

Evidence-Based Antibiotic Prophylaxis for Prosthetic Joint, Infective Endocarditis, and Extraction Regimens

NEW

Prepared by:

Debra A. Goff, Pharm.D., FIDSA, FCCP | Professor of Pharmacy Practice, College of Pharmacy, The Ohio State University | Infectious Diseases Specialist, The Ohio State University Wexner Medical Center

Introduction: Dental Antibiotic Stewardship

Antibiotic prophylaxis (AP) in dentistry has undergone a fundamental evolution driven by emerging evidence, updated clinical guidelines, escalating rates of antibiotic resistance, and heightened awareness of antibiotic-associated harm. For decades, the administration of prophylactic antibiotics prior to invasive dental procedures was viewed as a benign, standard-of-care insurance policy against distant-site infections. Today, studies demonstrate that the clinical utility of AP is limited to select, high-risk populations. Conversely, the risks, including **Clostridioides difficile** infection, multi-drug-resistant organisms, and profound microbiome disruption, are substantial.

Historically, dentists prescribed AP without directly observing the resultant adverse events and complications. Patients experiencing antibiotic adverse drug reactions do not seek care at a dental office. They present to the emergency room or urgent care. Furthermore, a patient who develops a *C. difficile* infection eight weeks after taking a single AP dose seldom links the dental antibiotic prescription with the antibiotic adverse event. Because medical and dental electronic health records rarely communicate with one another, physicians do not inform a dentist when a patient experiences a severe, antibiotic-related adverse event.

Because medical and dental Electronic Health Records (EHRs) remain largely unintegrated, physicians do not routinely inform dentists when a mutual patient develops a severe, antibiotic-related complication. Consequently, dentists rely almost entirely on patient self-reporting, leading to a profound underestimation of the systemic harm caused by dental prescriptions. This communication gap underscores the critical need for an evidence-based shift in prescribing behavior.

Updated AP guidelines from the American Heart Association (AHA), the American Dental Association (ADA), and the 2024 American Academy of Orthopaedic Surgeons (AAOS) emphasize an evidence-based approach and reinforce a unified mandate: optimize oral health, reserve AP for clearly defined high-risk scenarios and eliminate unnecessary systemic antibiotic exposure.

Prosthetic Joint Implants

Perhaps the most dramatic paradigm shift in dental AP occurred within orthopedic and dental cross-specialty guidance. In November 2024, the American Academy of Orthopaedic Surgeons (AAOS) published an updated evidence-based Clinical Practice Guideline. This document formally resolved a decade-long discrepancy by declaring that **routine systemic antibiotic prophylaxis before dental procedures in patients with total hip or knee replacements does not reduce the risk of subsequent periprosthetic joint infection (PJI)**. This clear stance aligns with the American Dental Association's long-standing position of establishing a unified, evidence-based standard across medicine and dentistry.

Rationale

The clinical rationale for omitting routine dental AP in arthroplasty patients rests on definitive microbiological data. Periprosthetic joint infections (PJI) are predominantly caused by cutaneous staphylococci (such as *Staphylococcus aureus* and coagulase-negative staphylococci) introduced intraoperatively or via hematogenous seeding from skin structures. Conversely, oral flora, specifically viridans group streptococci (VGS) account for fewer than 5% of all late-onset PJIs. The baseline incidence of late-onset PJI remains extremely low, ranging from 0.07% to 0.3% across large-scale registries.

CONTENTS

Introduction	1
Guideline for Prosthetic Joint AP	2
Chairside Scripts	3
Infective Endocarditis	4
Medicolegal Risk and Defensive Prescribing	5
Key Takeaways	6

Supporting this standard, a 2026 systematic review and meta-analysis published in *The Journal of Arthroplasty* evaluated data from retrospective cohort studies encompassing 157,466 patients. The investigators found no statistically significant reduction in PJI rates among individuals who received prophylactic antibiotics prior to dental procedures. In fact, a slight, non-significant increase in PJI risk was observed in the antibiotic cohorts, likely reflecting confounding clinical variables or alterations in host resistance.

A 2024 retrospective cohort study of 10,894 patients evaluated antibiotics prior to dental procedures and the association between dental procedures and periprosthetic joint infection. Routine antibiotics prior to dental procedures were not shown to affect the risk of late-presenting PJI. These findings suggest that routine antibiotic prophylaxis before dental procedures is not necessary after total hip and total knee arthroplasty

A 2023 analysis of 2,344 patients who were admitted to a hospital with late periprosthetic joint infections noted no relationship with prior dental procedures. The authors concluded: "In the absence of benefit, the continued use of antibiotic prophylaxis poses an unnecessary risk to patients from adverse drug reactions and to society from the potential of antibiotic prophylaxis to promote development of antibiotic resistance. Dental antibiotic prophylactic use to prevent late PJI should, therefore, cease."

Similarly, a large South Korean database study tracking 591,602 total knee arthroplasty (TKA) patients demonstrated no association between invasive dental work and subsequent PJI and confirmed no therapeutic benefit from AP in both primary and revision arthroplasty cohorts.

The 2024 AAOS consensus statement includes an opinion-based suggestion to delay invasive dental care for up to 3 months following total joint arthroplasty (TJA), under the theoretical assumption that a healing surgical site is highly susceptible to hematogenous seeding. However, this opinion has been challenged by dental leaders. In a 2025 commentary in the *Journal of the American Dental Association*, Dr. T. Paumier (President-elect of the ADA) along with co-authors Lockhart, Springer, and Thornhill, called for an immediate revision of this timeline, arguing that delaying essential dental care is illogical and risks exacerbating oral infections.

To highlight the inconsistency of this delay, consider the following clinical scenarios:

- **Dermatological Comparison:** Most PJIs occurring within 3 months of joint surgery are caused by skin-derived staphylococci, yet there is no medical requirement to delay dermatological interventions post-arthroplasty.

Country

Guideline for Prosthetic Joint AP

United States
(ADA / AAOS)

NOT routinely recommended
oral hygiene emphasized exclusively

International
(Australia, Canada, UK, France,
Netherlands, Norway)

NOT recommended
oral hygiene emphasized exclusively

Timing of Dental Procedures for Joint
Implant Patients

The 2024 American Academy of Orthopaedic Surgeons (AAOS) Clinical Practice Guideline provides recommendations for the timing of dental procedure prior to and post joint implant surgery. It is important to understand these specific recommendations are rooted in expert consensus rather than clinical trials. Nevertheless, dentists can anticipate that orthopedic surgeons will follow these recommendations.

PROCEDURE TYPE	BEFORE TJA	AFTER TJA
Exam (no probing)	Same day	3 months
Cleaning (no scaling), probing (no SRP)	1 day	3 months
Non-invasive (sutures, injections, crowns, impressions, root canals)	1 day	3 months
Scaling/Root Planing (SRP)	1 week	3 months
Extractions (incl. bone grafts)	3 weeks	3 months
Oral Surgery (implants, periodontal, cleft palate, etc.)	After infection resolves	3 months

- **Gastrointestinal Comparison:** *Enterococcus* species cause PJIs at rates substantially higher than oral streptococci, yet patients are never instructed to delay screening colonoscopies or endoscopies during the 3-month post-operative window.

Singling out dental procedures for mandatory delays is clinically counterproductive. The most effective, evidence-verified method to prevent the rare cases of VGS-mediated late PJI is the optimization of daily oral hygiene and the elimination of chronic periodontal inflammation.

Medical History Screening

To bridge the gap between guideline recommendations and clinical practice, dental offices should implement standardized screening and documentation templates. Comprehensive documentation translates clinical decision-making into a clear, defensive evidentiary record that minimizes liability while optimizing patient safety. At every new patient intake and during each annual update, the clinical staff must explicitly document:

- **Prosthetic Joint Details:** Document the type of joint prosthesis (hip, knee, shoulder, ankle) and the date of surgery.
- **Interdisciplinary Guidelines:** Determine and note whether the orthopedic surgeon adheres to the 2024 AAOS evidence-based guideline.
- **True Allergy Verification:** Do not accept a generic “penicillin allergy” label. Document the date and clinical manifestation of the reaction (e.g., “gastrointestinal upset” vs. “cutaneous rash” vs. “acute anaphylaxis requiring epinephrine”). Patients with unverified histories should be formally referred to an allergist for skin testing or oral challenges to facilitate penicillin de-labeling.

Standardized Charting Template

Template A: Prosthetic Joint Patient AP NOT Prescribed

“The patient has a history of a [Primary Left Total Knee Arthroplasty] performed on [Date]. The planned dental procedure involves [Routine Scaling, Root Planing, and Multi-Surface Restorations]. The 2024 AAOS Clinical Practice Guideline and the 2015 ADA Clinical Practice Guideline recommend against the routine administration of prophylactic antimicrobials for prosthetic joint recipients undergoing invasive dental procedures. There are no patient-specific qualifying comorbidities. The patient was educated on the current medical-dental guidelines, the lack of therapeutic efficacy, and the systemic risks of unnecessary antibiotic

use (including *C. difficile* infection and antimicrobial resistance).”

Template B: Prosthetic Joint Patient AP requested by orthopedic surgeon

“The patient has a history of a [Primary Left Total Knee Arthroplasty] performed on [Date]. The planned dental procedure involves [Routine Scaling, Root Planing, and Multi-Surface Restorations]. The 2024 AAOS Clinical Practice Guideline and the 2015 ADA Clinical Practice Guideline recommend against the routine administration of prophylactic antimicrobials for prosthetic joint recipients undergoing invasive dental procedures. There are no patient-specific qualifying comorbidities. The patient was educated on the current medical-dental guidelines, the lack of therapeutic efficacy, and the systemic risks of unnecessary antibiotic use (including *C. difficile* infection and antimicrobial resistance). *As recommended by the ADA, the patient was informed that the orthopedic surgeon will need to prescribe the prophylactic antibiotic prescription. The patient verbalized understanding.*”

Patient and Orthopedic Surgeon Communication Strategies

Transitioning to an evidence-based framework requires clear communication with anxious patients and outdated recommendations by medical colleagues.

Chairside Scripts for Patients

When a patient insists on receiving an antibiotic because their surgeon stated they must take it for two years or for life, use these evidence-based structured scripts:

- **Validating and Educating:** “I completely understand why you expect a prescription today, as your surgeon previously gave you that advice. However, the national organizations representing both orthopedic surgeons and dentists have recently reviewed over 150,000 cases. They found that taking antibiotics before dental care provides no protection against joint infections. Because dental procedures are not the cause of joint infections, the antibiotics offer no medical benefit.”

- **Confronting Individual Risk:** “More importantly, taking an antibiotic when it is not indicated exposes you to potential harm. Single doses of antibiotics disrupt your oral and gut microbiome by destroying your healthy intestinal bacteria. This increases your risk for a life-threatening diarrhea called *C. difficile* and colitis. As your dentist, it is my responsibility to keep you safe. I cannot write a prescription that harms your health without any proven benefit.”

- **Refocusing on Prevention:** *“The absolute best, scientifically proven way to protect your joint replacement is to maintain excellent oral health. Chronic gum inflammation allows mouth bacteria into your bloodstream every single day when you chew or brush. Regular cleanings and brushing will do more to protect your joint than an antibiotic.”*

Letter for Orthopedic Surgeons: Interdisciplinary Antibiotic Stewardship

When an orthopedic surgeon requests prophylaxis for a joint implant patient, the dentist can engage them using guideline-driven language:

“Dear Dr. [Name],

Thank you for collaborating on the care of our mutual patient. Regarding the upcoming dental care for [Patient Name], our office practices adherence to the 2024 AAOS Clinical Practice Guideline and the 2015 ADA Clinical Practice Guideline, both of which recommend against the routine use of antibiotic prophylaxis for patients with prosthetic joints. Current data demonstrate that late-onset PJI is predominantly caused by staphylococci rather than oral streptococci, and extensive reviews show no statistical reduction in infection rates with antibiotic prophylaxis.

If you believe this patient has a unique, clinical risk that requires prophylaxis, we request that your office generate the antibiotic prescription and provide the medical rationale for our dental records.

Thank you for your dedication to interdisciplinary antibiotic stewardship.

*Sincerely,
Dr. [Dentist Name], DDS/DMD”*

Infective Endocarditis

In stark contrast to the non-prophylaxis standard applied to prosthetic joint recipients, AP is indicated for patients at high risk for developing Infective Endocarditis (IE). Following the landmark 2007 American Heart Association (AHA) guidelines, which restricted AP to patients with the highest risk of adverse outcomes, subsequent updates including the 2021 AHA Scientific Statement and the 2020 ACC/AHA Valvular Heart Disease Guideline have reinforced these narrow boundaries.

An extensive 2024 meta-analysis in *JAMA Cardiology* and an exhaustive US Medicaid cohort study confirmed that while AP provides no statistical benefit to the general population, it demonstrates a substantial protective effect exclusively within a well-defined, high-risk cardiac subgroup.

High-Risk Cardiac Conditions (AP Indicated)

Systemic antibiotic prophylaxis is recommended before dental procedures that involve the manipulation of gingival tissue, the periapical region of teeth, or the intentional perforation of the oral mucosa in patients with:

1. Prosthetic Cardiac Valves or material: This includes transcatheter-implanted valves and prosthetic materials utilized for cardiac valve repair (e.g., annuloplasty rings, bands, or clips), as well as left ventricular assist devices (LVADs).

2. Prior History of Infective Endocarditis

3. Congenital Heart Disease (CHD): Unrepaired cyanotic CHD (including palliative shunts and conduits) or completely repaired CHD utilizing prosthetic material or devices with residual shunts or regurgitation at or adjacent to the repair site.

4. Heart transplant: Only if they have developed cardiac valvulopathy.

Conditions for Which AP is NOT Recommended

Prophylaxis should **not** be prescribed for patients with intermediate or low-risk cardiac conditions as the risk of antibiotic related harm outweighs any theoretical cardiac benefit. This includes:

- Mitral valve prolapse (with or without valvular regurgitation)
- Pacemakers, pledgets, implantable cardioverter-defibrillators (ICDs), vena cava filters
- Coronary artery stents or other vascular stents
- Peripheral vascular grafts including those used for hemodialysis
- Bicuspid aortic valve disease (in the absence of prosthetic material)
- Rheumatic heart disease (isolated, without a prosthetic valve replacement)
- Hypertrophic cardiomyopathy
- Physiological, functional, or innocent cardiac murmurs

Prophylaxis Regimens

AP must be administered 30 to 60 minutes prior to the first surgical incision or tissue manipulation. If the antibiotic is inadvertently omitted, it may be administered up to 2 hours post-procedure without compromising efficacy.



MALPRACTICE INSURANCE
BY DENTISTS, FOR DENTISTS®

Extractions

Surgical and routine tooth extractions induce some of the highest rates of transient bacteremia of any elective dental procedure, ranging from 10% to 100%. However, this must be contextualized within daily physiological metrics: routine tooth brushing yields transient bacteremia rates of 20% to 68% and standard chewing induces rates of 7% to 51%. Consequently, a patient with chronic oral inflammation is exposed to a cumulative daily bacterial load from routine activities that vastly exceeds the transient bacteremia induced by an isolated extraction.

The clinical approach to an extraction may vary based on the patient's specific systemic status:

1. **The Prosthetic Joint Patient:** Does not warrant AP. Extractions have no statistical correlation with subsequent late PJI.

2. **The High-Risk Cardiac Patient:** Does warrant AP. Extractions are highly correlated with VGS endocarditis in this specific sub-population.

A 2024 large cohort study of 385,880 Veterans Health Administration patients undergoing extractions found 31.8% were given AP. Post-op complications (alveolar osteitis, surgical site infections) were rare overall, occurring in just 0.9% of visits. Diabetes was a major modifier of antibiotic efficacy. Among visits for patients without diabetes, AP was significantly associated with an increased odds of post-extraction complication (odds ratio [OR] = 1.25, 95% confidence interval [CI]: 1.13–1.38), but among visits for patients with diabetes no significant effect was observed (OR = 1.03, 95% CI: 0.92–1.15). The study observed no significant protective effect of antibiotic prophylaxis on routine post-extraction complications or subsequent medical care utilization. These data suggest the routine use of AP for dental extractions needs to be re-evaluated to minimize unnecessary antibiotic use.

Specialized Patient Subpopulations

Dentists frequently encounter distinct non-cardiac, non-orthopedic cohorts where prophylactic antibiotic use requires precise risk-stratification:

• Patients on Antiresorptive Therapy (Bisphosphonates / Denosumab):

This represents a highly significant dental cohort. Pre-operative AP is widely supported by international consensus to minimize the risk of Medication-Related Osteonecrosis of the Jaw (MRONJ) following invasive extractions. AP is widely supported by international consensus for patients receiving high-dose oncological regimens or long-term oral anti-resorptives with compounding risk factors. Retrospective data show that a targeted peri-procedural antibiotic protocol

reduces the relative risk of post-extraction MRONJ by 86% to 93%.

• Immunocompromised and Neutropenic Patients:

There are no randomized controlled trials evaluating AP for extractions in medically fragile or immunosuppressed populations. For patients exhibiting severe bone marrow suppression or profound neutropenia, an individualized prophylactic protocol should be established in direct consultation with the patient's attending oncologist or physician.

The Microbiome and the Threat of *Clostridioides difficile*

Every dose of an antibiotic carries a biological price. The human intestinal microbiome is a complex, finely balanced ecosystem that provides vital immunomodulatory, metabolic, and protective barrier functions. A single AP dose causes profound taxonomic shifts, depleting protective commensal pathogens and clearing the way for opportunistic pathogens. Antibiotics not only target pathogenic bacteria but also disrupt beneficial microbial communities, reducing diversity and increasing susceptibility to metabolic disorders, immune dysfunction, and opportunistic infections like *C. difficile*. While many common commensal bacteria recover within a few weeks post-treatment, large-scale studies reveal that some disturbances and microbial alterations can persist for four to eight years following a single course of treatment.

The most severe manifestation of this microenvironment disruption is the proliferation of *C. difficile*. A single prophylactic dose is insufficient to trigger CDI. Data compiled by Thornhill and colleagues reveal the stark clinical consequences of dental AP-related adverse drug reactions (ADRs). Their investigations identified a rate of **13 deaths per million single doses** of 600 mg clindamycin when utilized for endocarditis prophylaxis—with all recorded fatalities resulting directly from fulminant *C. difficile* infection or severe antibiotic-associated colitis. Conversely, amoxicillin demonstrated a significantly lower rate of severe adverse drug reactions and resulted in zero deaths within the studied cohorts.

Based on this unfavorable risk-to-benefit ratio, **clindamycin has been removed** from all primary dental prophylaxis guidelines, including those of the American Heart Association (AHA). The drug's high propensity to cause severe, life-threatening CDI renders its routine use in the dental office indefensible when safer alternatives exist.

Medicolegal Risk and Defensive Prescribing

A major driver of inappropriate prescribing is clinical concern regarding potential litigation. A 2025 Veterans Affairs healthcare system investigation highlighted a stark gap between guidelines and real-world execution: 67% of all dental prophylaxis prescriptions written were not indicated according to ADA criteria. Strikingly, when the 2024 AAOS orthopedic guidelines were applied to medical-record data, **100% of the prescriptions written for AP were clinically non-indicated**. Orthopedic surgeons demonstrated the lowest compliance, writing the highest volume of inappropriate antibiotic prescriptions, followed by primary care physicians and dentists.

Dentists frequently state they prescribe unindicated AP because an orthopedic surgeon “ordered” them to do so or because they fear being sued if a joint subsequently fails. This represents a fundamental misunderstanding of medical jurisprudence and professional liability:

1. Clinical Guidelines and the Standard of Care: National evidence-based guidelines published by the ADA and AAOS define the legally recognized standard of care. Deviating from these peer-reviewed standards by writing an AP prescription to practice “defensive medicine” escalates a clinician’s liability.

2. The Prescriber Holds Ultimate Liability: Under the law, the clinician who writes the prescription is solely responsible for any subsequent medical injuries. If a dentist prescribes an antibiotic for a prosthetic joint patient at the request of a surgeon, and the patient develops *C. difficile* or suffers any adverse event, the dentist will be the primary doctor of the malpractice suit. The orthopedic surgeon cannot absolve the dentist of the responsibility to practice evidence-based healthcare.

Key Takeaways

- **Joint Implant Prophylaxis:** The ADA and AAOS are aligned. **Routine antibiotic prophylaxis is not recommended** for patients with prosthetic hip/knee joint implants
- **High-Risk Endocarditis Prophylaxis:** AP remains indicated *only* for the four highest-risk cardiac cohorts defined by the AHA 2021 Scientific Statement. The dentist’s medical history form must list the specific

cardiac conditions rather than just listing “heart condition”. Patients often forget important details of their health history.

- **Microbiome and *C. difficile* Mitigation:** Single doses of dental AP can cause severe collateral damage to the human microbiome. Community-acquired *C. difficile* infections are a documented risk of dental AP.

- **Clindamycin is not recommended:** Clindamycin is no longer recommended in dental AP regimens due to its strong association with *C. difficile* infection. It is replaced by oral doxycycline, azithromycin, or cephalosporins (noting that cephalosporins are not recommended for patients who experienced hives or anaphylaxis to penicillin).

- **Oral Hygiene:** Optimizing oral health and controlling periodontal disease is the most effective way to prevent distant-site hematogenous seeding.

- **Legal Responsibility:** Dentists hold ultimate legal responsibility for the prescriptions they sign. Writing unindicated prescriptions outside of established ADA/AAOS/AHA guidelines increases professional liability and exposes the patient to harm.

- **Document-Driven Practice:** Every clinical decision regarding antibiotic prophylaxis must be supported by chart documentation. Rationale and interdisciplinary conversations must be recorded to maintain a defensible standard of care.

Conclusion

As major prescribers of outpatient antimicrobials, dentists bear a significant responsibility in the global campaign against antimicrobial resistance. The systemic risks of AP including serious adverse events, microbiome disruption, and the select pressure driving multidrug-resistant pathogens outweigh the speculative benefits of AP in all but the highest-risk cohorts. Transitioning from historical prescribing habits to an evidence-based paradigm is imperative to assure the future efficacy of

For further information on EDIC Risk Management or to a request a lecture on dental malpractice risks for your dental school or organization, please contact EDIC’s Risk Manager/Chief Risk Officer, Katie Panikian, JD, CPCU, ARM, at kpanikian@edic.com or call 508.475.0955. Eastern Dentists Insurance Company, Malpractice Insurance, “By Dentists, For Dentists”® | www.edic.com.

Provided by Eastern Dentists Insurance Company (EDIC), June 2026. The information contained is only accurate to the day of publication and could change in the future.