

Review of Guidelines for Dental Antibiotic Prophylaxis for Prevention of Endocarditis and Prosthetic Joint Infections and Need for Dental Stewardship

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Summary: We review The American Heart Association, American Dental Association, and American Association of Orthopedic Surgeons guidelines on dental antibiotic prophylaxis for prevention of endocarditis and prosthetic joint infections. We discuss how to engage dentists and orthopedic surgeons in dental stewardship.

## Abstract

Dentists prescribe 10% of all outpatient antibiotic prescriptions, writing more than 25.7 million prescriptions per year. Many are for prophylaxis in patients with prosthetic joint replacements; the American Dental Society states “in general” prophylactic antibiotics are not recommended to prevent prosthetic joint infections. Orthopedic surgeons are concerned with the risk of implant infections following a dental procedure and therefore see high value and low risk in recommending prophylaxis. Patients’ are “stuck in the middle” with conflicting recommendations from OS and dentists. Unnecessary prophylaxis and fear of lawsuits amongst private practice dentists and OS has not been addressed. We review The American Heart Association/American College of Cardiology, American Dental Association, and American Association of Orthopedic Surgeons’ guidelines on dental antibiotic prophylaxis for prevention of endocarditis and prosthetic joint infections. We provide experience on how to engage private practice dentists and OS in dental stewardship using a community-based program.

Key Words: dental stewardship; prosthetic joint infection, infective endocarditis, antibiotic prophylaxis, behavior change

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Dentists prescribe approximately 10% of all outpatient antibiotic prescriptions, writing more than 25.7 million prescriptions per year [1]. One survey reported dentists prescribe a median of four antibiotic prophylaxis (AP) prescriptions per month for “high-risk” conditions per infective endocarditis (IE) guidelines (84%); and non-recommended situations: legal concerns (24%): patient demand (22%), and primary care physician recommendations (64%).[2] Another recent study assessed the appropriateness of dental AP and found 80% of antibiotics were unnecessary.[3]

The American Heart Association (AHA) has maintained the same recommendations for AP since the 2007 Prevention of IE Guideline [4] until 2015[5]. (Table 1) The American Dental Association (ADA) and the American Academy of Orthopedic Surgeons (OS), (AAOS) have worked together and separately on guidelines for dental AP for patients with total joint replacement (TJR). (Table 2). The ADA (without the AAOS), issued the 2015 evidence-based guideline that states “in general, for patients with prosthetic joints, prophylactic antibiotics are not recommended prior to dental procedures to prevent a prosthetic joint infection (PJI)”.[6] This was followed by a collaborative ADA/AAOS 2016 Appropriate Use Criteria for dental AP for TJR recipients, which described 64 scenarios whereby AP was appropriate in 12%, “may be” appropriate in 27%, but for over 61% of the scenarios, it was “rarely appropriate.”[7] [8] Selected examples of appropriate use includes A1C > 8, severely immunocompromised, or history of PJI requiring an operation. This committee recommended that dentists and OS use a risk calculator. [9] This advice represented yet another change for dentists from the 2015 ADA guideline and created conflict.

OS are concerned about the risk of hematogenous seeding and infection following a dental procedure and therefore see high value and low risk in AP. OS who recommend “AP for life” contribute to the development of resistance and microbiome disruption, expose patients to adverse drug reactions (ADR) and *Clostridioides difficile* infections (CDI).[10] [11] Dentists are put in a precarious situation if patients demand AP based on advice from OS. The patient is “stuck in the middle” with conflicting recommendations from their dentist, orthopedic surgeon, and possibly a primary care physician, who often has no inter-professional contact and may be unaware of changing guidelines.

We propose that antibiotic stewardship pharmacists and physicians (ASP) lead the collaboration between dentists and OS to achieve consensus regarding AP. The challenge is significant. By 2030,

recipients of primary total hip and knee replacement in US is projected to be 1.9 million procedures total.[12] If each TJR recipient visits the dentist twice a year to have their teeth cleaned and receives AP, this represents a potential 3.8 million prescriptions a year, and the ADA states “in general, are unnecessary”.

To date, dental stewardship initiatives have been described in Veteran Association (VA) dental clinics.[13] The VA implemented a program of education and guidelines to improve prescribing and observed a 72.9% decrease in antibiotic prescribing. Providing similar programs for private practice dentists is crucial, but fraught with challenges since private practice dentists are not all in one building or system. With over 80% of US dentists in private practice, [14] providing education on antibiotic resistance rates, CDI, and guideline updates are difficult, without common educational venues to reach them. Gaining an understanding of why dentists and OS continue to prescribe AP when no longer recommended for most patients is critical to create behavior change.

As background, we review AP guidelines from the AHA and ADA for IE prevention and the ADA and AAOS positions regarding risks for PJI. We share experiences from dentists and OS regarding challenges encountered in dealing with conflicting recommendations while best serving patients’ interests.

### **Infective Endocarditis Prophylaxis**

The AHA Guideline for prevention of IE was first published in 1955. The ADA contributed to updates in 1972. It was not until 1997 that AP was revised to amoxicillin pre-procedure and postoperative doses were no longer advised. (Table 1) The rationale for the revision was: 1-IE was more likely to result from exposure to bacteremia associated with daily activities (i.e. chewing, brushing teeth), than from a dental procedure; 2-AP may prevent a small number of IE cases; 3- risk of antibiotic associated ADRs exceeds benefit, from AP and 4- maintenance of oral health from daily activities is more important than AP for a dental procedure. AP is no longer recommended based solely on an increased lifetime risk of acquisition of IE.[4] [5]. The AHA and ADA are in agreement on these recommendations, perhaps as a result of greater than four decades of working collaboratively.

Recently, Chen et.al. performed a risk analysis of patients with IE (2004-2013) after complicated invasive dental procedures using a database, which includes nearly 100% of Taiwan's population of 27 million.[15] They found no increased IE risk after invasive dental procedures, and no increased IE risk for any subset. They concluded there is "no evidence to support AP for the prevention of IE" and no longer recommend it.

### **Prosthetic Joint Implant Prophylaxis**

Whether dental procedures increase the risk of PJI has been debated for decades. (Table 2) AP prior to invasive dental procedures reduces bacteremia, but not necessarily prevents infection.[16, 17] In a randomized placebo controlled trial,[18] AP did not alter incidence, type, nor magnitude of bacteremia after tooth extraction compared to no AP. Some high-strength studies link dental procedures to bacteremia, but only as a surrogate measure of risk for a PJI. No studies explain the microbiological relationship between bacteremia and PJI.[17]

The best available evidence to date shows that dental procedures are not associated with a PJI.[6, 19] [20]. Despite the lack of data, many OS recommend AP for dental procedures in TJR recipients and some endorse AP for life.[21] At the Proceedings of the International Consensus on PJI in 2013, there was consensus that "high risk patients should receive lifelong dental AP." [22]

The ADA reviewed the AP literature.[6] In a single center, case-control study of 339 patients with prosthetic hip or knee infections, Berbari et al matched cases with 339 patients without infection and assessed dental procedures as "exposure" within the prior six months-two years pre-admission. They were broken into low risk dental procedure (i.e. restorative dentistry and endodontic) and high risk dental procedures (i.e. extractions, dental abscess treatment).[19] There was no statistical association between high-risk procedures without AP and PJI at six months or two years. High-risk procedures with AP were protective at 6 months, but not at 2 years. PJI cases had lower odds of having undergone dental procedures than controls. A subgroup of 35 patients with PJI from oral flora pathogens and a randomly selected group of 35 controls also showed no increased risk of PJI, regardless of AP. In the subgroups of high-risk patients who were immunocompromised, had diabetes mellitus, prior arthroplasty, duration of PJI symptoms of <8 days, or were within a year of a TJR, dental procedures in these patients were not risk factors for a PJI.

Skaar et al. reported a case-control study with 168 patients who had TJRs: 42 with PJIs matched with 126 controls.[23] Control patients were more likely to have undergone invasive dental procedures than cases. The investigators failed to demonstrate an association between dental procedure and PJI. Swan et al assessed patients for late PJIs and failed to demonstrate an association between dental procedure and PJI. [24] A fourth study with 2,700 TJR patients[25] in 1986, noted an association in 30 cases with late onset PJI between dental procedures and PJI; however, their methodologic limitations affected the validity of their results. The authors did not report the type of dental procedure performed, and the statistical analysis implied patients undergoing dental procedures were at lower risk of developing PJI. In a population-based cohort study of 255,568 Taiwanese residents in 2017, those with a total knee or hip arthroplasty were assessed for the association between invasive dental treatment and incidence of PJI during the first two postoperative years. PJI occurred in 0.57% in the dental treatment cohort and 0.61% in the non-dental cohort.[26] The dental cohort was then sub-grouped into those who did and did not receive AP; PJI occurred in 0.2% and 0.18% in the AP and non AP groups, respectively - (P=0.8) , confirming a lack of association between the incidence of PJI and AP.

Although PJI post dental procedures are rare (<0.5%), patients can suffer significant morbidity.[16] Patients who receive unnecessary AP can also suffer. Antibiotics disrupt the gut microbiome for long periods, contribute to antibiotic resistance, and cause ADRs).[11] [27] A recent study of hospitalized patients receiving antibiotics showed one in five patients develop an ADR that results in a prolonged length of stay, re-admission, or a visit to an emergency room.[27] CDI is a known ADR occurring from any oral or IV antibiotic, but is highly associated with clindamycin. In the US, dentists are the leading prescriber of clindamycin.[1] A 2014 study by Thornhill et al. on the incidence and nature of ADR's to amoxicillin and clindamycin for dental AP against IE, identified 12 deaths from CDI per million receiving a single 600 mg dose of oral clindamycin, and no deaths following a single three gm oral dose of amoxicillin.[28] Clindamycin, whether a single dose or a course, carries the highest risk of CDI with an odds ratio of 17-20 compared to no antibiotic exposure. [29], [30],[31].

### **Dental antibiotic stewardship**

Dentists and OS need to be aligned when addressing dental AP for TJR recipients. We describe our approach to engage private practice dentists and OS in dental stewardship in our community. Our goal was to bring them together to hear their views on dental AP for TJR recipients to achieve consensus. Our secondary goal was to improve patient care via better communication between academic and private practice dentists and OS and to come to consensus on conflicting AP recommendations.

The ASP pharmacist and physician (DAG and JEM) proposed a town hall community evening forum. DAG and JEM developed a pre and post survey (Table 3), to address current dental beliefs, barriers to guideline adherence and preferred methods for educating patients and themselves. DAG and JEM developed two patient cases with ten questions (supplemental material) to understand the rationale for answers. Questions and cases were pilot tested with dental and orthopedic faculty. The local dental and OS societies were used to identify their members to generate an inclusive invitation list. The 28 attendees were administered the pre-test followed by a one-hour educational program led by the ID pharmacist and physician, two oral surgeons, one OS, and two CDC physicians. Data on escalating local and global antibiotic resistance rates, incidence of CDI and associated mortality, antibiotic ADRs, and the 2016 ADA/AAOS document for AP was reviewed. This was followed by a one-hour breakout session with seven interdisciplinary groups of both dentists and OS to address the two cases and questions. The team leaders presented answers to the whole group for discussion and “their next-steps” to engage more private practice dentists and OS. The post-test assessing new knowledge and real-world use of guidelines was administered to attendees.

For most attendees, it was the first time they had ever spoken face to face and this forum allowed them to discuss patient case scenarios together, to share their perspectives. Importantly, they came to consensus by agreeing that AP was not necessary for one case and would be considered prudent for the second case. Table 4 provides insightful comments from the dentists and OS regarding AP.

Consistent with previous surveys [2] [32], we found 75% of dentists and 88% of OS prescribe AP as “defensive medicine”. Our hospital lawyers were present and addressed this concern. They could not find any lawsuits proving that lack of AP resulted in a patient’s PJI; however, they did find lawsuits proving an antibiotic caused CDI and harm to the patient. Tebano and colleagues suggested measures to



reduce fear and defensive medicine behavior: have local guidelines and share decisions through teamwork.[32] Our town hall forum brought dentists and OS together to achieve consensus on AP with shared decision making. The AAOS and ADA support shared AP decision making tools to engage patients in the decision process and provide information to further clarify the risks and benefits.[33] Our approach had limitations. Dentists and OS not interested in this topic did not attend, potentially biasing our finding to dentists and OS who are receptive to learning new information. Second, although the majority of dentists and OS stated they will use less AP as a result of the new information learned, there is currently no process to track AP prescriptions from private practices and OS. Thirdly, the ID PharmD and MD efforts were voluntary, without compensation for extensive time and effort and may not be applicable to other settings.

### **Next Steps for Dental Stewardship**

To enact change, we suggest the following steps to engage dentists and OS in stewardship.

*ASP engagement:* We recommend community events to allow ASPs the opportunity to create the first steps to shared decision-making on AP.

- ASP's should meet with local dental and orthopedic societies to address guidelines and controversies, provide local data on resistance rates, prevalence and mortality from superbugs and CDI, risk of antibiotic ADRs, and improve knowledge gaps about antibiotic resistance and consequences associated with antibiotic use.
- Forums within regional and national meetings for dentists should include OS and ASP; orthopedic surgery meetings should include dentists and ASP's.
- Dentists and OS prefer to receive education by webinars and ASP's can provide this.
- *ADR Reporting and feedback:* Currently when patients develop an ADR from AP the dentists and OS is rarely informed. Patients who develop CDI (i.e. harm) seek treatment from a primary care physician, urgent care or emergency room, not their dentist nor OS; we believe this lack of feedback contributes to overuse of dental AP. In order to achieve

the desired change among dentists and OS, they need knowledge of this harm. The CDC and professional societies can advocate toward moving policy forward to inform clinicians when their patient develops CDI. Until then, clinicians need to ask patients to inform them of antibiotic related CDI or other significant ADRs. See Figure 1.

*Dentists:* Private practice dentists depend on referrals and community engagement to build their practices; therefore, they frequently host and attend community events. Community face-to-face interactions with local OS will help build interprofessional relationships to attain consensus on AP.

- Collaborate with OS to perform dental clearance prior to elective TJR. (See supplemental material)
- For the select 12% of patients where AP is deemed appropriate according to AAOS/ADA 2016 guidance, we support an ADA recommendation that the OS writes the prescription.
- Use Figure 1 to educate the patient on AP and allow shared decision making as to whether AP is recommended.

*OS:* We recommend OS require patients see a dentist prior to elective TJR to assure infected teeth are removed and a cleaning is performed. (See supplemental material for sample form.)

- The OS needs to “call the shot” of whom among the 12% (e.g. according to the AAOS 2016 report) AP is deemed appropriate and provide the prescription.
- Use Figure 1 to educate the patient on AP and allow shared decision making as to whether AP will be recommended.

*Patient engagement:* Most ASP strategies are aimed at changing doctors’ prescribing behavior; however, strategies are needed to also address patients’ behavior. Patients’ expectations influence a doctor’s decision making. Dentists and OS should discuss the morbidity and mortality associated with PJI and antibiotic

ADRs including CDI, to frame the AP discussion with patients. We believe a tool that provides consistent messaging and shared decision-making will decrease defensive medicine prescribing.

- Dentists and OS need to instruct patients to inform them if AP causes an ADR requiring a visit to a physician, emergency room or hospital admission. (See Figure 1)
- Dentists and OS can refer patients to The Peggy Lillis Foundation website for CDI awareness <https://peggyfoundation.org/c-diff-101/cdiff-101/> to learn about CDI from the perspective of patients and surviving family members.
- *Legal Concerns:* Defensive medicine is amongst the reasons both dentists and OS prescribe dental AP. During our community forum, clinicians listened to one another and achieved consensus on the issue of dental AP. We believe if patients hear the same recommendations from both clinicians the risk of a lawsuit is decreased.
- With increased patient education about risks of AP and lack of evidence that dental procedures cause a PJI, defensive medicine prescribing should decrease.

*Behavior change:* The ADA and AAOS joined in the 2018 CDC antimicrobial resistance challenge and pledged to increase awareness of when dental AP should and should not be used. Making a pledge to “do better” is commendable; however, it’s time to put action behind the pledge.

- Simply asking clinicians to do a better job at prescribing has not and does not work. Significant relational dynamics in dental AP decision-making are centered on risk and desire to reassign risk elsewhere. This includes ownership of risk for patients and clinician reputational risk. AP acts as a “safety valve” to manage the fear of a PJI.
- ASP should lead this collaboration amongst dentists and OS.

## Conclusion

In the US, recommendations for dental AP for patients who have undergone cardiac procedures to prevent IE remained the same since 2007; and with more focus on scrupulous oral hygiene and frequent dental

office visits in 2015.[5] AP for TJR recipients is generally not recommended by dentists, yet still “preferred” by many OS. Lack of evidence to support dental AP, risk of ADRs and escalating antibiotic resistance have led Taiwan to no longer recommend dental AP for prevention of IE, and PJIs. Similar to the current US opioid crisis which has greatly impacted dentists and OS to reconsider every opioid dose and duration, we believe community based dental stewardship must advocate for both dentists and OS to rethink any AP prescribed with a goal towards far less.

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## **Conflicts of Interest**

Dr. Debra Goff reports consulting fees from BioK and Tetrphase; grants to her institution from Merck and Pfizer; and speaking fees from Astellas, all outside the submitted work. All other authors have no potential conflicts to disclose.

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Table 1

Evolution of guidelines and selected studies for dental antibiotic prophylaxis (AP) to prevent infective endocarditis (IE)

Year	Organization	Recommendation and comments	References
1955	AHA	AP for many patients to prevent streptococcal infections	[4]
1957	AHA	AP with oral penicillin 2 days before surgery, IM at procedure, to 2 days after surgery.	[4]
1960	AHA	AP for 2 days pre and post procedure with higher penicillin doses with concerns of antibiotic resistance; chloramphenicol if penicillin allergy	[4]
1972	AHA  endorsed by ADA	AP with IM penicillin 1 hour before and once daily for 2 days post procedure; ADA emphasized importance of maintenance of good oral hygiene	[4]
1977	AHA	Categorization of AP for patients with high and low risk groups	[4]

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<b>1984*</b>	AHA  endorsed by ADA	Attempts to simplify AP with clear lists of procedures;  reduced <u>post</u> -procedure AP to only one oral or  parenteral dose.	[4]
<b>1990</b>	AHA	Added a complete list of cardiac conditions and dental  procedures for AP. Recognition of medical legal risks  associated with IE and “intended as a guideline not as  established standard of care”.	[4]
<b>1997</b>	AHA	AP limited to only pre-operative timing; amoxicillin 2  gm orally, one hour before	[4]
<b>2004</b>	French Society of  Cardiology	Changing epidemiology of IE with less streptococci;  concern regarding lack of efficacy of AP benefit; cost  and antibiotic resistance questions; highest benefit to  risk; focus on oral hygiene daily	[34]
<b>2006</b>	Working Party of  the British Society  for Antimicrobial  Therapy	Consensus based: high-risk cardiac factors to require  AP: previous IE, cardiac valve replacement surgery;  surgically constructed systemic or pulmonary shunts. If  penicillin allergic, oral azithromycin	[35]

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<b>2007*</b>	AHA	<p>AP for fewer conditions than in 1997; only for highest risk patients with: prosthetic cardiac valves or materials for valve repair, prior IE, more limited CHD (unrepaired cyanotic, completely repaired defects with prosthetics during the first 6 months, repaired CHD with residual defects at or near the site of the patch) and cardiac transplant recipients with cardiac valvulopathy.</p> <p>IE is more likely to result from daily activities; maintain optimal oral health for daily activities which is more important than AP for a dental procedure to reduce IE risk. High risk dental procedures involve manipulation of either gingival tissue or the periapical region of teeth or perforation of the oral mucosa; this includes routine dental cleaning."</p>	[4]
<b>2015</b>	<p>AHA Endorsed by IDSA</p>	<p>"Poor oral hygiene and periodontal diseases, not dental office procedures, are likely to be responsible for the vast majority of cases of IE that originate in the mouth."</p>	[5]
<b>2008 revised in 2015</b>	<p>National Institute for Health and Clinical</p>	<p>"Although people with cardiac conditions are at increased risk of IE (e.g. valvular heart disease, hypertrophic cardiomyopathy, previous IE, structural</p>	[36]

	Excellence (NICE) United Kingdom	CHD with surgically corrected conditions including valve replacement) no AP”	
<b>2009 revised in 2015</b>	European Society of Cardiology	AP for only highest risk patients who undergo highest risk dental procedures. High-risk conditions: prosthetic valve or material for cardiac valve repair, prior IE, CHD.  Penicillin/ampicillin/amoxicillin; if allergy clindamycin 600 mg  Good oral hygiene and regular dental review have an important role to reduce IE risk.	[37]
<b>2017</b>	AHA/ACC	AP was expanded to include: patients with transcatheter prosthetic valves and patients with prosthetic material used for valve repair such as annuloplasty rings and chords. Addition is based on observational studies for increased risk of IE.	[38]
<b>2018</b>	Health Insurance Database in Taiwan from 2005-2011	No clinically significant association between dental treatment and risk of IE; no evidence to support antibiotic prophylaxis for any patients, even high risk	[15]



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Abbreviations: American Heart Association (AHA), American Dental Association (ADA), American College of Cardiology (ACC); Congenital heart disease (CHD), Infectious Diseases Society of America (IDSA)

\*In 1984, indications for AP to prevent IE were expanded by the AHA to also include GI and GU procedures; in 2007 the indications for AP to prevent IE were rescinded for both GI and GU procedures.

Table 2. Evolution of guidelines for dental antibiotic prophylaxis (AP) in recipients of total joint replacements (TJR)

Year	Organization	Recommendations and Comments	References
1997	ADA and AAOS	<p>AP for patients at potential increased risk of PJI:</p> <p>1- Immunocompromised/suppressed due to inflammatory arthropathies or disease/ drug/ radiation induced immunosuppression and</p> <p>2-Other patients with: Type 1 DM, first 2 years post joint replacement, previous PJI, malnourished and hemophilia.</p> <p>AP is not indicated for patients with pins plates or screws and is <u>not</u> routinely indicated for most patient with TJR.</p>	[39]
2003	ADA and AAOS	<p>Modifications in classifications of patients at potential increased risk</p> <p>“AP for at risk patients no longer includes ALL patients during the first 2 years after TJR.”</p> <p>Immunocompromised now include: HIV infection and malignancy</p> <p>Included incidence stratification of dental procedures as high and low risk</p>	[40]

2009	AAOS	Recommendations did not meet AAOS criteria for an evidence-based guideline	[41]
		“Given the potential adverse outcomes and cost of treating a PJI, AAOS recommends clinicians consider AP for ALL TJR prior to any invasive procedure that may cause bacteremia, because any invasive procedure can cause bacteremia”	
2010	American Association of Oral Medicine	No evidence for change from the 2003 joint AP recommendation	[41]
2015	European societies	Disagree with 2009 AAOS recommendations due to lack of evidence	[20]
		ADA: let patients decide; continue to follow 2003 and suggest to orthopedic surgeon to follow 2003	
2013	ADA and AAOS	AAOS reversed itself  Clinicians should consider discontinuing the long-standing practice of routinely prescribing AP for patients with prosthetic joint implants. This statement replaces the AAOS 2009.  Patients should maintain appropriate oral hygiene Patient preference should play a significant role	[17]

2015	ADA	“In general, for patients with prosthetic joint implants, AP is not recommended to prevent PJI; prophylactic antibiotic should not be given.” Consider preferences of each patient.	[6]
2017	AAOS/ADA	AP for patients at high risk; AIDS, cancer, RA, SOT on IS, inherited immune deficiency diseases  Among 64 scenarios created to determine if AP is appropriate: 12% appropriate: 27% may be appropriate and 61% rarely appropriate  Clindamycin for penicillin allergy is replaced by azithromycin	[8]
2017	Dutch Orthopedic and Dental society	AP is not appropriate	[16]

Abbreviations: Antibiotic prophylaxis (AP); Immune suppression (IS); Diabetes Mellitus (DM), Rheumatoid arthritis (RA); Solid organ transplantation (SOT)

Table 3. Dentists and Orthopedic Surgeons responses to dental antibiotic prophylaxis (AP) patient cases and survey questions.

	Pre		Post		
	Private Practice Dentists n=20	Orthopedic Surgeons n=8		Private practice Dentists n=20	Orthopedic Surgeons n=8
Years post training (mean, range)	28 (4-44)	24 (3-33)	I will change my antibiotic prescribing	100%	93%
Aware of both ADA and AAOS guidelines	60%	88%	This forum to learn dental stewardship was effective	100%	100%
Recommend antibiotic prophylaxis for TJR	10%	100%	Data on CDI and “superbugs” changed my perspective on AP	90%	81%
Prescribe correct antibiotic, dose, duration	60%	25%	I will decrease my use of antibiotics	100%	88%
I am notified if patient developed CDI	5%	12%	I am aware of “superbugs” in our community	16%	13%
I prescribe antibiotic prophylaxis as “defensive” medicine	75%	88%	I use the AAOS/ADA risk calculator for antibiotic prophylaxis	0%	0%

**Table 4:** Verbatims from dentists and orthopedic surgeons on dental antibiotic prophylaxis (AP) for joint implant patients

<b>Orthopedic surgeons</b>
<p>“You just need to be burned once from a prosthetic joint infection after a dental procedure then you treat everyone else the same with antibiotic prophylaxis, regardless.</p>
<p>“One terrible case impacted my practice for the rest of my career.”</p>
<p>“If you asked me yesterday, I would say the patient in case one should receive dental antibiotic prophylaxis for her lifetime. Tonight, I learned new information and I will no longer recommend prophylaxis in this type of patient.</p>
<p>“ There is no one-size fits all guideline when I consider antibiotic prophylaxis.”</p>
<p>“I only use oral AP so my patient can not get C. difficile infection.”</p>
<p>“I have never had nor have I heard of a patient getting C. difficile infection from a single oral dose of antibiotic prophylaxis.”</p>
<p>“ I really never thought how disruptive it is for the dentist when my patient shows up demanding AP before their dental procedure and expects the dentist to track me down to call in a prescription. Now that we met each other I’ll make sure to respond.”</p>
<p>I don’t really think a single dose of an oral antibiotic is that risky for C. difficile infection. If I could tell my patient the risk of C. difficile infection from a single dose of antibiotics that would be helpful.”</p>
<b>Dentists</b>

<p>I examine and complete many dental clearance forms for patients having elective total joint replacement. I think every orthopedic surgeon should do this. It just makes good sense.</p>
<p>“I don’t know how well controlled the patients’ diabetes mellitus is and neither does the patient. The risk calculator is useless.”</p>
<p>“At my office appointment, I am calling their primary care physician or orthopedists and if I don’t, the patient is stuck in the middle in my office hoping to get their dental work done.”</p>
<p>“I enjoyed the opportunity to interact with our own community orthopedic surgeons and listen to different perspectives other than our own (and the ADA’s) on antibiotic prophylaxis”</p>
<p>“My discussion with the oncologic orthopedic surgeon in my group provided a new perspective and understanding for use of antibiotic prophylaxis in his patients.”</p>
<p>“Why do the orthopedic surgeons recommend lifelong antibiotic prophylaxis? Our ADA guidance says no antibiotic prophylaxis”</p>

## Figure 1 Legend

The routine use of pre-dental procedure antibiotics is not supported by current evidence. Antibiotics are associated with unwanted side effects and adverse events. One in five patients will develop a serious adverse event that requires a visit to the doctor or emergency room. These adverse events include allergic reactions and diarrhea that can cause death. Sometimes the diarrhea leads to another infection called *C. difficile*, which happens as the good bacteria in our GI tract are being wiped out (microbiome disruption) by the antibiotic. This creates bad bacteria (superbugs) that set up shop within us. Taking an antibiotic to possibly prevent an infection puts you at a risk for adverse events and development of superbugs. Prosthetic joint infections can occur in < 1 % of patients. Patients who have compromised immune systems (cancer, chemotherapy, chronic steroids use are some examples) might be at greater risk for implant infections and your surgeon may consider antibiotics before dental procedures.

Based on this information and our discussion:

I will not take antibiotics before dental procedures

I will take antibiotics before dental procedures implants. If you develop an adverse event that requires a visit to a doctor or ER you need to call my office.

Figure 1. Doctor-Patient Shared Decision Making Tool

