory diabetes outreach program; CAP = collaborative ADOP pathway; GLP-1 RA = glucagon-like peptide-1 receptor agonist; GIP/GLP-1 RA = glucose-dependent insulinotropic polypeptide/glucagon-like peptide-1 receptor agonist; DPP-IV = dipeptidyl peptidase 4; SGLT2i = sodium glucose cotransporter 2 inhibitor

The increase in utilization of GLP-1 RA or GIP/GLP-1 RAs was statistically significant in ADOP and CAP. A reduction in insulin and sulfonylurea use was observed in both groups, but this was not statistically significant. Both ADOP and CAP were associated with an increase in utilization of CGMs and a digital health tool used to track blood glucose readings over the study period (Table 8). No statistically significant differences in CGM or digital health tool

use between ADOP and CAP were noted.

Over the study period, 1,895 referrals to ADOP were received, of which 67 were transitioned to management via CAP (3.54%). Fourteen of the 67 patients who transitioned to CAP were transitioned at the time of referral and never met with a pharmacist, whereas 53 patients initially met with a pharmacist but later transitioned to care with an RN CDCES in CAP. One patient enrolled in CAP was seen by an

RN CDCES who was not involved in CAP, potentially duplicating care. Eight patients enrolled in CAP were seen by a registered dietitian in addition to an RN CDCES via CAP.

No statistically significant differences were found in safety outcomes in this study (Table 9). One patient in ADOP had an urgent care visit, emergency department visit, or hospitalization for hypoglycemia, compared to zero patients in CAP (1.5% vs. 0%, respectively; $p=1$). On the other hand, three patients in ADOP and one patient in CAP had an urgent care visit, emergency department visit, or hospitalization due to hyperglycemia (4.5% vs. 1.5%, respectively; $p=0.6$).

Discussion

As demonstrated by the primary outcome, implementation of CAP within the F&MCW primary care clinics reduced the time pharmacists spent in appointments by an average of four 30-minute appointment slots per patient. By reducing pharmacist involvement in diabetes management for patients eligible for CAP, primary care clinical pharmacists theoretically had additional bandwidth to manage other chronic disease states or more complex patients with diabetes. While comparing the number of 30-minute appointment slots per patient across programs is reasonable for assessing pharmacist involvement and time saved, it does not provide a comprehensive overview of the additional tasks a pharmacist may be completing outside scheduled appointments. This is why a comparison of clinician productivity level was used as a secondary outcome.

Regardless of program, pharmacists and RN CDCES had similar average productivity levels, slightly below 3 per visit. For context, a productivity level of 2 at F&MCW would correlate to 6 to 20 minutes spent with the patient, 1 to 4 changes made to update the patient's medication list, 1 to 2 new or changed prescriptions via CPA, and/or decision-making on one focused disease state area without provider collaboration, among other categories. A productivity level of 3 would align with 21 to 40 minutes spent with the patient, 5 to 6 changes updated on the medication list, 3 or 4 new or changed prescriptions via CPA, and/or decision-

TABLE 7. Medication Prescribing Trends from Enrollment to Discharge/End of Study

Medication or Medication Class Assessed Per Program	Enrollment N = 67 ¹	Discharge or End of Study N = 67 ¹	p-value ²
ADOP			
Insulin	27 (40)	22 (33)	0.13
GLP-1 and GIP/GLP-1 RA	19 (28)	32 (48)	0.002
Sulfonylurea	16 (24)	13 (19)	0.4
DPP-IV Inhibitor	1 (1.5)	5 (7.5)	0.13
SGLT2i	16 (24)	16 (24)	1
Metformin	51 (76)	50 (75)	1
Pioglitazone	2 (3)	3 (4.5)	1
CAP			
Insulin	25 (37)	22 (33)	0.2
GLP-1 and GIP/GLP-1 RA	18 (27)	31 (46)	0.004
Sulfonylurea	19 (28)	17 (25)	0.7
DPP-IV Inhibitor	6 (9)	6 (9)	1
SGLT2i	20 (30)	23 (34)	0.5
Metformin	49 (73)	49 (73)	1
Pioglitazone	2 (3)	3 (4.5)	1

¹n (%); ²McNemar's chi-squared test with continuity correction
 Abbreviations: ADOP = ambulatory diabetes outreach program; CAP = collaborative ADOP pathway; GLP-1 = glucagon-like peptide-1; GIP/GLP-1 RA = glucose-dependent insulinotropic polypeptide/glucagon-like peptide-1 receptor agonist; DPP-IV = dipeptidyl peptidase 4; SGLT2i = sodium glucose cotransporter 2 inhibitor

TABLE 8. Continuous Glucose Monitor and Digital Health Tool Use

Characteristic	ADOP N = 67 ¹	CAP N = 67 ¹	p-value ²
Continuous Glucose Monitor			
At Enrollment	9 (13)	8 (12)	0.8
At Discharge or End of Study	25 (37)	14 (21)	0.036
Digital Health Tool for Blood Glucose Tracking			
At Enrollment	0 (0)	0 (0)	-
At Discharge or End of Study	5 (7.5)	7 (10)	0.5

¹n (%); ²Pearson's chi-squared test
 Abbreviations: ADOP = ambulatory diabetes outreach program; CAP = collaborative ADOP pathway

making on one new or worsening disease state requiring provider collaboration, among other categories. The productivity level findings demonstrate that, when averaged per patient visit, a similar amount of time is spent, or a similar number of interventions are made, by pharmacists and RN CDCES between CAP and ADOP. However, pharmacists have fewer patient visits in CAP than in ADOP, meaning their total productivity per patient (and thus time spent both within and outside scheduled appointments) is lower in CAP than in ADOP.

Overall, based on the study outcomes, it is reasonable to conclude that CAP provided diabetes care to patients that was as effective as ADOP. This is evidenced by the median A1c reductions that were not statistically significantly different.

Additionally, a majority of patients enrolled in ADOP and CAP were discharged with A1c or blood glucose readings that met patient-specific

TABLE 9. Safety Outcomes

<i>Outcome</i>	<i>ADOP N = 67¹</i>	<i>CAP N = 67¹</i>	<i>p-value²</i>
Urgent care visit, emergency department visit, or hospitalization for hyperglycemia	1 (1.5)	0 (0)	1
Urgent care visit, emergency department visit, or hospitalization for hypoglycemia	3 (4.5)	1 (1.5)	0.6

¹n (%); ²Fisher's exact test
Abbreviations: ADOP = ambulatory diabetes outreach program; CAP = collaborative ADOP pathway

targets. The two programs had similar discharge rates for each potential reason, demonstrating a comparable efficacy profile for ADOP and CAP. It is important to highlight that a large proportion of patients discharged from CAP and ADOP were unreachable despite 3 attempts. This accounts for nearly one-quarter of all patients in each program.

Enrollment duration for participants in CAP was, on average, significantly longer than in ADOP. The reasoning behind this change is unknown, as the study was not

designed to investigate this finding. The study investigators hypothesize that, based on this study's findings, it is likely that patients who are resistant to medication changes by a pharmacist and prefer lifestyle interventions (at least to start) would benefit most from participation in CAP. Furthermore, the time from program referral to the initial patient visit did not differ significantly between ADOP and CAP. This demonstrates that there is no delay in care for patients involved in CAP compared to ADOP, despite the transition of care that



may occur between pharmacists and RN CDCES immediately upon enrollment. Of note, many patients enrolled in CAP are initially scheduled with a pharmacist, and this study did not assess whether there was an additional delay in care when patients were transitioned from a pharmacist to an RN CDCES after the initial visit.

F&MCW primary care clinics, as a future direction of this project, hope to expand utilization of CAP for eligible patients, with the intent of increasing access to diabetes care services throughout the F&MCW health system. As part of this expansion, F&MCW will evaluate the need for additional full-time equivalent support in an effort to grow the RN CDCES team.

There are several limitations to the study design. First, as mentioned previously, the primary outcome comparing the median number of 30-minute pharmacist-led appointment slots is not an all-inclusive representation of time saved by a pharmacist. However, the study design sought to minimize this limitation by including productivity-level data. Second, the prescribing trends do not account for medications that may have been prescribed by a clinician but ultimately discontinued due to cost, adverse reactions, etc. Medication prescribing trends provide a snapshot of prescribing at enrollment and discharge for each program. Chart review was not conducted to assess who prescribed each medication, so medications may have been prescribed outside of ADOP or CAP (e.g., SGLT2 inhibitor prescribed by cardiology or nephrology). Third, to assess potential delays in care by measuring the time between a patient's referral and initial visit, a chart review was not conducted to determine whether patients "no-showed" an earlier appointment or for any other reason beyond the clinician's control. Fourth, for safety outcomes, the chart review was limited to F&MCW electronic health records and institutions visible via Care Everywhere. Finally, this study's sample size was small, as only 3.54% of ADOP referrals transitioned to CAP over the study period. This was due to F&MCW having 14 pharmacists and only 2 RN CDCES on the team, so pharmacists were limited in the number of patients they could refer to CAP in the initial stages of the CAP pilot.

Conclusion

Implementation of CAP significantly reduced the time primary care clinical pharmacists spent on diabetes management, allowing them to focus on patients with other chronic disease states (e.g., hyperlipidemia, hypertension). Patients enrolled in CAP achieved similar outcomes in efficacy (e.g., reduction in A1c) and safety compared with ADOP. For patients who would benefit primarily from lifestyle interventions and/or medication titration (per RN CDCES protocol), diabetes management via CAP is a safe and effective care model.

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References

1. World Health Organization. Diabetes. WHO.int. Published April 5, 2023. Accessed August 7, 2024. <https://www.who.int/news-room/fact-sheets/detail/diabetes>
2. Centers for Disease Control and Prevention. National diabetes statistics report. CDC.gov. Updated July 23, 2024. Accessed August 7, 2024. <https://www.cdc.gov/diabetes/php/data-research/index.html>
3. Improving Care and Promoting Health in Populations: Standards of Care in Diabetes-2025. *Diabetes Care*. 2025;48(Suppl 1):S14-S26. doi:10.2337/dc25-S001
4. GlobalData Plc. The complexities of physician supply and demand projections from 2021 to 2036. AAMC.org. Published March 2024. Accessed August 7, 2024. <https://www.aamc.org/media/75236/download?attachment>
5. American Diabetes Association Professional Practice Committee. Comprehensive medical evaluation and assessment of comorbidities: standards of care in diabetes-2025. *Diabetes Care*. 2025;48(Suppl 1):S59-S85. doi:10.2337/dc25-S004
6. Pontefract BA, King BS, Gothard DM, King CA. Impact of pharmacist-led diabetes management in primary care clinics. *Innov Pharm*. 2018;9(2):1-8. doi:10.24926/iip.v9i2.985
7. Cutler TW, Stebbins MR, Smith AR, Patel RA, Lipton HL. Promoting access and reducing expected out-of-pocket prescription drug costs for vulnerable Medicare beneficiaries: a pharmacist-directed model. *Med Care*. 2011;49(4):343-7. doi:10.1097/MLR.0b013e318202a9f2
8. Burke SD, Sherr D, Lipman RD. Partnering with diabetes educators to improve patient outcomes. *Diabetes Metab Syndr Obes*. 2014;7:45-53. Doi:10.2147/DMSO.S40036
9. Davidson MB. The effectiveness of nurse- and pharmacist-directed care in diabetes disease management: a narrative review. *Curr Diabetes Rev*. 2007;3(4):280-6. doi:10.2174/157339907782330058
10. Mauerma, AE. Breaking boundaries in diabetes care: the success story of the ambulatory diabetes outreach program. Unpublished report; 2023.
11. R Core Team. R: a language and environment for statistical computing. R foundation for statistical computing. Accessed 2025. <https://www.R-project.org/>

Navigating Coverage for Anti-Obesity Medications: A Practical Toolkit for Pharmacists and Care Teams

by Yerandy Rosas-Garcia, 2026 PharmD Candidate



Obesity is a chronic disease associated with significant morbidity, mortality, and healthcare costs. According to the World Health Organization, 2.5 billion adults were overweight in the year 2022, and of those people, 890 million were living with obesity.¹ Obesity is a complex, chronic disease strongly associated with cardiometabolic conditions, including type 2 diabetes mellitus, hypertension, dyslipidemia, cardiovascular disease, obstructive sleep apnea (OSA), and metabolic dysfunction-associated steatohepatitis (MASH).

Recognition of obesity as a disease state has expanded the role of pharmacologic therapy as part of long-term management strategies. Glucagon-like peptide-1 receptor agonist agents have demonstrated clinically meaningful weight loss and improvements in obesity-related outcomes. In 2025, the World Health Organization (WHO) issued a global guideline on the use of glucagon-like-peptide-1 (GLP-1) medicines in treating obesity.² Pharmacotherapy has emerged as an evidence-based component of comprehensive weight management, yet

Abstract

Obesity is a chronic disease that contributes to multiple serious health conditions, including cardiovascular disease, type 2 diabetes, and obstructive sleep apnea. As the use of anti-obesity medications continues to expand, pharmacists and other healthcare professionals play a growing role in supporting safe use and ensuring medication access. However, coverage requirements and prior authorization processes can be complex and time-intensive, creating barriers for both clinicians and patients. The ForwardHealth Anti-Obesity Drug Coverage Toolkit was developed to help pharmacists and care teams navigate Wisconsin Medicaid and SeniorCare coverage criteria for anti-obesity medications.

access to anti-obesity medications remains highly dependent on insurance coverage policies, and coverage restrictions frequently limit patient access. ForwardHealth, Wisconsin's Medicaid program, provides coverage for select anti-obesity medications under specific criteria, creating both opportunities and challenges for clinicians and pharmacists.

Navigating prior authorization requirements, renewal timelines, dose limitations, and lifetime coverage rules can be complex, costly, and time-intensive

for both patients and prescribers. A recent retrospective cohort study³ aimed to determine discontinuation rates of GLP-1 receptor agonists over two years after treatment initiation and to identify factors associated with discontinuation and reinitiation. It was found that lower income was tied to higher discontinuation, highlighting potential access and affordability barriers, especially for non-diabetes indications where insurance coverage is often limited.³ Pharmacists can play a critical role in bridging this gap by

interpreting coverage criteria, proactively managing prior authorization submissions and renewals, verifying dose and duration limits, and educating patients and care teams on coverage expectations to prevent therapy interruptions. The ForwardHealth Anti-Obesity Drug Coverage Toolkit was developed by Pharmacy Society of Wisconsin (PSW) members to support pharmacists in this role by consolidating coverage policies into a clear, stepwise, and actionable resource that enables efficient medication access and promotes continuity of care.

Toolkit Overview

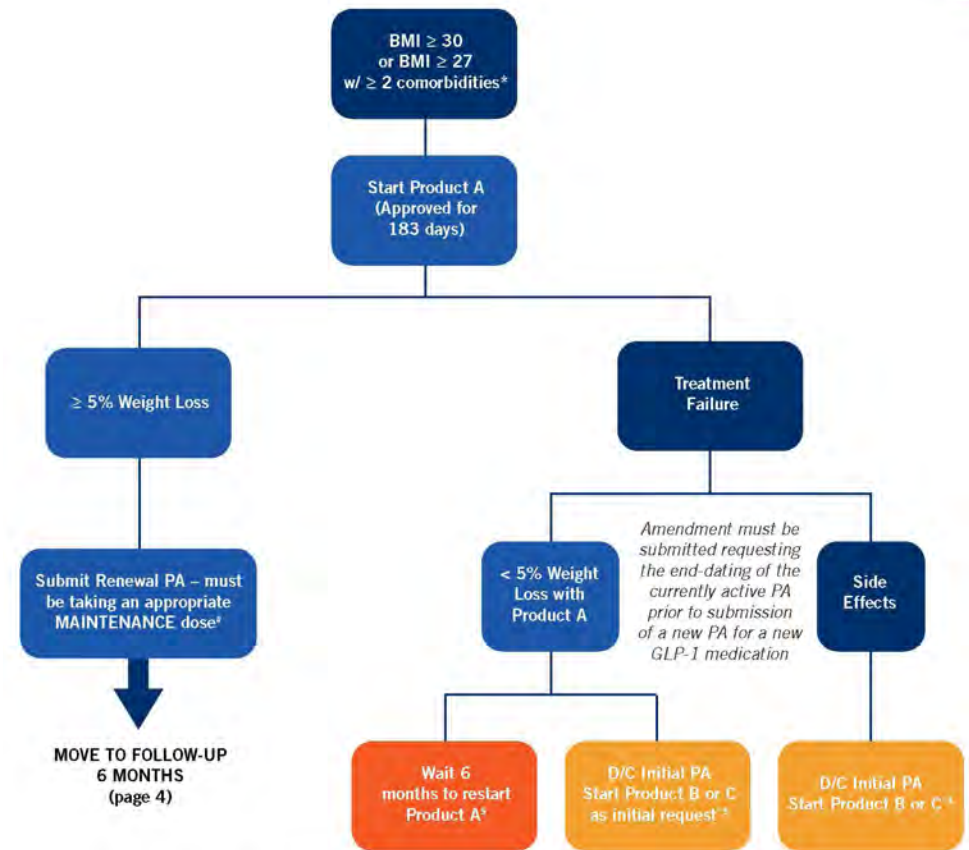
The PSW ForwardHealth Anti-Obesity Drug Coverage Toolkit was designed to assist pharmacy professionals and interdisciplinary care teams in navigating prior authorization requirements, renewal criteria, lifetime limits, and special indications. The ForwardHealth Anti-Obesity Drug Coverage Toolkit was developed by pharmacy clinicians with expertise in ambulatory care, diabetes education, medication access, and obesity management.

Toolkit sections include: screening - initial 6 months, screening - follow-up 6 months renewal, lifetime examples, special indications, and additional information. Explore a few key highlights from the topics below to get a snapshot of resources and tools pharmacy professionals can access today.

Initial Screening and Eligibility for Coverage

The “Screening - Initial 6 Months” section provides a visual guide and decision-making algorithm for weight management eligibility, as ForwardHealth coverage requires patients to meet body mass index (BMI) criteria of ≥ 30 kg/m² or ≥ 27 kg/m² with at least two comorbidities, such as hypertension, hyperlipidemia, type 2 diabetes mellitus, coronary artery disease, or obstructive sleep apnea. During this period, patients are titrating to an appropriate maintenance dose for each medication, as defined by ForwardHealth. (See Figure 1) This section also outlines the steps for prior authorization renewal when patients achieve at least a 5% weight loss, as well as guidance for managing treatment failure (less than a

FIGURE 1. Screening - Initial 6 Months (ForwardHealth Topic #7837)



*Comorbidities: CAD, HLD, HTN, T2DM, OSA

†Maintenance Doses: Saxenda–3 mg, Wegovy–1.7 or 2.4 mg, Zepbound–5, 10 or 15 mg

‡Patient must meet initial PA criteria for coverage

§Changing Product A to Product B or C uses (1) lifetime attempt of Product A

5% weight loss) or medication intolerance due to side effects. By understanding this information, pharmacists can proactively assess eligibility, streamline coverage determinations, and guide decision-making during this initial treatment phase.

Initial Six-Month Period Renewal and Follow-Up Coverage

The “Screening - Follow-Up 6-Month Renewal” section offers a comparable visual guide and decision-making algorithm for use after the initial six-month treatment period. Renewal prior authorizations may be submitted no earlier than one month before the expiration of the active authorization and require patients to be on a maintenance dose while meeting established treatment response criteria. When renewal criteria are met, coverage is approved for an additional 183 days, with subsequent renewals

potentially granted for longer durations depending on the indication. A clear understanding of this section is essential, as it clarifies renewal timelines and outlines procedures for dose adjustments, including when prior authorization amendments are required and when consultation with the Drug Authorization and Policy Override Center is most appropriate.

Lifetime Coverage Limits and Product Switching

The “Lifetime Examples” section includes illustrative examples of continuous therapy, intermittent therapy, and treatment failure. (See Figure 2) These examples are intended to reduce confusion and support consistent interpretation of policy across care teams. ForwardHealth applies lifetime coverage limits to anti-obesity medications when used solely for weight management. Patients are generally limited

FIGURE 2. Lifetime Examples ForwardHealth Topic #7837: Treatment Failure #1

Treatment Failure



to two 12-month lifetime attempts per product, for a total of up to 24 months. Switching between products counts toward lifetime attempts based on duration of use and reason for discontinuation. The examples help pharmacists be better equipped to accurately track lifetime use, counsel patients on coverage expectations, guide appropriate therapy transitions, and proactively prevent avoidable denials.

Special Indications with Modified Coverage Rules

The “Special Indications-MACE, MASH, and OSA” section outlines ForwardHealth’s expanded coverage for select anti-obesity medications when prescribed for indications beyond weight management alone, including major adverse cardiovascular events (MACE), metabolic dysfunction-associated steatohepatitis (MASH), and moderate-to-severe obstructive sleep apnea (OSA). For these indications, lifetime coverage limits do not apply; however, routine prior authorization renewals are still required by ForwardHealth. Initial and renewal criteria emphasize disease-specific clinical documentation, demonstration of treatment response, and appropriate specialist involvement when applicable. While BMI documentation is still required, specific BMI thresholds do not apply for renewal under these special indications. Familiarity with these expanded indications allows pharmacists to accurately identify eligible patients, anticipate documentation requirements, and support prescribers in meeting disease-specific prior authorization and renewal criteria.

Additional Information

Finally, the “Additional Information” section highlights several practical considerations that impact prior authorization success and medication access. The section of the toolkit underscores the importance of timely and complete submission of prior authorization documentation, as ForwardHealth renders coverage decisions within 20 working days of receipt of all required information. This section also clarifies that patients do not need to confirm medication availability before prior authorization submission, helping to avoid unnecessary delays in care. Additionally, this final section outlines when amendments are required, such as when requesting additional doses under an active authorization, particularly for non-maintenance dosing, and notes that multiple doses may be included on a single prior authorization form during the initial approval period to facilitate titration. The pharmacist plays a critical role in ensuring accurate documentation, anticipating renewal timelines, educating patients, and coordinating communication between prescribers and payers to support timely, uninterrupted therapy.

Access to the Toolkit

The ForwardHealth Anti-Obesity Drug Coverage Toolkit is available through this [link](#) or by searching “GLP Toolkit” on the [PSW website](#). Designed to translate complex payer requirements into a structured, clinician-friendly format, the toolkit streamlines workflows and promotes equitable access to evidence-based obesity treatment within Wisconsin Medicaid. By clarifying eligibility criteria, treatment timelines, lifetime limits, and

special indications, the toolkit empowers Wisconsin pharmacists and their teams to proactively support medication access, align therapy with coverage policies, and help reduce glucagon-like-peptide-1 (GLP-1) receptor agonist discontinuation rates associated with cost-related barriers. As obesity pharmacotherapy continues to evolve, resources like this toolkit reinforce the essential role of provider pharmacists in delivering sustainable, patient-centered care in publicly funded healthcare programs. For questions regarding the toolkit, please contact info@pswi.org.

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References

1. World Health Organization. Obesity and Overweight. WHO Newsroom—Fact Sheets. <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>. Published 8 December 2025. Updated 8 December 2025.
2. Celletti F, Farrar J, De Regil L. World Health Organization guideline on the use and indications of glucagon-like peptide-1 therapies for the treatment of obesity in adults. *JAMA*. 2026;335(5):434-438. doi:10.1001/jama.2025.24288
3. Rodriguez PJ, Zhang V, Gratzl S, et al. Discontinuation and reinitiation of dual-labeled GLP-1 receptor agonists among US adults with overweight or obesity. *JAMA Netw Open*. 2025;8(1):e2457349. Published 2025 Jan 2. doi:10.1001/jamanetworkopen.2024.57349

FORWARDHEALTH ANTI-OBESITY DRUG COVERAGE TOOLKIT



VIEW GUIDE



Pharmacy Society
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"MORTAR & PESTLE" CONCORDIA UNIVERSITY WISCONSIN SCHOOL OF PHARMACY STUDENT WRITING CLUB:

Business Member Spotlight: Katie Reinke

by Shayla M. Braun, 2027 PharmD Candidate

Katie Reinke, PharmD, MHA, BCPS, is passionate about advancing pharmacy practice as the Director of Inpatient Pharmacy Services at SSM Health St. Agnes Hospital in Fond du Lac. After earning her Doctor of Pharmacy degree from the University of Wisconsin - Madison School of Pharmacy, she completed a two-year residency in pediatrics at Children's Wisconsin in Milwaukee. She then worked at a small community hospital, where her father had served as Director of Pharmacy while she was growing up. She joined St. Agnes in 2007 as a Clinical Pharmacist and shortly thereafter sought to take on more responsibilities, becoming a leader in the Anticoagulation Clinic and later serving as a Clinical Coordinator. Reinke earned a Master's degree in healthcare administration, seeking to continue learning and improving

processes within inpatient pharmacy. In addition to her administrative roles at St. Agnes Hospital, she collaborates on acute care initiatives across the SSM Health system's 23 hospitals, helping to advance the profession system-wide. She has a desire to create meaningful change within pharmacy practice to improve patient outcomes.

Day-to-Day Practice

There is no such thing as a typical day in leadership, Reinke says, and each day is different. She spends her time in various meetings, analyzing data from many sources to assess practices and make improvements, growing her teammates, reviewing best-practice literature, and triaging issues. The primary goal of each workday is to enhance the practice of pharmacy. The focus of her day depends on whether she is addressing clinical or distributive functions of pharmacy. Maintaining a balance

between the two ensures the department operates effectively. As Director of Inpatient Pharmacy, Reinke is involved in all aspects of medication use, interacting with hospital leaders, nursing, respiratory therapy, physical therapy, physicians, finance, and other departments.

The culture of the St. Agnes pharmacy team is collaborative and fun. Reinke says their low pharmacist turnover rate reflects this, and some pharmacists have worked with the organization for more than 30 years. The team enjoys humor but is also aware of the impact they have. They are high-achieving, with pharmacists and technicians working diligently to care for patients. Staff are eager to take on work and seek solutions, always striving to work at the top of their license. Reinke also says,



"recognizing peers is important – everyone wants to hear when they've done a good job." She believes that empowering others is key to excellence in pharmacy practice.

Reinke says the most rewarding part of being a leader is seeing the team work together to make a positive impact on patient outcomes or safety. Early in her career, she was responsible for designing clinical programs and implementing best practices. However, as she transitioned to leadership, she enjoyed seeing the people in her department grow their skill sets and develop as leaders and clinicians.

Outside the hospital, the pharmacy team focuses on community outreach to support various organizations. Reinke has served on community boards such as YScreen and Big Brothers Big Sisters of Fond du Lac County, and enjoys inspiring others to be involved in their community. Reinke also serves on the board of Adelante Mujer, a nonprofit supporting women pursuing medical education in Nicaragua. Recently, the pharmacy residents at St. Agnes organized a walk to support people affected by Alzheimer's disease, with strong representation from the pharmacy staff. The walk is one example of how the pharmacy team cares for patients outside the hospital walls. She says, "It's important to have that connection to the community. You can't just come to work and call it a day; you have to care for the community, because overall you're caring for your patients."

Reinke states that she has been involved with the Pharmacy Society of Wisconsin (PSW) for a long time and has previously served on the PSW Health-System Pharmacy Advisory Committee. Reinke says, "We have PSW to thank for leading the way and advocating for legislation that allows pharmacists and technicians to operate at the top of their license. This enables us to practice in one of the best states for pharmacy. We are very fortunate." She observes this within the SSM Health system, where there are responsibilities that pharmacists in Wisconsin have that they cannot fulfill in other states. She is proud to work in a state that recognizes and supports the expanding role of pharmacists and technicians. In addition to her involvement with PSW, Reinke is active in national organizations such as the American College of Clinical Pharmacy (ACCP) and the American Society of Health-System



Pharmacists (ASHP), where she served on the New Practitioners Forum Education Subcommittee and as a House of Delegates alternate.

Raising the Bar

Pharmacists and technicians at St. Agnes Hospital play a significant role in patient care and are recognized for their impact. The favorable pharmacist-to-patient ratio enables pharmacists to be closely involved in patients' medication management and healthcare while they are in the hospital. Pharmacy consult services, such as total parenteral nutrition, heparin, anticoagulants, aminoglycosides, vancomycin, and glycemic management, are entrusted to the pharmacists by providers. Pharmacists review every patient chart daily, writing a pharmacotherapy note with monitoring details and recommendations. Providers use these notes to implement recommendations. Pharmacists also review discharge medication reconciliation orders to prevent transition-of-care issues and review admission medication reconciliation orders throughout the patient's stay. Pharmacy technicians conduct medication histories and screen for patients who may be eligible for discharge medication delivery to the bedside. Reinke values the technicians, referring to them as "the eyes, the ears, and the legs" of the pharmacy. They notice and escalate concerns, especially those related to patient safety, and consistently report opportunities for improvement, having a substantial impact on patient care and safety.

There are numerous opportunities for pharmacists and technicians to pursue continuing education at St. Agnes. They host pharmacist and technician days, allowing pharmacists and technicians to educate themselves on current pharmacy topics and share that knowledge with others. Every Tuesday, they offer a Lunch and Learn on a different topic. Pharmacists are also invited to participate in medical staff-level education and journal clubs organized by residents and students. SSM Health also offers a Clinical Ladder program, a point system that enables staff to earn bonuses for participating in additional activities, such as volunteering, peer-reviewing journals, and presenting at conferences. Through this program, they offer financial support to attend conferences, join pharmacy

organizations, and subscribe to journals, which helps staff continue their education. Additionally, the team has implemented a Tech Lattice to help pharmacy technicians track their progress across various competencies and areas of involvement.

Bumps in the Road

Reinke says healthcare is changing rapidly, which makes it challenging to keep up, especially in a large health system. It is necessary to adapt quickly and find ways to implement changes. Every healthcare system faces financial challenges, especially with declining reimbursement rates. Organizations must find ways to continue serving patients and fulfilling their mission, even as healthcare costs continue to rise.

Some notable successes at St. Agnes Hospital include various consulting services that have enabled pharmacists to expand their scope of practice. When the anticoagulation clinic opened in 2007, providers were still managing warfarin, and bridge therapy was not being used. The clinic initially planned to be open only a few days each week. However, in the weeks following its opening, the clinic demonstrated success in anticoagulation management, and as a result, many providers began referring patients to it. Providers gained trust in pharmacists, which led to the introduction of new services, such as antibiotic stewardship and glycemic management. Elisha Buchberger, PharmD, was the driving force behind the glycemic management consult service's success. Reinke enjoyed seeing Buchberger's passion and educational efforts. They used small tests of change, starting the glycemic management program with a trial. When this trial produced positive data, they expanded the program. Reinke says, "While things may be huge and daunting, do small trials to provide data to show impact; or if there's no impact, then you know not to put more of your resources there, and put it elsewhere."

Moving Forward

Over the next few years at St. Agnes Hospital, Reinke aims to give staff greater recognition. She would like pharmacists to become privileged and credentialed members of the medical staff and be board-certified in a specialty they are passionate about. She wants technicians to be involved

in more programs and organizations, such as PSW, to further develop their skills. She also hopes that more pharmacists will apply for the Clinical Ladder, as many already meet the qualifications in their daily work. Reinke wants to see her staff continually grow to improve patient care.

For pharmacy professionals seeking a leadership position, Reinke says the essential qualities are a passion for clinical pharmacy and process development. She entered pharmacy school wanting to be a clinician, not a pharmacy leader, but she had ideas for improving current processes and wanted to do more. She also emphasizes the importance of having prior clinician experience, and "walking in the shoes of your staff." She likes to shadow staff to see what they do on a day-to-day basis, because as a leader you are removed from those day-to-day operations. Seeing the problems they face helps you relate to them. She also asks her staff for feedback on what goes well during the day and what doesn't. Outside of pharmacy, it is also essential to understand what leaders in other professions do. As a pharmacy leader, you represent your department, and it is necessary to be aware of the people around you and their activities to enhance the services you can offer. Being able to speak with leaders from non-clinical backgrounds about pharmacy operational goals is important. Overall, curiosity and continuous learning are essential for leadership.

Reinke's dedication to advancing pharmacy practice and empowering her team reflects her commitment to patient-centered care and continuous improvement. Her leadership continues to elevate the practice of pharmacy at St. Agnes Hospital, across the SSM Health system, and beyond.

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Trust and Autonomy Dynamics with Preceptors and Learners

by Stacy A. Reid, PharmD, BCPS, Jody M. Nordby, PharmD, Lisa R. Brauer, RPh

The development of trust between preceptor and learner is foundational to effective supervision and safe clinical practice within experiential education. In this context, trust refers to a preceptor's judgment that a learner can perform skills competently with an appropriate level of supervision while maintaining patient safety.¹ Trust factors into entrustment decisions preceptors make regarding learner responsibilities. These entrustment decisions are influenced by multiple variables, including the characteristics of the preceptor and learner, the nature of the relationship, the clinical context, and the specific tasks performed.² Learner autonomy for this article is defined as the degree to which a learner is permitted to independently complete clinical tasks and make patient care decisions.³ Autonomy is granted progressively based on learner competence, consistency, and professionalism. Preceptors continuously balance autonomy with oversight as learners develop.

Biases can threaten learner development, creating a greater need for preceptors to balance support and oversight. Entrustable Professional Activities (EPAs) and entrustment scales (ES) are intended to enhance consistency and standardize evaluation of learner readiness, yet their effectiveness depends on how thoughtfully they are applied.

This article explores key factors that influence trust in experiential education, the role of biases in entrustment decisions, and the value of EPAs to promote learner autonomy and prepare learners for independent practice.

Factors Influencing Trust

As the individual ultimately responsible for patient safety and outcomes, the preceptor carries the weight of each entrustment decision. Deciding when to trust a learner requires careful judgment, and this trust is built through ongoing

Abstract

When a learner begins a rotation, preceptors are faced with the question: how much trust and autonomy is appropriate? Preceptors and learners have unique characteristics they bring to the relationship that influence the degree of trust and autonomy. These characteristics, as well as the practice setting and task difficulty, will impact the preceptor's decision regarding the degree of autonomy to be granted to a learner. In addition to objective factors, there are subjective biases that influence a preceptor's assessment. Awareness of potential biases minimizes the impact on a learner's rotations. Additionally, the application of tools that standardize and encourage objective measurement, such as Entrustable Professional Activities (EPAs) and an Entrustment Scale (ES), will help foster a positive experience for the preceptor, learner, and site. Balancing learner autonomy and supervision can be difficult for preceptors. Awareness of learner and preceptor characteristics and potential biases requires implementing resources to minimize their impact. This will result in enhanced learning opportunities on the rotation.

interactions and observation. The behaviors of both the supervisor and the trainee, the nature of their relationship, the clinical setting, and the specific tasks involved influence the level of autonomy to grant a learner.^{1,2,4,5} Understanding the factors that influence trust can help preceptors and learners make informed decisions that support learner development while ensuring patient safety and quality care.

Preceptor Characteristics

Preceptors evaluate learner performance by comparing observed behaviors to personal standards or to predetermined expectations. Experienced preceptors learn to tailor supervision by integrating direct observations with an awareness of the learner's developmental needs. In contrast, novice preceptors may lack confidence in their precepting abilities and struggle to determine the appropriate level of supervision.^{2,5,6} Less experienced preceptors may tend to supervise too closely, which, while potentially safer, can limit opportunities for learner growth. Conversely, granting premature

autonomy can increase the risk of errors.² Differentiating between enough support and micromanaging can be challenging, and preceptors may need to limit interventions while at the same time addressing their own concerns for patient safety.³ Collaborative partnerships between new and experienced preceptors can support the development of shared expectations and enhance ongoing feedback regarding autonomy decisions.²

Preceptors who demonstrate positive attitudes and enthusiasm for both teaching and clinical care contribute to environments where learners feel supported and are more likely to succeed.² When preceptors model self-awareness, acknowledge how their actions impact others, and express openness about their own uncertainties, they encourage learners to adopt similar behaviors.² These habits not only strengthen the learning relationship but also foster the development of trust.²

Learner Characteristics

Trust is built on multiple learner characteristics beyond clinical knowledge and skills, including self-confidence, self-

awareness, and commitment to life-long learning.⁷ According to Self-Determination Theory (SDT), autonomy is not only associated with independence and levels of supervision but is a source of motivation that drives learners to seek opportunities to develop their professional identities as healthcare professionals.^{5,7} Based on SDT, when learners demonstrate autonomy, competence, and relatedness, they are more likely to actively engage and commit to professional growth.⁷ The learners' intrinsic motivation influences their ability to make independent and accurate clinical decisions. This builds confidence and reinforces the sense of belonging and value within the healthcare team.^{2,7}

Finally, learners who are willing to seek feedback and learn from experience focus on growth rather than merely on performance. In contrast, learners who avoid feedback are at greater risk for professional difficulties, including loss of licensure.² Regardless of the learners' degree of self-awareness, the preceptor should initiate and provide routine feedback to ensure the learner benefits and to reinforce learner competence.⁵ Effective feedback should extend beyond the assessment of clinical competencies, include how trust is established, and address any differences between the learner's self-perception and the preceptor's evaluation.^{1,8}

Preceptor-Learner Relationship

The relationship between a preceptor and learner is a key component in the development of trust. A preceptor's ability to engage as a partner in the learning process is a critical first step in creating opportunities for the learner to take on appropriate clinical responsibilities.^{2,4}

A strong, collaborative relationship allows for open communication, mutual respect, and shared goals. Establishing shared responsibility for patient care and discussing mutual goals for the rotation are essential. Being transparent about how autonomy is granted and encouraging open, honest communication builds trust. This approach empowers learners to seek help without fear of judgment and to request additional responsibility when they are ready to face greater challenges.^{2,9} Supervision should be adjusted based on observed strengths and weaknesses, acknowledging that each learner progresses

TABLE 1. Summary Of The Different Biases¹²

Type of Bias	Definition
Halo	Focusing on the learner's positive characteristics and ignoring any other information that may contradict the positive perception
Horn	Focusing on the learner's negative characteristics and ignoring any other information that may contradict the negative assumption
Affinity	Increased favorability with those who have shared experiences like pharmacy school or career goals
Conformity	When someone feels pressured to agree with the majority, even if it contradicts their personal beliefs
Confirmation	Seeking specific information to support an initial opinion of the learner

at their own pace.¹⁰

Setting In Which Supervision Occurs

The work environment can either support or constrain supervision. A supportive team culture, manageable workloads, and clear procedures contribute to a safe space for learning and supervision.^{2,11} Conversely, high-pressure or understaffed environments may limit a preceptor's ability to supervise closely and affect their willingness to delegate.²

Workplace opportunities, such as access to varied clinical tasks, can support or hinder the development of trust. More diverse opportunities allow the learner to demonstrate skills and growth.²

The Task

Finally, the nature of the clinical task itself is a crucial factor. The complexity and critical nature of the task directly affect the level of supervision needed. Simpler tasks may be delegated sooner, while high-stakes or complex situations require the preceptor to be more involved until the learner demonstrates readiness. Preceptors must continually assess whether the learner's capabilities align with the demands of the task and the potential risk to patient safety.^{1,2}

Summary

From the preceptor's perspective, trust is shaped by many factors and must be earned. Recognizing the factors that influence trust helps preceptors make informed decisions that support both patient care and learner development. Balancing oversight and autonomy is fundamental to fostering learner growth while ensuring patient safety and quality care.¹¹ Trust in oneself and in

learners, combined with flexibility to meet individual needs, supports the development of competent and confident professionals.

Preceptor And Learner Biases

The goal across any type of medical training is to prepare learners to provide safe, unsupervised professional care.¹⁰ Three modes of trust in preceptor-learner relationships have been proposed by ten Cate et al: presumptive trust, initial trust, and grounded trust. However, these modes of trust are vulnerable to preceptor biases and can adversely affect the preceptor-learner relationship.¹⁰

Presumptive trust is the first level of trust that is influenced by bias. This trust is based entirely on credentials rather than any prior interactions.¹⁰ For example, the learner is a second-year student at a well-known and respected pharmacy school, therefore they are pre-assumed to possess a certain level of skill. The presumption of trust is vulnerable to affinity bias.¹² Affinity bias can occur between a preceptor and learner if they share experiences or credentials, such as attending the same pharmacy school or having other traits in common, like race, gender, or cultural background.¹² Affinity bias is not rooted in any time spent together or in observed, measurable data for the task or skill requiring a decision on a level of autonomy.¹²

Once the preceptor and learner have spent some brief time together in clinical settings, they progress to an initial trust stage.¹⁰ This mode of learning is perhaps the most vulnerable to biases, as the preceptor has only had limited interactions with the learner at this point.¹⁰ For example, initial trust can be greatly influenced by halo bias.^{10,12} A student shows up each day

with a positive attitude, willing to jump in, may have an outgoing personality or attractive appearance, but when it comes to clinical decision-making, may struggle with knowledge retention or the ability to apply didactic learning to real case scenarios. Due to their bias, a preceptor may overlook some of these deficiencies and allow a student more autonomy attempts than would otherwise be given. The opposite of the halo bias is the horn bias, in which a negative first impression influences how a learner is perceived overall.^{10,12} This may be evident when a student is late due to parking issues, has a shy, quiet personality, or forgets their access badge and now must overcome an unfavorable first impression. Conformity and confirmation biases are also concerns at this stage of autonomy decision-making, as noted in Table 1.¹²

Perhaps the least vulnerable to bias is the grounded mode of trust.^{10,12} This trust is based on extensive experience with the learner, is preceded by sufficient observation, and is based on data obtained through standardized levels of entrustment measures.¹⁰ While less influenced by the biases noted in Table 1, this level is not without other factors influencing autonomy decisions, such as whether autonomy decisions are being made in urgent or controlled situations; for repeated, predetermined tasks like medication histories or laboratory assessments; or when determined on a case-by-case basis when opportunities for autonomy arise.^{10,12}

Awareness of biases is paramount when making autonomy decisions. When these decisions are based on data that is observed, measurable, and evaluated using standardized entrustability assessments, our biases toward learners can be mitigated. Preceptors can then think more deliberately about autonomy and levels of responsibility to bestow upon learners rather than simply reporting observed performance.¹⁰

Entrustable Professional Activities (EPAs) And Entrustment Scale (ES)

Historically, across healthcare education, there have been several approaches to assessing a learner's competency in the skills and tasks required to perform the job.^{13,14} Additionally, each profession has determined which skills and tasks

TABLE 2. Overview Of The Entrustment Scale For Pharmacy Education¹⁵

OBSERVE ONLY	Learner is permitted to observe only. Even with direct supervision, learner not entrusted to perform activity/task.
DIRECT SUPERVISION	Learner entrusted to perform activity/task with direct & proactive supervision. Learner must be observed in order to provide immediate feedback.
REACTIVE SUPERVISION	Learner entrusted to perform activity/task with indirect & reactive supervision. Learner can perform task without direct supervision but may request assistance. Feedback provided immediately.
INTERMITTENT SUPERVISION	Learner entrusted to independently perform activity/task with supervision at a distance. Learner meets with supervisor periodically. Feedback provided regarding overall performance.
GENERAL DIRECTION	Learner entrusted to independently decide what activities/tasks need to be performed. Learner entrusted to direct and supervise activities of others. Learner meets with supervisor periodically. Feedback provided based on broad professional expectations.

are essential to perform the role. Within pharmacy education, the Center for the Advancement of Pharmacy Education (CAPE) has developed educational outcomes.¹⁵ In the latest version, published in 2023, CAPE developed 13 Curriculum Outcomes and Entrustable Professional Activities (COEPA) in which all pharmacy learners should develop competency prior to entering the professional workforce.¹⁵ To measure the competency of each of the COEPAs, an ES was leveraged. There are several entrustment scales noted in the publication and used by various professions, as well as previous versions recommended in pharmacy education.^{13,15} Along with the 2022 COEPAs, an updated ES was implemented, as described in Table 2.¹⁵ This scale uses descriptors and statements, rather than grades or points, for the preceptor to evaluate the learner's level of entrustment.

The current ES recommended in pharmacy education can be applied to learners and professional practitioners. It is designed to be a progressive scale.¹⁵ As the depth and maturity of the learner's knowledge, skills, and attitudes on the task or skill increase, the learner moves to the next level on the scale. Flexibility is built into the scale, as each learner can progress at a different pace, each skill can develop at varying rates, and the scale can be used from beginning learners in the first year of pharmacy school to seasoned pharmacists. Utilizing the scale removes the pressure for graded evaluation and allows the preceptor to accurately assess how much trust to give the learner. While the ES is a useful tool for evaluating trust and autonomy,

there are some notable challenges with implementation.

Providing the necessary level of trust and autonomy is a skill that the preceptor develops and refines with each learner. Due to preceptor characteristics and biases, utilization of the ES may become less reliable and inconsistent.^{13,14} If a learner is not given the correct level of autonomy, as a result of limitations imposed by the preceptor, the scale will not accurately reflect the trust, autonomy, and resulting competency in the skill or task assessed. While it is intended to be a resource, it may lead the learner to have a false sense of confidence or insecurity during their development as a pharmacist.¹³ In addition, the preceptor could falsely rate the level of entrustment higher or lower than what is provided in practice. This mismatch can create confusion for the learner regarding their progression to competency.

The other issue with implementing the ES is how to assess trust in specific tasks that an unlicensed learner may not legally perform. In these situations, preceptors may feel it is incorrect to assess a learner at a lower level on the scale. The dilemma is that if they were licensed, they would be trusted, but at present, they cannot perform the task independently. Preceptors must then determine whether the assessment on the ES should be prospective or retrospective. The literature varies on whether to use retrospective assessment versus prospective assessment of the learner.^{14,16} In pharmacy education, the 2022 COEPAs recommend that the current ES prospectively assess the learner.¹⁵ The prospective assessments

help alleviate the barrier of legal issues like licensure or laws limiting the scope of practice for the learner. Having a prospective assessment on trust, autonomy, and the resulting competence creates a future-focused environment for the preceptor and learner.

Utilization of COEPAs and the ES is well-defined and serves as a means of taking subjective concepts of trust, autonomy, and competence and creating objective measurements. Quantifying trust and autonomy creates clear markers of learner progression and should be implemented to enable both the learner and the preceptor to reflect and assess.

Application And Implementation

When autonomy and trust are provided at an appropriate level, the authors have observed that both preceptors and learners have a better rotation experience. Learners frequently report that increased hands-on experience translates into greater confidence and the development of clinical skills. Similarly, preceptors state that learners displayed more confidence and higher engagement during the rotation. Providing

enough independence and trust to a learner fosters positive relations between the preceptor and learner. The experience is not mutually beneficial when there is a mismatch of autonomy between the preceptor and learner. In these situations, learners comment on the lack of sufficient feedback, and preceptors later note that the learner could have had more independence, resulting in a missed opportunity for growth.

While the preceptor-learner relationship involves two parties, preceptors need to take the initiative to grant the learner autonomy. Each learner is different, and preceptors must be aware of their potential biases. To reduce the risk of bias, preceptors should avoid discussing learners' performance with previous preceptors and should not read prior evaluations. The learner's past rotations should not preconceive expectations for their performance in the current rotation. Additionally, preceptors and learners should set aside dedicated time during the first few days to discuss expectations and provide an overview of the rotation experience. This meeting can be used to establish a baseline for determining how much independence a learner may be afforded during the rotation. Preceptors will need to continuously

evaluate the learner and the level of trust given for a task. The midpoint evaluation is a key opportunity for preceptors to use EPAs and the ES to objectively assess learners' abilities. Through reflection and discussion, preceptors and learners can become aware of current levels of autonomy and trust and determine whether an increase is warranted for the remainder of the experience. By the final evaluation, the objective measurements of EPAs and ES should reflect learners' growth in confidence and clinical skills. These benchmark evaluations ensure learners are provided the proper trust and hands-on experience to continue developing their skills.

Preceptors must be aware of the risk of beginning a rotation with biases and creating or perpetuating them throughout a learner's experience. While it is tempting to desire background information about the learner, it may not always create the best experience. Utilizing tools and objective measurements before and during a rotation can help minimize bias, foster reflection, and create a positive experience.

Conclusion

The level of trust and autonomy to provide to learners is a difficult skill for



preceptors to develop. There are several biases that can interfere with the preceptor-learner relationship. Awareness of biases and influencing factors, as well as the use of an ES, can help minimize interference and create a positive rotation experience.

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References

1. Al-Diery T, Marotti S, Sim YT, Rowett D, Johnson JL. Entrustment in action: Factors that contribute to entrustment decision-making through the lens of the supervisor and the intern. *Am J Pharm Educ.* 2025;89(9):101478. doi:10.1016/j.ajpe.2025.101478
2. Hauer KE, ten Cate O, Boscardin C, Irby DM, lobst W, O'Sullivan PS. Understanding trust as an essential element of trainee supervision and learning in the workplace. *Adv Health Sci Educ Theory Pract.* 2014;19(3):435-456. doi:10.1007/s10459-013-9474-4
3. Carbo AR, Huang GC. Promoting clinical autonomy in medical learners. *Clin Teach.* 2019;16(5):454-457. doi:10.1111/tct.13066
4. Sheu L, Kogan JR, Hauer KE. How supervisor experience influences trust, supervision, and trainee learning: A qualitative study. *Acad Med.* 2017;92(9):1320-1327. doi:10.1097/ACM.0000000000001560
5. Chen HC, Ladenheim RI, Schumacher DJ, Chou FC, ten Cate O. Graded autonomy and grounded self-determination in health professions education. In: ten Cate O, Burch VC, Chen HC, Chou FC, Hennis MP, eds. *Entrustable Professional Activities and Entrustment Decision-Making in Health Professions Education.* 1st ed. London: Ubiquity Press; October 2024.25-33.
6. Gin BC, Holzhausen Y, Khursigara-Slattey N, Chen HC, Schumacher DJ, ten Cate O. Theoretical foundations of trust and entrustment in health professions education. In: ten Cate O, Burch VC, Chen HC, Chou FC, Hennis MP, eds. *Entrustable Professional Activities and Entrustment Decision-Making in Health Professions Education.* 1st ed. London: Ubiquity Press; October 2024.35-50.
7. Sawatsky AP, O'Brien BC, Hafferty FW. Autonomy and developing physicians: Reimagining supervision using self-determination theory. *Med Educ.* 2022;56(1):56-63. doi:10.1111/medu.14580
8. Gin BC, Tsoi S, Sheu L, Hauer KE. How supervisor trust affects early residents' learning and patient care: A qualitative study. *Perspect Med Educ.* 2021;10(6):327-333. doi:10.1007/s40037-021-00674-9
9. Tolleson S, Truong M, Rosario N. Navigating power dynamics between pharmacy preceptors and learners. *Explor Res Clin Soc Pharm.* 2024;13:100408. Published 2024 Jan 17. doi:10.1016/j.rcsop.2024.100408
10. ten Cate O, Hart D, Ankel F, et al. Entrustment decision making in clinical training. *Acad Med.* 2016;91(2):191-198. doi:10.1097/ACM.0000000000001044
11. Jonker G, Klasen JM, Hennis MP, de Graaf J, Schumacher DJ, ten Cate O. Entrustment with health care tasks: balancing trainee autonomy, supervision, and patient safety. In: ten Cate O, Burch VC, Chen HC, Chou FC, Hennis MP, eds. *Entrustable Professional Activities and Entrustment Decision-Making in Health Professions Education.* 1st ed. London: Ubiquity Press; October 2024.213-223.
12. Bergelson I, Tracy C, Takacs E. Best practices for reducing bias in the interview process. *Curr Urol Rep.* 2022;23(11):319-325. doi:10.1007/s11934-022-01116-7
13. Jarrett JB, Elmes AT, Schwartz A. Which entrustment-supervision scale is right for pharmacy education?. *Am J Pharm Educ.* 2023;87(5):100021. doi:10.1016/j.ajpe.2022.12.003
14. ten Cate O, Jarrett JB. Would I Trust or Will I Trust? The gap between entrustment determinations and entrustment decisions for trainees in pharmacy and other health professions. *Pharmacy (Basel).* 2023;11(3):107. Published 2023 Jun 18. doi:10.3390/pharmacy11030107
15. Medina MS, Farland MZ, Conry JM, et al. Finalizing the work related to the Curriculum Outcomes and Example Objectives and Entrustable Professional Activities (COEPA) document: The report of the 2022-2023 Academic Affairs Standing Committee. *Am J Pharm Educ.* 2023;87(8):100560. doi:10.1016/j.ajpe.2023.100560
16. Persky AM, Fuller KA, ten Cate O. True entrustment decisions regarding entrustable professional activities happen in the workplace, not in the classroom setting. *Am J Pharm Educ.* 2021;85(5):8536. doi:10.5688/ajpe8536

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PHARMACY SOCIETY OF WISCONSIN

STRATEGIC PLAN 2026



ENVISIONING THE FUTURE OF PHARMACY PRACTICE

PSW envisions a future where pharmacy professionals are indispensable partners in healthcare, thriving at the intersection of innovation, compassion, and accountability. We anticipate and prepare for workforce transformation, technological advancement, evolving patient expectations, and shifting political and economic landscapes. Our commitment is to ensure pharmacists and pharmacy technicians remain at the forefront of care, empowered by technology, enabled by sustainable care and payment models, and trusted by patients to deliver accessible, high-quality care across Wisconsin.

By unifying our voice, resources, and leadership, we support the advancement of pharmacy in Wisconsin. We promote the profession of pharmacy as vital healthcare partners, providing patient-focused care, optimizing medication therapy, participating actively throughout the full continuum of patient care with outcome-based practices, and advocating for policies that allow patients to decide where and how they receive their pharmacy services.

CROSS-CUTTING COMMITMENT: HEALTHCARE WORKFORCE WELL-BEING

PSW is dedicated to fostering a culture of well-being for all pharmacy and healthcare professionals. We will:

- Advance evidence-based well-being practices.
- Address stigma around mental health.
- Support environments where professionals thrive personally and professionally.



PSW MISSION

Provide a unified voice, resources, and leadership to advance the pharmacy profession and improve the quality of medication use in Wisconsin

EMPOWER PHARMACY PRACTICE TRANSFORMATION



GOAL 1: Advocate for pharmacists' unrestricted use of **professional judgement** to act in the best interest of patients and as essential members of the healthcare team.



GOAL 2: Advocate for the adoption of a **Standard of Care regulatory framework and practice authority** that empowers pharmacists to utilize the full extent of their expertise.



GOAL 3: Provide education, resources, and peer coaching to advance **pharmacist provider status**, ensuring pharmacists are recognized, authorized, and paid for delivering patient care services within their scope of practice.



GOAL 4: Measure and showcase the impact of pharmacy and pharmacist-led care in collaboration with the broader healthcare team, positioning Wisconsin as a model for outcomes-driven, patient-centered practice.



GOAL 5: Create pathways for **pharmacy technicians to assume advanced responsibilities**, while ensuring a skilled and robust technician workforce.



GOAL 6: Equip pharmacy professionals to **harness technology and artificial intelligence (AI)** to enhance patient care, optimize workflows, and preserve human connection.

CULTIVATE PROFESSIONAL GROWTH, INNOVATION, AND LEADERSHIP



GOAL 7: Build vibrant networks for collaboration, idea exchange, and innovation **across all practice areas**.



GOAL 8: Nurture and support **professional identity formation** and continuing professional and leadership development for pharmacists and pharmacy technicians at all career stages.



GOAL 9: Prepare pharmacy professionals to serve as **strategic financial experts**, supporting pharmacy professional development in revenue cycle management, medical coding and billing, evolving reimbursement models, and high-cost personalized therapies.

ADVOCATE FOR ACCESS TO PHARMACY CARE



GOAL 10: Collaborate with community organizations, policymakers, and healthcare teams to **eliminate pharmacy deserts** and ensure equitable access to pharmacist-provided care statewide.



GOAL 11: Advocate for policies that enable **patients to choose the location where they receive their pharmacy care.**



GOAL 12: Empower pharmacy professionals to **create safe workplaces.**



GOAL 13: Advocate for policies that **simplify pharmacist licensure and technician registration.**



GOAL 14: Engage policymakers to eliminate obstacles to innovation, including the use of **telehealth, license portability, and expanded roles for pharmacy professionals.**



GOAL 15: Share our joy in the **pharmacy profession** to attract and inspire future healthcare students.

TRANSFORMING PHARMACY PRACTICE TO ENHANCE THE HEALTH OF WISCONSINITES



Pharmacy Society of Wisconsin

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Pharmacy Society
of Wisconsin

2026 PSW AWARDS

NOMINATE A COLLEAGUE!

Each year, PSW recognizes exemplary professionals through the PSW Awards Program. Please consider nominating a colleague! The nomination deadline is **April 1, 2026**.

PSW Awards:

- Bowl of Hygeia
- Distinguished Service
- Distinguished Technician Award
- Excellence in Innovation
- Interdisciplinary Care Partner Award
- Pharmacy Stars Shining Star Compounding Pharmacy Technician
- Pharmacist of the Year
- Technician of the Year
- Young Pharmacist of the Year

Award recipients will be recognized and receive their award during the PSW Awards Banquet at the PSW Annual Meeting in Wisconsin Dells on Saturday, August 29, 2026.

[NOMINATE HERE](#)



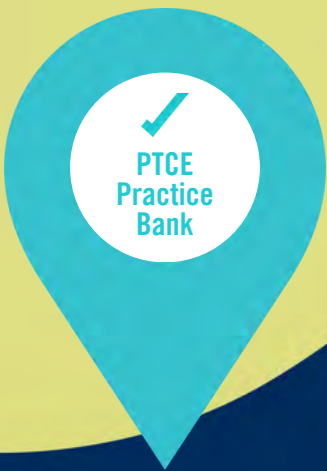
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