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Antibiotic Use by Members of the American Association of Endodontics: A National Survey for 2009- A Follow up from the Report in 1999

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A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Dentistry at Virginia Commonwealth University.

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Abstract

ANTIBIOTIC USE BY MEMBERS OF THE AMERICAN ASSOCIATION OF ENDODONTICS: A NATIONAL SURVEY FOR 2009- A FOLLOW UP FROM A REPORT IN 1999

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The purpose of this study was to determine the changes in prescribing habits of active members of American Association of Endodontics (AAE) with regards to antibiotics in comparison to the findings reported by Yingling et al. in 1999.

The invitations to take the online survey were sent via email to 2593 active members. A response rate of 37.75% was obtained. It was determined to be adequate for analysis and for comparison to the results obtained by Yingling et al. Comparisons between the percentages shown in this survey and the previous survey were tested using a z-test. An ANOVA model was used to determine the relationships between predictive factors and the number of prescriptions written.

The change in distribution of respondents was notable with an increase in younger clinicians (25% in 1999 to 36% at present). They were more likely to be in private practice and much less in part-time academic and private practice setting. The number of patients being seen per week and the number of prescriptions written per week also decreased in comparison ($p<0.001$). For all the considered factors, it was also noted that board certified endodontists were prescribing less antibiotics per week. A positive correlation was noted for number of years in practice ($p=0.0006$), type of practice ($p<0.001$) and number of prescriptions written per week.

Changes in choice of antibiotics were also noted. There was a decrease in use of Penicillin (61.48% to 43%), an increase in the use of Amoxicillin (27.5% to 37.6%), and an increase in use clindamycin (45.3% to 64%) for patients with no medical allergies. As for patients with medical allergies, there was a steep incline in the use of clindamycin (56.03% to 90.3%) as first choice to an increase in azithromycin (7.4% to 38%) as a second choice.

An improved trend was noted with a significant decrease in use of antibiotics in managing most of the endodontic scenarios given. Antibiotic use in cases of irreversible pulpitis significantly dropped from 16.76% to 12% ($p<0.05$); in necrotic pulps with acute apical periodontitis with no swelling, a significant decline from 53.9% to 28.3% ($p<0.001$); significant decreases were also noted for necrotic pulp with chronic apical periodontitis with no/mild symptoms, 18.8% to 16.1% ($p=0.029$), and necrotic pulp with acute apical periodontitis with swelling and mod/severe symptoms, 99.2% to 92.4% ($p<0.001$). An exception was noted for necrotic pulp with chronic apical periodontitis with a sinus tract

where there was a significant increase in antibiotic use from 11.9% to 29.1% ($p<0.001$). Many clinicians (19%) were still giving antibiotics due to soliciting of patients and referring general dentists in fear of losing referrals. A disturbing find is that 50% of the respondents were using antibiotics to manage post treatment flare-ups and pain, while 13% were using antibiotics for inter-appointment pain.

As for prophylactic antibiotics, most clinicians were aware of the new AHA/ADA guidelines and were abiding by them. Most of the clinicians responding to survey were choosing the appropriate antibiotics and regimen (i.e. dosage, loading dose, and duration). Although there is an improvement in trends, it has to be noted that there is still an indiscriminate and overuse of antibiotics at large. There needs to be greater improvement in the use of antibiotics in endodontics, and a group effort as a specialty is needed in halting this alarming problem of antibiotic resistance globally.

INTRODUCTION

Antibiotics are the second most commonly prescribed drug. The indiscriminate use of antibiotics by healthcare practitioners and general public at large is a major contributing factor to the rise in antibiotic resistance bacterial strains. Increase in incidence of methicillin-resistant *Staphylococcus aureus* (MRSA) has become a major concern. The systemic review of 76 studies by Tacconelli et al. reported a significant increase in risk of acquiring MRSA with previous exposure to antibiotics (9). According to the report in 2003 by National Nosocomial Infections Surveillance system, 57.1% of *S. aureus* clinical isolates were methicillin-resistant (10). The Agency for Healthcare Research and Quality reported in a statistical brief significant growth of MRSA infections from 2,000 cases in 1993 to 368,000 cases in 2005 (11,12). This is an alarming trend and a restraint in the indiscriminate use of antibiotics in all aspects of health care is needed (13).

Dentists prescribe about 10% of all the common antibiotics (1). The antibiotic type, regimen and rationale for prescribing can greatly affect the effectiveness of the antibiotic and contribute to antibiotic resistance. A limited number of studies have been conducted to observe the trend of antibiotic usage in endodontics. Dorn et al. in 1977 surveyed the diplomats of American Board of Endodontics (ABE) and reported trends in treatment of endodontic emergencies (2, 3). The study was repeated by Gatewood et al. in 1988 (4). Whitten et al. 1996 surveyed diplomats of ABE and general dentists to determine treatment and antibiotic prescribing practices when treating endodontic cases (5). The most recent

study was conducted a decade ago by Yingling et al. in 1999. She surveyed members of American Association of Endodontics (AAE) to determine type of most commonly prescribed antibiotic, rationale for prescribing, and treatment regimens. The data was associated with the experience of the practitioner and the type of practice background (6). Yingling's findings illustrated the lack of standardization in utilizing antibiotics to manage and treat endodontic disease. Although most of the dentists were choosing appropriate antibiotics to manage endodontic infections, many were prescribing antibiotics inappropriately (6). The lack of standardization in prescribing habits first noted in 1977 was seen to persist to the turn of the century has ultimately contributed to antibiotic resistance and ineffectiveness of the drugs in managing true orofacial infections (6).

In 2007, the American Dental Association (ADA) issued new guidelines, in conjunction with the American Heart Association (AHA), for prophylactic antibiotic regimen for prevention of infective endocarditis (IE). They recommended antibiotic prophylaxis only for patients with underlying cardiac conditions associated with the highest risk of adverse outcome from IE (14). A survey published in 2000 by Epstein et al. reported that of all licensed dental practitioners in British Columbia, that more than 80 percent of respondents were following the AHA recommended prophylaxis guidelines (15). However, discrepancies in regimen still existed in treating IE, prosthetic joints and clinical infections. Based on that survey, it can be assumed that approximately the same percentage of practicing dentists in the United States should adapt to the changes in prophylaxis protocol.

Dentists often prescribed antibiotics in an effort to reduce post operative pain and swelling associated with root canal treatment. Studies have shown that the use of penicillin in managing postoperative pain and swelling in symptomatic necrotic cases is ineffective (12). Studies have also shown the use of prophylactic amoxicillin in prevention of flare-up in asymptomatic necrotic teeth is also ineffective (14). With sound evidence base, dentists should be able to implement improved protocols and regimens for the use of antibiotics in managing endodontic cases. Yingling et al. found that most clinicians were using appropriate antibiotics, but many were using them indiscriminately (6).

The purpose of the study was to determine the changes in prescribing habits of active members of American Association of Endodontics (AAE) with regards to antibiotics in comparison to the findings reported by Yingling et al. in 1999.

MATERIALS AND METHODS

The survey was constructed based on Yingling et al.'s survey from 1999. Certain modifications, such as the omission of questions to determine gender, age, year of graduation from dental school or residency, were made since no clinical relevance was shown by Yingling el al. In addition, the list of antibiotics were revised and updated to ensure that all were current. And, due to the most current update by the AHA/ADA on antibiotic prophylaxis, questions were added to determine whether the clinicians were aware of and are abiding by the new prophylaxis protocol.

An invitation to the survey was sent out via email to 2593 members to request participation in the survey (See Appendix 1 for invitation email). Those who responded were directed to a University web site where the survey was administered online using the Inquisite Survey Software (Version 8.0, Inquisite Inc.) (See Appendix 2 for the online survey).

The results were summarized using frequency counts and percentages. Comparisons between the percentages shown in this survey and the previous survey were tested using a z-test. An ANOVA model was used to determine the relationships between predictive factors and the number of prescriptions written.

Pilots surveys were carried out with the part-time endodontic faculty and with the residents in the program to determine if the questions were clear and the use of terminologies were current.

RESULTS

Invitations were sent via email to 2593 members of AAE. Of these, 355 were returned as spam, 2 were not accessible, 6 were not in active practice, 24 were retired, and 11 were blocked as not deliverable. Of those remaining as potentially eligible to respond to the survey (n = 2238), 37.75% responded (n = 845). The results of the survey are presented in Tables 1-9. Note that percentages in some instances may not add up to 100% since the survey allows for multiple answers within a question, and also that a respondent may choose to not answer the questions partially or completely. It was determined that the response rate was sufficient for analysis and for comparison with the findings presented by Yingling et al.

Demographics

The characteristics of the respondents (n = 845) in this survey are shown in Table 1 along with the comparable percentages from the survey a decade ago. Demographic data solicited for this study varied slightly from the study of 1999. Age, gender, and year of graduation were omitted. Additionally, respondents were surveyed as to board certification status (American Boards of Endodontics).

In the study of 1999, most respondents were in private practice. This was also true in this study. There was a significant increase in the percentage of respondents in private practice (up from 44% to 78%) and a significant decrease in the percentage of respondents in part-time academics (down from 52% to 11%). Thirty-nine percent of respondents had greater than 20 years of private practice experience, 25% from 11 to 20 years, 18% from 5-10 years, and 18% with less than 5 years. There was an even distribution of respondents by

region. Twenty-five percent of the respondents were board certified through American Board of Endodontics (ABE); 74.6% were not. The mean number of patients seen per week was 26. This compares to a mean of 35% in the previous survey.

Table 1: Description of Respondents

	2009		1999
Category of practice	n	%	%
Private (full-time)	649	77.6	44.4
Private (part-time)	44	5.3	2.6
Academics only	49	5.9	1.4
Academics & Private practice	94	11.2	51.6
Years in practice			
less than 5 years	148	17.7	8.1
5-10 years	152	18.2	17.0
11-20 years	210	25.1	33.1
more than 20 years	327	39.1	41.7
Region of practice			
Northeast	79	9.4	16.8
Midatlantic	153	18.3	15.8
Southeast	108	12.9	15.0
Great Lakes	80	9.5	16.3
Midwest	150	17.9	12.2
Western	235	28.0	22.6
Other	33	3.9	1.3
Board certified in Endodontics			
Yes	212	25.4	
No	623	74.6	
Average number of patients treated in a week			
n	831		1586
Mean	26.01		34.88
SD	12.52		16.57
Range	0-130		0-140

Antibiotic-Related Topics

Respondents in this survey wrote an average of 6.8 antibiotic prescriptions per week. This is significantly less than the 1999 study (mean=9.25). Twenty-one percent reported one prescription per week or less. This was significantly less than the percentage reported in 1999 (13%).

The average number of prescriptions per week was strongly skewed, therefore, an analysis of the log-transformed value was performed. Responses indicating "<1 per week" were analyzed as 0.5 and zeroes were analyzed as 0.25. All of the factors listed in Table 1 were included in an ANOVA model. Average number of patients treated in a week is also strongly skewed, therefore, was also analyzed on the log scale.

The average number of prescriptions per week was not related to practice location ($p = 0.62$), but was related to all of the demographic factors. The average number of prescriptions per week was related to the average number of patients seen in a week ($p < .001$) and also related to the category of practice ($p < .001$). Those in full-time private practice write an average of 4.0 prescriptions (95% CI = 2.33-4.20). This is significantly more than those in academics alone (mean = 1.8, 95% CI = 1.31-2.59), those in part-time academics/private practice (mean = 2.5, 95% CI =2.06-3.08). Those in part-time private practice were not significantly different from the other practice categories (mean = 3.1, 95% CI = 2.33-4.20).

Years in practice was positively related to the number of prescriptions ($p = 0.0006$). Practitioners with less than 5 years experience prescribed 2.21 prescriptions per week (95% CI = 1.80-2.72). The number of prescriptions steadily increased until those with more than 20 years of experience prescribed 3.13 per week (95% CI = 2.68-3.67). Board certified respondents prescribed fewer prescriptions per week than all other respondents ($p = 0.039$). Those without certification prescribed a mean of 2.54 prescriptions per week (95% CI = 2.12-3.04), and those with certification prescribed a mean of 3.01 (95% CI = 2.62-3.46). This difference was significant.

Respondents were queried as to the duration and use of loading dose of antibiotic therapy for patients not allergic to penicillin. The average duration of antibiotic therapy was 7.04 days, with 79% choosing 7 days. A loading dose was prescribed by 70% with 96% choosing twice the normal dose.

Respondents were queried as to the duration and use of loading dose of antibiotic therapy for patients allergic to penicillin. The average duration of antibiotic therapy was 6.89 days, with 77% choosing 7 days. A loading dose was prescribed by 70% with 97% choosing twice the normal dose.

The average duration of antibiotic therapy was 7.58 days in the 1999 study. A loading dose of twice the normal dose was reported by 85.14% of those surveyed. Respondents were queried as to their first choice and second choice of antibiotic for patients with and without allergy to penicillin. Table 2 and 3 represent the antibiotic choices, first and second choice respectively, for patients with no medical allergies (penicillin allergy) along with the corresponding percentages from the 1999 survey.

Penicillin VK, 500mg qid, was the first-choice 43.3% of the time for patients with no medical allergies. Amoxicillin 500mg tid was the first-choice 37.6% of the time. This represents a notable decrease in the use of penicillin VK (61.48% previously to 43.3% presently) and a notable increase in the use of amoxicillin (27.51% previously to 37.6% presently). Clindamycin was first-choice for 8.1% (150mg qid= 4.6%, 300mg tid/qid= 3.5%) of respondents. Only 2.8% (150mg qid= 1.91%, 300mg tid/qid= 0.86%) chose clindamycin for patients with no penicillin allergies in 1999.

Table 2: First Choice Antibiotic Preference for Adult Patients with No Medical Allergies (n = 832)

	2009		1999
Choice	n	%	%
Penicillin VK 500mg qid	360	43.3	61.48
Amoxicillin 500mg tid	313	37.6	27.51
Clindamycin (Cleocin®) 150mg qid	38	4.6	1.91
Amoxicillin (Amoxil®) 875mg bid	30	3.6	
Clindamycin (Cleocin) 300mg tid/qid	29	3.5	0.86
All others (below)	62	7.5	
Ampicillin 500mg qid	14	1.7	2.31
Cephalexin (Keflex) 500mg qid	14	1.7	2.84
Augmentin 500mg tid	13	1.6	
Augmentin 875mg bid	10	1.2	
Penicillin VK 250mg qid	5	0.6	1.91
Ampicillin 250mg qid	2	0.2	0.59
Azithromycin (Z-PAK®) 500mg stat, 250mg qid	1	0.1	
Cephalexin (Keflex®) 250mg qid	1	0.1	0.46
Erythromycin Base 250mg qid	1	0.1	0.00
Tetracycline 500mg qid	1	0.1	0.00

Approximately 38% of respondents chose clindamycin 300mg tid/qid as second-choice for patients with no medical allergies. Approximately 30% of respondents from the previous survey chose clindamycin 150mg qid as the second choice, in comparison to 26.2% of respondents in 2009. This is a notable increase in the use of clindamycin 300mg (15.7% previously to 37.8% presently).

Respondents were queried as to their first-choice and second-choice of antibiotic for patients with and with allergy to penicillin. Table 4 and 5 represent the antibiotic choices, first and second choices respectively, for patients with penicillin allergy along with the corresponding percentage from the previous survey.

Clindamycin 300mg tid/qid was the first-choice 53.7% of the time for patients with penicillin allergy. This was a notable increase from 21.5% in 1999. Clindamycin 150mg qid was the first-choice 36.6% of the time, in comparison to 35.54% in 1999. Azithromycin was used 4.1% of the time. This was a notable increase from 2.89% in 1999. Use of erythromycin derivatives markedly decreased from 26.6% in 1999 to less than 2% in 2009. There was a decrease in use of cephalexin (5.58% to 2.8%).

Table 3: Second Choice Antibiotic Preference for Adult Patients with No Medical Allergies (n = 832)

	2009		1999
Choice	n	%	%
Clindamycin (Cleocin) 300mg tid/qid	282	37.8	15.7
Clindamycin (Cleocin®) 150mg qid	196	26.2	29.6
Amoxicillin 500mg tid	91	12.2	14.5
Penicillin VK 500mg qid	57	7.6	8.9
All others (below)	121	16.2	
Augmentin 875mg bid	22	2.9	
Augmentin 500mg tid	21	2.8	3.0
Azithromycin (Z-PAK®) 500mg stat, 250mg qid	20	2.7	0.8
Cephalexin (Keflex) 500mg qid	19	2.5	10.7
Metronidazole (Flagyl) 500mg qid	10	1.3	3.1
Amoxicillin (Amoxil®) 875mg bid	9	1.2	
Ampicillin 500mg qid	6	0.8	0.8
Cephalexin (Keflex®) 250mg qid	4	0.5	1.8
Metronidazole (Flagyl®) 250mg qid	3	0.4	2.4
Clarithromycin (Biaxin) 500mg tid	2	0.3	0.2
Erythromycin Base 500mg qid	2	0.3	2.0
Cefadroxil (Duricef®) 500mg bid	1	0.1	0.2
Ciprofloxacin (Cipro®) 500mg bid	1	0.1	0.5
Penicillin VK 250mg qid	1	0.1	0.4

Table 4: First Choice Antibiotic Preference for Adult Patients with Medical Allergies (n = 827)

	2009		1999
Choice	n	%	%
Clindamycin (Cleocin) 300mg tid/qid	444	53.7	21.49
Clindamycin (Cleocin®) 150mg qid	303	36.6	35.54
Azithromycin (Z-PAK®) 500mg stat, 250mg qid	34	4.1	2.89
Cephalexin (Keflex) 500mg qid	23	2.8	5.58
All others (below)	23	2.8	
Erythromycin Base 500mg qid	7	0.8	9.30
Erythromycin Ethylsuccinate (EES®) 400mg qid	5	0.6	9.71
Erythromycin Base 250mg qid	4	0.5	7.64
Ciprofloxacin (Cipro®) 500mg bid	3	0.4	1.03
Tetracycline 250mg qid	2	0.2	0.21
Amoxicillin 500mg tid	1	0.1	0.41
Cephalexin (Keflex®) 250mg qid	1	0.1	0.41

Second-choice for patients with penicillin allergy 38.1% of the time was Azithromycin 500mg stat, 250mg qd. This represents a notable increase in the use of azithromycin (7.4% previously to 38.1% presently). Approximately 13% (12.5%) chose cephalexin 500mg qid as the second-choice. This compares to 9.6% in 1999. Respondents chose clindamycin 300mg 8.3% of the time and 150mg 7.8% of the time. This represented a decrease in the use of clindamycin from 1999 (300mg: 13.2% previously to 8.3% presently; 150mg: 10.9% to 7.8%).

Table 5: Second Choice Antibiotic Preference for Adult Patients with Medical Allergies (n = 551)

	2009		1999
Choice	n	%	%
Azithromycin (Z-PAK®) 500mg stat, 250mg qid	210	38.1	7.4
Cephalexin (Keflex) 500mg qid	69	12.5	9.6
Clindamycin (Cleocin®) 150mg qid	46	8.3	13.2
Clindamycin (Cleocin) 300mg tid/qid	43	7.8	10.9
All others (below)	183	33.2	
Metronidazole (Flagyl) 500mg qid	36	6.5	6.2
Clarithromycin (Biaxin) 500mg tid	26	4.7	7.3
Erythromycin Base 500mg qid	24	4.4	11.2
Erythromycin Base 250mg qid	22	4.0	6.0
Ciprofloxacin (Cipro®) 500mg bid	14	2.5	4.0
Metronidazole (Flagyl®) 250mg qid	11	2.0	6.2
Clarithromycin (Biaxin®) 250mg tid	8	1.5	1.9
Cephalexin (Keflex®) 250mg qid	7	1.3	1.0
Erythromycin Ethylsuccinate (EES®) 400mg qid	7	1.3	12.7
Tetracycline 500mg qid	5	0.9	0.7
Cefadroxil (Duricef®) 500mg bid	4	0.7	0.2
Ciprofloxacin (Cipro) 750mg bid	4	0.7	0.5
Amoxicillin 500mg tid	3	0.5	0.5
Augmentin 500mg tid	3	0.5	0.9
Augmentin 875mg bid	3	0.5	NA
Cefaclor (Ceclor) 500mg qid	2	0.4	0.95
Tetracycline 250mg qid	2	0.4	0.43
Cefaclor (Ceclor®) 250mg qid	1	0.2	0.43
Penicillin VK 500mg qid	**1**	0.2	0.00

Table 6: What do you do when no improvement is seen within 2-3 days (1st choice- antibiotic to be changed to; 2nd choice- antibiotic to be added)

	First choice		Second Choice	
Choice	n	%	n	%
Clindamycin (Cleocin) 300mg tid/qid	277	36.1	109	21.4
Metronidazole (Flagyl) 500mg qid	148	19.3	135	26.5
Clindamycin (Cleocin®) 150mg qid	142	18.5	38	7.5
Metronidazole (Flagyl®) 250mg qid	61	8.0	40	7.8
Others (listed below)	139	18.1	188	36.9
Augmentin 500mg tid	48	6.3	43	8.4
Augmentin 875mg bid	41	5.3	40	7.8
Amoxicillin 500mg tid	18	2.3	7	1.4
Azithromycin (Z-PAK®) 500mg stat, 250mg qid	9	1.2	38	7.5
Cephalexin (Keflex) 500mg qid	9	1.2	25	4.9
Penicillin VK 500mg qid	5	0.7	8	1.6
Amoxicillin (Amoxil®) 875mg bid	2	0.3		
Ciprofloxacin (Cipro®) 500mg bid	2	0.3	7	1.4
Ampicillin 500mg qid	1	0.1	2	0.4
Cefaclor (Ceclor®) 250mg qid	1	0.1		
Cefadroxil (Duricef®) 500mg bid	1	0.1	1	0.2
Ciprofloxacin (Cipro) 750mg bid	1	0.1	3	0.6
Clarithromycin (Biaxin) 500mg tid	1	0.1	4	0.8
Cephalexin (Keflex®) 250mg qid			1	0.2
Clarithromycin (Biaxin®) 250mg tid			1	0.2
Erythromycin Base 250mg qid			3	0.6
Erythromycin Base 500mg qid			2	0.4
Tetracycline 250mg qid			1	0.2
Tetracycline 500mg qid			2	0.4
Total expressing a choice	767		510	

Table 6 represents respondent choices made when queried "What do you do in cases where improvement was not seen after 2-3 days with your first-choice of antibiotic?" When respondents chose to replace the initial antibiotic, clindamycin was the antibiotic of choice 45.6% of the time (300mg 36.1%; 150mg 18.5%). When the respondents chose to

add an additional antibiotic to the initial antibiotic, metronidazole was antibiotic of choice 34.3% of the time (500mg 26.5%; 250mg 7.8%).

From Table 2, of the respondents (n = 360) who chose penicillin as their first choice, 50% chose clindamycin as the replacement antibiotic of choice, and 32% chose to add metronidazole to the initial antibiotic. Of respondents (n = 343) whose first choice was Amoxicillin, 56% chose clindamycin and 13% chose augmentin as the replacement antibiotic of choice, and 19% chose to add metronidazole.

Antibiotic Usage

Table 7: Situations in which antibiotics were prescribed

	2009		1999	
Situation	n	%	%	p-value
Irreversible pulpitis; mod/severe pre-op symptoms	19	2.2	3.5	0.017
Irreversible pulpitis with acute apical periodontitis; mod/severe pre-op symptoms	83	9.8	13.3	<.001
Necrotic pulp with chronic apical periodontitis; no swelling, no/mild symptoms	136	16.1	18.8	0.029
Necrotic pulp with acute apical periodontitis; no swelling, no/mild symptoms	239	28.3	53.9	<.001
Necrotic pulp with chronic apical periodontitis; sinus tract present, moderate/severe symptoms	246	29.1	11.9	<.001
Necrotic pulp with acute apical periodontitis; swelling present; mod/severe pre-op symptoms	781	92.4	99.2	<.001
Total number of prescribing dentists:	845		1528	

Table 7 represents the percentage of respondents who prescribed antibiotics for various pulpal and periapical diagnoses in 1999 and 2009. The percentages in the two years were compared using a z-test. Significant difference was found between the respondents in 1999 and 2009.

A significant decrease in the use of antibiotics in all cases can be noted ($p<0.05$), with the exception of *necrotic pulp with chronic apical periodontitis; sinus tract present, moderate/severe symptoms* where a significant increase was noted in the use of antibiotics (11.9% to 29.1% respectively, $p<0.001$). Significantly less antibiotic were prescribed for: *irreversible pulpitis with no periapical involvement and mod/severe symptoms* (3.5% to 2.2%, p=0.017); *irreversible pulpitis with acute apical periodontitis and mod/severe pre-op symptons* (13.3% to 9.8%, p<0.001); *necrotic pulp with chronic apical periodontitis with no swelling and no/mild symptoms* (18.8% to 16.1%, p=0.029); *necrotic pulp with acute apical periodontitis with no swelling and no/mild symptoms* (53.9% to 28.3%, p<0.001); and *necrotic pulp with acute apical periodontitis with swelling and mod/severe pre-op symptoms* (99.2% to 92.4%, p<0.001).

Table 8: Situations where antibiotics are routinely prescribed

	2009		1999	
Situation	n	%	%	p-value
I&D of diffused intraoral swelling with extraoral swelling	751	88.9	89.9	0.338
I&D of diffused intraoral swelling, no extraoral swelling	554	65.6	69.4	0.020
Avulsions	486	57.5	61.4	0.023
Post treatment flare-ups/pain	425	50.3		
I&D of a localized intraoral swelling, no extraoral swelling	381	45.1	44.8	0.881
Apicoectomy (root end resection)	281	33.3		
Retreatments (Gutta percha/Silver points/etc.)	230	27.2		
Re-treatments, silver points			27.0	0.899
Re-treatments, gutta percha			15.4	<.001
Perforations (before/after repair)	73	8.6	9.3	0.468
Interappoint pain	111	13.1		
Endodontic surgeries			37.3	
Post-op pain after instrumentation and/or obturation			12.6	
Total number of prescribing dentists:	845		1606	

Items in italics were in 1999 study but not queried as such in 2009. Silver point and gutta percha retreats were grouped, endodontic surgeries were queried as apicoectomy, and post-op pain after instrumentation and/or obturation were queried as post treatment flare-ups/pain and interappointment pain.

Table 8 lists other endodontic treatment situations and the percentage of respondents who prescribed antibiotics routinely for each situation. Approximately 89% of respondents prescribed antibiotics for incision and drainage (I&D) of diffused intraoral swelling with extraoral swelling. This represents no significant change 1999 (89.9%, p=0.338). Antibiotics were prescribed for I&D of diffused intraoral swelling with no extraoral swelling 65.6% of the time. This was a significant change from 1999 (69.4%, p=0.020). There was a slight increase in antibiotics prescribed for I&D of localized intraoral swelling (44.8% to 45.1% respectively).This was not significant (p=0.881). Significant decrease in the use of antibiotics for avulsions was noted (61.4% to 57.5%

respectively, p=0.023). For perforations, a slight decrease in antibiotics prescribed was found (9.3% to 8.6% respectively); but was not significant (p=0.468). Post treatment flare-ups/pain resulted in 50.3% prescribing antibiotics; 13.1% prescribing for interappointment pain; 33.3% for apicoectomy; and 27.2% for retreatment. For the above situations, comparisons were not made since terminologies were modified between 1999 and 2009 (see legend Table 8).

Question 16 (see Appendix 2) asked respondents "For which of the following special situations are you likely to prescribe antibiotics?". Of those responding, 52.5% indicated that they would prescribe antibiotics if "patient is going on vacation"; 19.1% if "patient/referring dentist solicit it"; 14.2% if there is an "upcoming long weekend"; and 13.4% if "you [the endodontist] are going on vacation". Other special situations indicated by write-in answer included immunocompromised/immunosupressed patients, uncontrolled diabetes, and swelling.

Question 17 asked the respondents "Have you began using any new prescriptions or different antibiotic regimens in the last 12-18 months?". Ninety-four percent responded "No". Write-in responses for changes included prescribing amoxicillin instead of penicillin, increasing amoxicillin dose 875mg bid, prescribing augmentin and/or z-pak instead of amoxicillin.

Antibiotic Prophylaxis

Table 9: The situation for which patients were taking antibiotic prophylaxis (1 being most common to 4 being least common)

	Rank				
	1	2	3	4	total
patient's medical condition dictates the need for prophylactic antibiotic regimen	709 (86.8%)	43 (5.3%)	28 (3.4%)	37 (4.5%)	817
referring dentist was prescribing using the old AHA/ADA guidelines	50 (7.7%)	131 (20.2%)	165 (25.5%)	301 (46.5%)	647
patient's personal choice to continue with the regimen despite being informed of new AHA/ADA guideli	16 (2.3%)	125 (18.1%)	335 (48.4%)	216 (31.2%)	692
physician's choice to keep patient on the regimen despite being informed of new AHA/ADA guidelines	54 (7.1%)	471 (61.6%)	159 (20.8%)	80 (10.5%)	764

Respondents described the situations for which patients were taking prophylactic antibiotics, ranking the situations from most common to least common. Most common was the patients' medical condition (86.8%); followed by physician's choice to continue with the regimen despite being informed of the new AHA/ADA guidelines (61.6%); followed by the patient's choice to continue with the regimen (48.4%); and lastly the referring dentist's lack of awareness for the new AHA/ADA guidelines (46.5%). The results are shown in Table 9.

Approximately 62% (61.8%) of respondents indicated that less than 25% of the time patients taking antibiotic prophylaxis actually fall within the new AHA/ADA guidelines. Approximately 10% (10.4%) indicated that 25-50% of the patients taking antibiotic prophylaxis actually fall within the new AHA/ADA guidelines. Approximately

6% (6.4%) and 15 (14.9%) indicated that 51-75% and >75% ,respectively, of the patients taking antibiotic prophylaxis actually fall within the new AHA/ADA guidelines.

Respondents indicated that there were 68.1% who indicated that less than 25% were (552/81), 10.4% “between 25 to 50%” (n = 85), 6.4% “51 to 75%” (n = 52), and 14.9% “more than 75%” (n = 121) In determining how many of the patients fall under the new AHA/ADA guidelines.

Discussion

The results of Yingling's 1999 on-paper survey (reported in 2000) of the active members of AAE suggested that dental practitioners in the field of endodontics may be contributing to the indiscriminate overuse of antibiotics. She reported overall prescribing habits of endodontists were appropriate for treating orofacial infections (6). However, clinicians were prescribing antibiotics when an antibiotic was not indicated (6). Ten years have passed since this study. Indiscriminate prescribing habits continue to be reported in scientific literature and popular media. Antibiotics continue to be the second most commonly prescribed drug. They remain a major contributing factor to the rise in antibiotic resistance bacterial strains such as methicillin-resistant *Staphylococcus aureus* (MRSA) (9-12). With increased knowledge often comes change in behavior. This study was undertaken to determine if increased awareness over the past ten years resulted in a change in antibiotic prescribing behavior.

With online access more common than in 1999, an online survey, utilizing Inquisite Software, rather than paper survey was used for ease of data entry and analysis. Online survey instruments have successfully obtained valid information. A large population (n=2593) of active members of AAE were sampled (n= 2238). The response rate of 37.75% (n=845) was deemed acceptable for the online survey and data was deemed sufficient for comparison with the results of 1999.

The on-paper survey instrument of Yingling et al. served as the model for the online survey. Poorly worded questions or ambiguous questions were reworded, but no changes were made in content being queried.

Questions related to demographic data were simplified. Items such as age, gender, and year graduated were omitted based on failure to provide relevance in the 1999 survey. The question regarding board certification was added as a possible variable in prescribing habits. With the recent changes in the ADA/AHA antibiotic prophylaxis guidelines, it was fitting to inquire if endodontists were following these guidelines.

Demographics

There was a notable increase in the number of respondents in private practice participating in the study (78%) compared with 1999 (44%). This mirrors in the rise of AAE members that are in private practice. An increase in the number of clinicians with 10 years or less in practice responding to the survey (25.1% to 35.9%) can be attributed to the ease with which the younger clinicians have embraced the computer technology. These practitioners may be more likely to use email in their private practice or home on a daily basis.

In this study, the respondents wrote an average of 6.8 prescriptions per week. This is significantly different from the 9.25 prescription written per week in the 1999 survey. There was a corresponding decrease in the number of patients being seen per week, with 34.88 patients seen in 1999 and 26.01 seen in 2009. The decrease in the number of patients seen per week may be explained by economics, treatment philosophy (one vs. two visit treatment), and practice model. The decrease in the number of prescriptions written

per week may be a reflection of the decrease in the number of patients seen per week, or a true decrease in the actual prescribing habits.

Board certified endodontists prescribed significantly less antibiotics than non-board certified endodontists. Mickel et al. reported and discussed the significant differences in use of analgesic between board certified and non-board certified endodontists (16). Board certified clinicians were less likely than non-board certified clinicians to use non-narcotic analgesics to manage pain and more likely to avoid the use of medicine to manage post-operative pain (16). These two studies suggest that board certified endodontists' prescribing habits differ from non-board certified endodontists. The findings also support the premise that increased knowledge and increased awareness result in change in behavior.

Antibiotic-Related Topics

Antibiotics should be used as an adjunct to appropriate clinical treatment, and should be prescribed only in cases of persistent infections with indication of systemic involvement, such as fever, swelling, lymphadenopathy, or malaise. Immunocompromised patients and those with underlying systemic diseases may require antibiotics (17). Odontogenic infections are polymicrobial, typically having rapid onset and short duration. Pallash discussed that proper dose and duration of an antibiotic is enough when there is sufficient evidence that the patients' host defenses can manage the infection. Duration of 5-7 days and the use of a loading dose are appropriate for treating oral infections (18). Seventy-seven to 79% of clinicians in this study chose a regimen of 7 days. A loading dose was used by 70%, with 96% to 97% choosing twice the normal dose as the loading dose.

Previously, clinicians reported using a loading dose 85.14% of the time, an average duration of 7.58 days, and a loading dose of twice the normal dose. There was no difference noted between the two surveys in the number of days an antibiotic was prescribed. Loading doses continued to be prescribed to achieve rapid therapeutic blood levels of the antibiotics due to the acute nature of the orofacial infections (6, 18).

Antibiotic Preferences

The online survey contained a similar list of antibiotics found on the previous survey. Appropriate modifications and additions were made to assure that the antibiotic list included the most currently prescribed antibiotics for the management of orofacial infections.

Yingling et al. reported penicillin VK 500 mg qid was the first-choice of antibiotic for patients who were not allergic to penicillin, being use by 61.48% of respondents (6). This survey showed a reduction in the use of penicillin VK (500mg qid), as the first choice of antibiotic, with 43.3% prescribing. There was a corresponding increase in the use of amoxicillin (500mg tid) from 27.51% to 37.6%. The increase in the use of amoxicillin in lieu of penicillin may be due to the ease of use and patience compliance since penicillin has to be taken 4 times a day before meals while amoxicillin can be taken 3 times per day with or without food. The cost of amoxicillin is slightly higher than penicillin, however it is a suitable alternative since it is readily absorbed, and is only taken 3 times per day due to the longer half-life and more sustained serum levels. Amoxicillin, a broader spectrum antibiotic than penicillin, used in a healthy individual may contribute to antibiotic resistance (6).

Of concern is the 8.1% (4.6% 150 mg qid + 3.5% 300mg tid/qid) of respondents in this survey who chose clindamycin as first-choice for patients **not** allergic to penicillin. This compares with 1.9% of respondents choosing clindamycin as first-choice in 1999. Sixty-four percent respondents chose clindamycin (37.8% 300mg tid/qid + 26.2% 150mg qid) as the second-choice for patients **not** allergic to penicillin. This compares with 45.3% (15.7% 300mg tid/qid + 29.6% 150mg qid) in 1999. Clindamycin is a broader spectrum antibiotic than penicillin, but has a narrower specificity for oral pathogens. It is associated with the risk for pseudomembraneous colitis, higher in cost, and leaves the clinician without a second-choice drug when penicillin or amoxicillin fail to control the odontogenic infection. It is an inappropriate initial antibiotic choice for patients **not** allergic to penicillin.

Penicillin is still the antibiotic of choice with less risk, lower cost, and less contribution to antibiotic resistance (6). Baumgartner and Xia, in their article regarding antibiotic susceptibility testing of bacteria associated with endodontic abscesses, discussed the need for careful consideration of choice of antibiotics. They reported that penicillin VK is still the antibiotic of choice in polymicrobial infections with relatively narrow spectrum such as odontogenic infections (20).

Clindamycin is an appropriate alternative for patients with penicillin allergy. Approximately 90% (53.7% 300mg tid/qid + 36.6% 150mg qid) of respondents chose clindamycin as the first-choice of antibiotic for penicillin-allergic patients. This was compared with 56.03% (21.49% 300mg tid/qid + 35.54% 150mg qid) in 1999. High cost and the risk for pseudomembraneous colitis exist; however, the risk is less compared to

ampicillin and cephalosporins. Clindamycin has good absorption for gastro-intestinal tract, reach a peak concentration within 60 minutes, and has good bone penetration (6). Baumgartner and Xia reported susceptibility for clindamycin to bacteria found in odontogenic infections to be 96% (20).

A significant decrease in the use of erythromycin (base or salt) as first-choice and second-choice antibiotic in penicillin-allergic patients was noted. When dosages (base and salt) were combined, 1.9% of respondents chose erythromycin as first-choice as compared to 26.65% in 1999. As a second-choice, 10.4% of respondents chose erythromycin as compared to 29.9% in 1999 (combined dosages). Erythromycin, a microlide, has similar spectrum of activity as penicillin for Gram-positive microorganisms, but is not considered a good choice for odontogenic infections since it is not as effective against anaerobe, and has a high incidence of gastrointestinal distress (6). These findings support the premise that increased knowledge and increased awareness result in change of behavior.

A slight increase in the use of azithromycin (Z-Pak®) as first-choice for penicillin-allergic patients was noted along with a steep increase in the use of azithromycin (Z-Pak®) as second-choice (7.4% to 38.1%). Azithromycin (Z-Pak®), a semi synthetic derivative of erythromycin, has a broader spectrum of activity, improved tissue penetration, decreased dosing regimen due to increased half-life, and lower incidence of gastrointestinal distress (19). The steep increase is most likely due to the user friendly once or twice daily dosing schedule, and its current “in vogue” status.

For the scenarios of improvement not seen with the first choice of antibiotics, penicillin or amoxicillin, most clinicians chose to switch to clindamycin, while some added metronidazole (Flagyl®). Others chose to switch to augmentin (amoxicillin with calvulanate). Metronidazole is very effective against obligate anaerobes but not against facultative anaerobes. This addition of metronidazole can be considered appropriate based on Baumgartner's susceptibility report. Metronidazole used in combination with penicillin and amoxicillin resulted in a susceptibility of 93% and 99% respectively (20). AAE's *College of Excellence Report* in '99 supported the addition of metronidazole to the regimen of penicillin. (21).

Antibiotic Usage

Pulpal and periapical diagnosis scenarios (Table 7), along with endodontic treatment scenarios most likely to elicit antibiotic usage (Table 8) were surveyed. These scenarios pertained only to basic tooth diagnosis and treatment, and did not involve in-depth symptoms/findings and patient's medical/systemic health status. Given more information or specific patient scenarios, respondents may have made different choices.

Yingling et al. reported that endodontists were using antibiotics in inappropriate situations such as irreversible pulpitis cases (16.76%) and necrotic cases with no swelling and mild symptoms (53.59%) (6). This inappropriate use continues, yet a positive change was noted with a significant decrease in use of antibiotics in all diagnosis situations (Table 7). Antibiotic use in irreversible pulpitis cases declined significantly from 16.67% to 12% at present. For necrotic cases with chronic apical periodontitis, no swelling and mild symptoms, a significant improvement was seen with a decline of 2.7% (18.8% in 1999 to

16.1% at present). This 16.1% was a steep decline from the 35.7% reported by Whitten et al. (5). Approximately 28% (28.3%) of respondents chose to prescribe antibiotics for the diagnosis of necrotic pulp with acute apical periodontitis, no swelling and no/mild symptoms. This was a significant decrease from 53.9% in 1999 ($p<0.001$). This is a positive trend when compared to reports by Dorn et al. (30.0%), Gatewood et al. (33.1%), and Whitten et al. (67.3%) (2-5). For necrotic pulp with acute apical periodontitis with swelling and moderate to severe symptoms, 92.4% prescribed antibiotics. This was a significant decrease from 99.2% reported in 1999 ($p<0.001$). The exception to the above positive changes was the diagnosis of necrotic pulp with chronic apical periodontitis with sinus tract present and with moderate to severe symptoms. A significant increase from 11.9% previously to 29.1% at present ($p<0.001$) was noted. This exception can be a result of the change in diagnosis situation of symptoms from no or mild symptoms in 1999 to mod/severe in the present survey.

Although a significant decrease in the use of antibiotics above is a promising trend, the use of antibiotics are not indicated in the given scenarios, with the exception of "necrotic pulp with acute apical periodontitis; swelling present; mod/severe pre-op symptoms". Nonsurgical root canal therapy without antibiotics was adequate to treat irreversible pulpitis with acute and chronic apical periodontitis, draining sinus tract, and mild swelling. Removing the source of the infection usually allows for healing without the need for antibiotics. Systemic antibiotics will not reach a therapeutic concentration level to be effective locally due to poor circulation of the pulp and periradicular tissue.

Clinicians may incorrectly choose to prescribe antibiotics to decrease pain associated with pulpitis or periapical periodontitis. Keenan et al., in their Cochrane Systemic Review, reported Nagle et al.'s paper, which showed that there was no significant difference in pain relief for patients with untreated irreversible pulpitis who received antibiotics versus those who did not (22, 23). Several studies have been published to show that antibiotics are neither effective in preventing pain nor swelling when used preoperatively and postoperatively in routine endodontic cases. Henry et al., in a study of symptomatic necrotic teeth with periapial lesions, concluded that penicillin administered post operatively did not significantly reduce pain, percussion pain, or the number of analgesic medications taken (24). This finding was confirmed by Fouad et al. in 1996 (25). Walton and Chiappinelli (1993) also reported that administration of penicillin as prophylaxis has no significant effect on post-treatment signs and symptoms in cases of asymptomatic periapical pathosis (26). The most effective treatment to decrease pain remains the use of analgesics and anti-inflammatory medications.

In other treatment scenarios (Table 8), such as incision and drainage, avulsions, apicoectomies, and retreatments, there was a generalized decreased in number of antibiotic prescriptions. There was a significance decrease noted for I&D of diffuse intraoral swelling with no extraoral swelling (69.4% in 1999 to 65.6% presently), and avulsions (61.4% in 1999 to 57.5% presently). No comparison can be made between the two studies regarding endodontic surgeries, retreatments, and interappoint flare-up/pain due to the changes in the terminology between the surveys.

It was shocking to note that 50% of the respondents were using antibiotics to manage post treatment flare-ups and pain, while 13% were using antibiotics for inter-appointment pain. As noted above, there was no evidence to support the use of antibiotics in managing inter-appointment pain and post-operative pain and flare up. Pickenpaugh et al. reported that prophylactic amoxicillin did not significantly influence the endodontic flare-up outcomes (27).

Unsettling is the trend that about 19% were prescribing antibiotics to appease their patients and referring dentists. This is a common finding in private practice setting where clinicians are forced to provide antibiotic prescriptions to ease the patients' apprehension or accommodate the desire of a referring dentist. Those respondents admitting to this practice stated that they inform the patient to hold the prescription and fill only after they had called the office or presented with specific symptoms (write-in responses).

Antibiotic Prophylaxis

The antibiotic prophylaxis regimen for preventing infective endocarditis (IE) has been recently updated. In June of 2007, the American Heart Association (AHA) along with ADA, issued new recommended guidelines which stated that IE prophylaxis for dental procedures should be recommended only for patients with underlying cardiac conditions associated with the highest risk of adverse outcome from IE, and is not recommended based solely on an increased lifetime risk of acquisition of IE (14). The rationale behind the revision of the recommendations was that the risk of antibiotic-associated adverse events exceeds the benefit since prophylaxis may prevent an exceedingly small number of cases of IE (14). Based on the survey, majority of the clinicians stated that, of the patients

who need antibiotic prophylaxis, less then 25% actually fall under the new AHA/ADA recommended guidelines.

Conclusion

This survey illustrated that the majority of private practice endodontists were choosing appropriate antibiotics and prescribing regimens for the treatment of endodontic related infections. An improved trend was noted by the decreased in use of antibiotics in managing various endodontic scenarios given. Tendencies to indiscriminately prescribe antibiotics when not indicated were still seen. Yingling in 1999 stated that “the most important decision for the dental practitioner to make is not which antibiotic to use but whether to use one at all” (6).

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Appendix 1

Letter of Invitation for the Survey

Dear [LAST NAME],

In 2002 we published the results of a survey designed to determine the antibiotics prescribing habits of active members of the American Association of Endodontics. Prescribing habits have changed since then….or have they?

Please take a few minutes and complete this 2009 survey to assist us in determining the current prescribing habits of endodontists. It will aid the endodontic specialty by providing awareness and improve the trends in the use of antibiotics.

Your participation is voluntary and you may stop the survey at any point. Rest assured that your answers are to be used only for research purposes and your anonymity will be maintained.

Thank you very much for your cooperation.

Click the following link to start...
[SURVEY LINK]

Sincerely,

Karan J. Replogle, DDS, MS
Interim Chairman and Program Director
Department of Endodontics
VCU School of Dentistry
520 North 12th Street
P.O. Box 980566
Richmond, VA 23298-0566.

For your reference the previous paper was Yingling, Byrne & Hartwell (2002) “Antibiotic use by members of the American Association of Endodontics in the year 2000: report of a national survey” Journal of Endodontics, 28(5), 396-404.

Appendix 2

Online Survey

Type of Practice (choose one):


Private (full-time)


Private (part-time)


Academics


Academics & Private practice

Years in Practice (choose one):

- [ ] less than 5 years
- [ ] 5-10 years
- [ ] 11-20 years
- [ ] more than 20 years

Practice location (choose one):

Northeast (MA, RI, CT, VT, NH, ME, NY, NJ)

Mid Atlantic (PA, MD, DE, WV, VA, NC, SC, DC)

Southeast (KY, TN, AR, LA, MS, AL, GA, AL)

Great Lakes (MN, WI, IL, IN, MI, OH)

Mid West (NM, CO, WY, MT, ND, SD, NE, KS, OK, TX, IA, MO)

Western (WA, OR, CA, ID, NV, UT, AZ, AK, HI)

Other

Are you Board Certified in Endodontics?

Yes

No

Average number of patients treated in a week:

Average number of prescription for antibiotics in a week:

Antibiotic preference for adult patients with **no medical allergies**:
(place **1** most often prescribed; place **2** for 2nd most often)

☐ Amoxicillin 500mg tid

☐ Amoxicillin (Amoxil®) 875mg bid

☐ Ampicillin 250mg qid

☐ Ampicillin 500mg qid

☐ Augmentin 500mg tid

☐ Augmentin 875mg bid

☐ Azithromycin (Z-PAK®) 500mg stat, 250mg qid

☐ Cefaclor (Ceclor®) 250mg qid

☐ Cefaclor (Ceclor) 500mg qid

☐ Cefadroxil (Duricef®) 500mg bid

Cephalexin (Keflex®) 250mg qid

Cephalexin (Keflex) 500mg qid

Ciprofloxacin (Cipro®) 500mg bid

Ciprofloxacin (Cipro) 750mg bid

Clarithromycin (Biaxin®) 250mg tid

Clarithromycin (Biaxin) 500mg tid

Clindamycin (Cleocin®) 150mg qid

Clindamycin (Cleocin) 300mg tid/qid

Erythromycin Ethylsuccinate (EES®) 400mg qid

Erythromycin Base 250mg qid

Erythromycin Base 500mg qid

☐ Metronidazole (Flagyl®) 250mg qid

☐ Metronidazole (Flagyl) 500mg qid

☐ Penicillin VK 250mg qid

☐ Penicillin VK 500mg qid

☐ Tetracycline 250mg qid

☐ Tetracycline 500mg qid

☐ Other

☐

Number of days prescribed:

Less than 5 days

5 days

7 days

10 days

14 days

More than 14 days

Do you use a loading dose when prescribing antibiotic selected above?

Yes

No

If yes, what is the dosage?:

2x the normal dose

3x the normal dose

Other

Antibiotic preference for adult patients **with penicillin allergy** (Place 1 most often prescribed; place 2 for 2nd most often):

☐ Amoxicillin 500mg tid

☐ Amoxicillin (Amoxil®) 875mg bid

☐ Ampicillin 250mg qid

☐ Ampicillin 500mg qid

☐ Augmentin 500mg tid

☐ Augmentin 875mg bid

☐ Azithromycin (Z-PAK®) 500mg stat, 250mg qid

☐ Cefaclor (Ceclor®) 250mg qid

☐ Cefaclor (Ceclor) 500mg qid

☐ Cefadroxil (Duricef®) 500mg bid

Cephalexin (Keflex®) 250mg qid

Cephalexin (Keflex) 500mg qid

Ciprofloxacin (Cipro®) 500mg bid

Ciprofloxacin (Cipro) 750mg bid

Clarithromycin (Biaxin®) 250mg tid

Clarithromycin (Biaxin) 500mg tid

Clindamycin (Cleocin®) 150mg qid

Clindamycin (Cleocin) 300mg tid/qid

Erythromycin Ethylsuccinate (EES®) 400mg qid

Erythromycin Base 250mg qid

Erythromycin Base 500mg qid

Metronidazole (Flagyl®) 250mg qid

Metronidazole (Flagyl) 500mg qid

Penicillin VK 250mg qid

Penicillin VK 500mg qid

Tetracycline 250mg qid

Tetracycline 500mg qid

Other

Number of days prescribed:

Less than 5 days

5 days

7 days

10 days

14 days

More than 14 days

Do you use a loading dose when prescribing antibiotic selected above?

Yes

No

If yes, what is the dosage?:

2x the normal dose

3x the normal dose

Other

What do you do in cases where improvement is not seen after 2-3 days with your first choice of antibiotic? (Place 1 most often prescribed; place 2 for 2nd most often):

☐ Amoxicillin 500mg tid

☐ Amoxicillin (Amoxil®) 875mg bid

☐ Ampicillin 250mg qid

☐ Ampicillin 500mg qid

☐ Augmentin 500mg tid

☐ Augmentin 875mg bid

☐ Azithromycin (Z-PAK®) 500mg stat, 250mg qid

☐ Cefaclor (Ceclor®) 250mg qid

☐ Cefaclor (Ceclor) 500mg qid

☐ Cefadroxil (Duricef®) 500mg bid

Cephalexin (Keflex®) 250mg qid

Cephalexin (Keflex) 500mg qid

Ciprofloxacin (Cipro®) 500mg bid

Ciprofloxacin (Cipro) 750mg bid

Clarithromycin (Biaxin®) 250mg tid

Clarithromycin (Biaxin) 500mg tid

Clindamycin (Cleocin®) 150mg qid

Clindamycin (Cleocin) 300mg tid/qid

Erythromycin Ethylsuccinate (EES®) 400mg qid

Erythromycin Base 250mg qid

Erythromycin Base 500mg qid

Metronidazole (Flagyl®) 250mg qid

Metronidazole (Flagyl) 500mg qid

Penicillin VK 250mg qid

Penicillin VK 500mg qid

Tetracycline 250mg qid

Tetracycline 500mg qid

Other

In which of the situations would you prescribe antibiotics? (Check all that apply; leave blank if no antibiotics are to be prescribed):

☐ Irreversible pulpitis; mod/severe pre-op symptoms

☐ Irreversible pulpitis with acute apical periodontitis; mod/severe pre-op symptoms

☐ Necrotic pulp with chronic apical periodontitis; no swelling, no/mild symptoms

☐ Necrotic pulp with acute apical periodontitis; no swelling, no/mild symptoms

☐ Necrotic pulp with chronic apical periodontitis; sinus tract present, moderate/severe symptoms

☐ Necrotic pulp with acute apical periodontitis; swelling present; mod/severe pre-op symptoms

In which of the following situations do you routinely prescribe antibiotics? (Check all that apply):

☐ Avulsions

☐ Post treatment flare-ups/pain

☐ Interappoint pain

☐ Retreatments (Gutta percha/Silver points/etc.)

☐ Perforations (before/after repair)

☐ Apicoectomy (root end resection)

☐ I&D of localized intraoral swelling, no extraoral swelling

☐ I&D of diffused intraoral swelling, no extraoral swelling

☐ I&D of diffused intraoral swelling with extraoral swelling

For which of the following special situations are you likely to prescribe antibiotics? (Check all that apply); leave blank if no antibiotics are to be prescribed:

☐ You are going on vacation

☐ Patient is going on vacation

☐ Upcoming long weekend

☐ Patient/Referring dentist solicit it

☐ Other

Have you begun using any new prescriptions or different regimens in the last 12- 18 months?

◯ Yes

◯ No

If yes, what antibiotic(s)

If yes, why?

Which of the following describe the situation for which your patients are taking prophylactic antibiotic? **(Please rank using numbers 1-4, 1=most common to 4=least common)**

patient's medical condition dictates the need for prophylactic antibiotic regimen

referring dentist was prescribing using the old AHA/ADA guidelines

patient’s personal choice to continue with the regimen despite being informed of new AHA/ADA guidelines

physician’s choice to keep patient on the regimen despite being informed of new AHA/ADA guidelines

How many of your patients who need prophylactic antibiotics actually fall under the new AHA/ADA antibiotic prophylactic guidelines?
(see http://ada.org/public/topics/antibiotics.asp)

Less than 25%

25 to 50%

51 to 75%

More than 75%

Comments:

Thank you for your participation!

VITA

Pye P. E Kyu, DDS, was born in Rangoon (Yangon), Burma (Myanmar) in Southeast Asia. He lived in Kingston, Jamaica, from the age of 10 to 16 years old, where he completed his high school education before moving to Chesapeake, Va. He attended Old Dominion University and graduated with a BS in Biology in 2002 followed by receiving a DDS from VCU School of Dentistry in 2006. He then went onto attaining a certificate in Advance Education in General Dentistry from Vcu School of Dentistry in 2007 before joining the Endodontic Residency at Vcu School of Dentistry. He is apart of Omicron Kappa Upsilon (OKU) and Delta Sigma Delta (DSD) dental societies, and he is an active participant of Mission of Mercy Projects and other dental projects throughout rural Virginia and local communities.

He currently is pursing a solo endodontic practice in Chesapeake, Va.