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Current Practices of the 2012 Antibiotic Prophylaxis Recommendations for Orthopaedic Implants in a Mid-West City

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Abstract

Background: This investigation examines practices with the 2012 recommendations by the American Dental Association (ADA) and American Academy of Orthopaedic Surgeons (AAOS) for antibiotic prophylaxis in patients with orthopaedic implants. Quantifying practices allow enforcement efforts to be focused, so the medical community can gain credibility by having united practices on this topic. **Methods:** A survey regarding the recommendations was mailed to randomly selected clinicians from the ADA and the AAOS membership lists. Participants were sixty orthopaedic surgeons, twenty-five oral surgeons, twenty-four endodontists, twenty-five general dentists, and twenty-one periodontists, all practicing within 100 miles of Omaha, Nebraska. **Results:** 81.3% of clinicians surveyed were aware of the recommendations, with no significant difference between orthopaedic surgeons and dentists (p=0.074). Of these clinicians, 74.5% indicated that they would recommend prophylactic antibiotics for patients with prosthetic implants prior to invasive dental treatment. Orthopaedic surgeons were significantly more likely to recommend prophylactic antibiotics for these patients (p<0.001). **Conclusions:** The primary hypothesis that clinicians who are aware of the recommendations would not routinely prescribe prophylactic antibiotics was rejected. The secondary hypothesis that there is no difference in practices between orthopaedic surgeons and dentists was rejected. Further studies should investigate the reason for this difference.

Keywords: antibiotic prophylaxis, orthopaedic implant

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1. Introduction

In 2009, the American Academy of Orthopaedic Surgeons published the information statement "Antibiotic Prophylaxis for Patients after Total Joint Replacement." The statement, It is likely that bacteremia associated with acute infection in the oral cavity…can and do cause late implant infection. Given the risk of infection and the associated cost, they recommended that "clinicians consider antibiotic prophylaxis for all total joint replacement patients prior to any invasive procedure that may cause bacteremia. However, patients with pins, plates and screws, or other orthopaedic hardware that is not within a synovial joint are not at increased risk for hematogenous seeding by microorganisms (The American Dental Association & The American Academy of Othopaedic Surgeons, 2012)." In the year that followed, more research began to emerge on both the benefits and the drawbacks of prophylactic antibiotic therapy. The American Dental Association and the American Academy of Orthopaedic Surgeons worked together to conduct an extensive literature review to highlight the evidence and also demonstrate what future research is needed to prevent infection in patients with orthopaedic implants undergoing dental procedures (The American Dental Association& The American Academy of Othopaedic Surgeons, 2012).

The first part of the 2012 recommendation was for the discontinuation of "routinely prescribing prophylactic antibiotics for patients with hip and knee prosthetic joint implants undergoing dental procedures." This is a limited recommendation, meaning the supporting evidence is unconvincing, or that well-conducted studies show little clear advantage to one approach over another. Practitioners should be vigilant for new publications in the area, but also allow patient preference to be a substantial factor in the decision. The second part stated they were "unable to recommend for or against the use of topical oral antimicrobials in patients with prosthetic joint implants or other orthopaedic implants undergoing dental procedures." This recommendation is classified as inconclusive, meaning there is a lack of compelling evidence and the balance between benefits and potential harm remains unclear. Practitioners are encouraged to be vigilant for new studies and review of literature when following both a limited and an inconclusive recommendation, while allowing patient preference to play a role in treatment decisions. The third and final part of the 2012 recommendation was that "patients with prosthetic joint implants or other orthopaedic implants maintain appropriate oral hygiene."

This is a consensus recommendation, meaning that it is supported by expert opinions, despite there being no empirical evidence (The American Dental Association & The American Academy of Othopaedic Surgeons, 2012). The first recommendation will be the focus of this study.

The first 2012 recommendation to discontinue routine use of prescribing prophylactic antibiotics for patients with hip and knee prosthetic joint implants undergoing dental procedures will be the focus of this study. Much of the current literature surrounding antibiotic prophylaxis in dentistry concerns heart patients and those at risk for developing infectious endocarditis. Thus, most of them focus on compliance with guidelines set by the American Heart Association. Some studies from the United Kingdom deal with guidelines set by the National Institute for Health and Care Excellence (NICE), but are still focused on the prevention of infectious endocarditis. This study brings some much-needed attention to patients with orthopaedic joint implants and the recommendations the American Dental Association and the American Academy of Orthopaedic Surgeons have set to address their risk for prosthetic joint infections. These recommendations are also worthy of study because they were jointly developed by both the medical and dental communities, while other recommendations have been developed by one or the other.

This investigation examined practices with the American Dental Association and the American Academy of Orthopaedic Surgeons recommendations among orthopaedic surgeons, oral surgeons, endodontists, general dentists, and periodontists. The primary hypothesis was that providers who were aware of the recommendations would not routinely proscribe prophylactic antibiotics. The secondary hypothesis was that though the American Dental Association and the American Academy of Orthopaedic Surgeonsjointly issued the recommendations, there should be no statistically significant difference in practices to these recommendations by the orthopaedic surgeons compared to dentists.

2. Methods

The design for this study was approved by the Institutional Review Board, exempt protocol #13-16855. The first question on the survey asked whether they were aware of the recommendations.

The second question was whether they would recommend antibiotic prophylaxis for a patient with a prosthetic joint implant prior to any invasive dental procedure. For the purpose of this study, an "invasive" procedure is one that elicits moderate bleeding. The third question was whether they would recommend antibiotic prophylaxis for a patient with a prosthetic joint implant prior to a routine dental cleaning. These questions were designed to determine how closely the recommendations were being followed. The fourth and fifth questions asked whether providers prescribed the antibiotics themselves or referred the patient back to a primary care or orthopaedic surgeon.

Surveys were sent to 365 practitioners, who were selected via random cell generation based on the American Dental Association and the American Academy of Orthopaedic Surgeons membership lists of providers within 100 miles of Omaha, Nebraska. This pool consisted of 136 orthopaedic surgeons, fifty-five oral surgeons, fifty-nine endodontists, fifty-five general dentists, and sixty periodontists. Also enclosed with the survey was a cover letter, a bill of subject rights, and an envelope with prepaid return postage. One hundred fifty-five surveys were completed, for an overall response rate for this investigation of 42.5%. The final pool of participants consisted of sixty orthopaedic surgeons, twenty-five oral surgeons, twenty-four endodontists, twenty-five general dentists, and twenty-one periodontists.

Chi-squared tests of independence were preformed to assess the statistical significance of differences among the specialties with respect to awareness of the recently modified recommendations as well as between orthopaedic surgeons and dentists taken together. Chi-squared testing was also done to compare recommendation of the use of a prophylactic antibiotic for patients with a prosthetic implant prior to any invasive dental treatment or a basic dental cleaning, both between all specialties and comparing orthopaedic surgeons to dentists taken together.

3. Results

The primary hypothesis that clinicians who are aware of the recommendations would not routinely prescribe antibiotics for prophylaxis was rejected. Of all the clinicians sampled (n=155), 81.3% responded that they were aware of the recently modified recommendations from the American Dental Association and the American Academy of Orthopaedic Surgeons regarding discontinuing the practice of prescribing prophylactic antibiotics for patients with prosthetic joints (Table 1).

Orthopaedic surgeons tended to show the greatest awareness (88.3%) while endodontists tended to show the least awareness (75.0%) of all the specialties surveyed, although there was no significant difference in awareness among the specialties according to chi-squared test of independence (p=0.489). In other words, orthopaedic surgeons were not significantly more aware of the modified recommendations than any of the dental specialties or the general dentists surveyed when groups were considered individually. When orthopaedic surgeons were compared to all dentists surveyed taken together, orthopaedic surgeons were more likely to be aware of the changes in recommendations compared to dentists, although it did not achieve statistical significance (p=0.074).

Table 1: Clinical Specialty by Awareness of Antibiotic Prophylaxis

Question: Had you been aware of the recently modified recommendations from the American Dental Association and the American Academy of Orthopaedic Surgeons regarding discontinuing the practice of prescribing prophylactic antibiotics for patients with prosthetic joints?[§]			
Clinical Specialty	**N**	**No**	**Yes**
Orthopaedic Surgery	60	11.7%	88.3%
Oral Surgery	25	20.0%	80.0%
Endodontics	24	25.0%	75.0%
General Dentistry	25	24.0%	76.0%
Periodontics	21	23.8%	76.2%
Total	**155**	**18.7%**	**81.3%**

[§]Based on chi-squared test of independence, p=0.489 for comparison of all clinical specialties. For comparison of orthopaedic surgeons to all dentists, p=0.074 based on chi-squared test of independence.

Of all the clinicians responding (n=153), 74.5% indicated that they would recommend the use of a prophylactic antibiotic for patients with a prosthetic implant prior to any invasive dental treatment (Table 2).

However, the tendency to recommend prophylactic antibiotics for patients with a prosthetic implant prior to any invasive dental procedure varied by clinical specialty ($p<0.001$) with orthopaedic surgeons being the most likely to recommend prophylactic antibiotics (91.7%) and endodontists the least likely to recommend prophylactic antibiotics (54.2%) for patients with a prosthetic implant prior to any invasive dental treatment. When orthopaedic surgeons were compared to all dentists taken together, they were again found to be significantly more likely to recommend the use of a prophylactic antibiotic for patients with a prosthetic implant prior to any invasive dental treatment ($p<0.001$).Thus the secondary hypothesis that there would no difference between dentists and orthopaedic surgeons was rejected.

Table 2: Clinical Specialty by Recommendation for Antibiotic Prophylaxis for Invasive Dental Treatment

Question: If treating a patient with a prosthetic joint implant, would you recommend the use of a prophylactic antibiotic prior to any invasive dental treatment?§			
Clinical Specialty	**N**	**No**	**Yes**
Orthopaedic Surgery	60	8.3%	91.7%
Oral Surgery	25	40.0%	60.0%
Endodontics	24	45.8%	54.2%
General Dentistry	24	25.0%	75.0%
Periodontics	20	35.0%	65.0%
Total	**153**	**25.5%**	**74.5%**

§Based on chi-squared test of independence, $p<0.001$ for both comparison of all clinical specialties and for comparison of orthopaedic surgeons compared to all dentists.

Of all the clinicians responding (n=152), 53.3% expressed that they would recommend the use of a prophylactic antibiotic for patients with a prosthetic implant prior to a basic dental cleaning (Table 3). However, the tendency to recommend prophylactic antibiotics for patients with a prosthetic implant prior to a basic dental cleaning varied by clinical specialty ($p=0.002$) with orthopaedic surgeons being the most likely to recommend prophylactic antibiotics (68.3%) and oral surgeons the least likely to recommend prophylactic antibiotics (28.0%) for patients with a prosthetic implant prior to a basic dental cleaning.

When orthopaedic surgeons were compared to all dentists taken together, they were again found to be significantly more likely to recommend the use of a prophylactic antibiotic for patients with a prosthetic implant prior to a basic dental cleaning (p=0.003).

Table 3: Clinical Specialty by Recommendation for Antibiotic Prophylaxis for Basic Dental Cleaning

Question: If treating a patient with a prosthetic joint implant, would you recommend the use of a prophylactic antibiotic prior to a basic dental cleaning?§			
Clinical Specialty	**N**	**No**	**Yes**
Orthopaedic Surgery	60	31.7%	68.3%
Oral Surgery	25	72.0%	28.0%
Endodontics	23	69.6%	30.4%
General Dentistry	24	37.5%	62.5%
Periodontics	20	45.0%	55.0%
Total	**152**	**46.7%**	**52.3%**

§Based on chi-squared test of independence, p=0.002 for difference among all clinical specialties listed. For comparison of orthopaedic surgeons compared to all dentists, p=0.003 based on chi-squared test of independence.

Of all the clinicians who indicated the necessity for antibiotic prophylaxis for at least some procedures (n=126), 88.9% personally prescribe antibiotic prophylaxis to patients with prosthetic implants while 11.1% refer patients back to either their primary care physician or orthopaedic surgeon for antibiotic prescriptions (Table 4). Oral surgeons were the least likely to refer back to physicians for antibiotic prophylaxis (referral=5.3%) with periodontists close behind (referral=5.6%). In contrast, endodontists were the most likely to refer back to physicians for antibiotic prophylaxis (referral=22.7%). Because of sparse cells, clinical specialty was dichotomized for statistical testing into two groups that were most similar in distribution: (1) orthopaedic surgery, oral surgery, and periodontics versus (2) endodontics and general dentistry.

Based on chi-squared testing of dichotomized dental specialties, there was a statistically significant difference in practitioners' tendency to personally prescribe versus referral back to the physician with orthopaedic surgeons, oral surgeons, and periodontists being more likely to personally prescribe antibiotic prophylaxis compared to endodontists and general dentists (p=0.018). When comparison was made between orthopaedic surgeons to all dentists taken together, Fisher's exact test showed no significant difference between orthopaedic surgeons and dentists in terms of prescribing/referral patterns (p=0.376).

Table 4: Clinical Specialty by Prescription Writer Preference among Clinicians Recommending Antibiotic Prophylaxis[£]

Question: If you do recommend the use of a prophylactic antibiotic prior to treatment, do you prescribe the antibiotic or do you refer the patient to their primary care physician or orthopaedic surgeon for the prescription?[§]			
Clinical Specialty	**N**	**No**	**Yes**
Orthopaedic Surgery	44	93.2%	6.8%
Oral Surgery	19	94.7%	5.3%
Endodontics	22	77.3%	22.7%
General Dentistry	23	82.6%	17.4%
Periodontics	18	94.4%	5.6%
Total	**126**	**88.9%**	**11.1%**

[£]Because of sparse cells, clinical specialty was dichotomized for statistical testing into two groups that were most similar in distribution: (1) orthopaedic surgery, oral surgery, and periodontics versus (2) endodontics and general dentistry with p=0.018 for chi-squared test of independence. For comparison of orthopaedic surgeons to all dentists, Fisher's exact test yielded p=0.376, indicating that prescribing/referral patterns among orthopaedic surgeons are not significantly different from dentists.

4. Discussion

It is understood that a response rate of 50-60% is optimal(Dilman, 1978). However, given the financial restraints and the strong response rate (42.5%) after a single mailing, this study did not follow Dillman's total design method.

However, an envelope with return postage was included in the mailing, which has been shown to increase response rate (Draugalis & Plaza, 2009).

The first question asked whether the provider was aware of the recommendations. However, one can be aware of what they are, but may not have read them, hindering their understanding of the philosophy behind them, or even the extent to which they reach. A similar study regarding the National Institute for Health and Care Excellence guidelines for antibiotic prophylaxis for high-risk cardiac patients found that while the vast majority of providers (95.7% and 94.1%) were aware of a revision to recommendations, only 62% and 69.7% had actually read them (Farook, Davis, Khawaja, & Sheikh, 2012). Further studies should include a means to test the provider's understanding of the recommendations, rather than relying on self-reported awareness.

The finding that providers who were aware of the recommendations are still routinely prescribing prophylactic antibiotics may be in contrast to a study from the United Kingdom. After the National Institute for Health and Care Excellence recommended that the use of antibiotic prophylaxis for high-risk cardiac patients be discontinued in the United Kingdom, an initial 78.6% reduction was seen in their prescription. Before this revision, general dental practitioners wrote 91.9% of all antibiotic prophylaxis prescriptions in the United Kingdom (Thornhill et al., 2011).It would be useful to gather data on the practices of clinicians before the updated recommendations to determine whether a decline is evident with the American Dental Association and the American Academy of Orthopaedic Surgeons recommendations.

Since 2007, when the American Heart Association recommended the reduction in antibiotic prophylaxis for those at risk for infective endocarditis, 80% of dentists reported a decrease in the number of patients for whom they would recommend antibiotic prophylaxis, with the average decrease being 60%. However, 19% reported no change in their prescription of antibiotic prophylaxis.

Of the dentists surveyed, 70% indicated that they still had patients who received prophylactic treatment even though the 2007 guidelines no longer recommended it. In 57% of these cases, the physician's recommendation for antibiotics was taken over the dentist's recommendation against it.

In 33% of the cases, the patient's preference for antibiotics was honored, despite medical recommendation (Lockhart, Hanson, Ristic, Menezes, & Baddour, 2013). By working on the 2012 recommendations together, the American Dental Association and the American Academy of Orthopaedic Surgeons hoped they would be able to minimize such discrepancies. However, this study found that orthopaedic surgeons are still significantly more likely to recommend the use of a prophylactic antibiotic for patients with a prosthetic implant prior to any invasive or routine dental treatment than were dentists. Building a united front as a medical community regarding our standards for antibiotic prophylaxis is important in strengthening credibility to patients. Future studies should investigate why there is a difference between prescription practices of orthopaedic surgeons and dentists, so that it may be reduced. These studies should also have a wider scale to determine whether the trends seen around Omaha are similar to those nationally.

The opinion of medical professionals outweighing those of dental professionals is of interest here as prescription writer preference was examined. However, in the survey, the opening phrase of the relevant question was worded, "If you do recommend the use of a prophylactic antibiotic." This suggests that they would personally recommend the use of antibiotic prophylaxis, but that may not be the case. Perhaps they recommend it be used to appease a patient, but they do not personally believe it to be necessary. The recommendation is classified as limited, leaving a substantial amount of room for patient opinion to influence treatment. However, it does mean that this question cannot be used as a measure of the acceptance of the practice of antibiotic prophylaxis, as a doctor may see the treatment fit for the situation, though it may not be medically necessary.

When changes are made to major recommendations, it is important to present patients with the updated information and explain the rationale for the change. Soheilipour (2013) found that an informational video is more likely to reduce patient concerns about the change compared to an informational leaflet alone. Furthermore, practitioners' attitudes toward evidence for new guidelines seem to be reflected in patients' attitudes and can influence patient choice.

If a practitioner is able to effectively communicate why a recommendation was revised, it will boost his or her credibility with the patient. This will make the patient feel more in control and comfortable with the decision to change his or her routine. By informing patients, their concern may be alleviated, increasing practitioner compliance with the guidelines.

The study did not ask for the length of time in practice. Newer providers may have learned about the mounting evidence against the practice of antibiotic prophylaxis as part of their training, making them more skeptical of its validity. Soheilipour (2011)suggests that newer providers are more likely to comply with institutional recommendations, as they have little history with their patients. Farook (2012)found that more established providers are more likely to continue prescribing antibiotic prophylaxis, despite updated recommendations. This suggests that the established providers weigh patient history and attitude more heavily than do less established providers.

5. Conclusion

Orthopaedic surgeons and dentists, though they have the same recommendations for antibiotic prophylaxis, have different prescribing practices. Orthopaedic Surgeons prescribe antibiotics more often, despite the recommendation to discontinue the practice of prophylactically prescribing antibiotics. The recommendations do leave room for clinical judgment, but there needs to be an understanding between orthopaedic surgeons and dentists regarding treatment for patients. There should also be an effort to educate patients on the new recommendations as well, so that they may also be able to give better informed consent.

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