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Factors That Affect Dentists' Use of Antibiotic Prophylaxis – Findings from a National Dental Practice-Based Research Network Questionnaire

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Abstract

Background

Little is known about factors that influence dentists' decision-making concerning antibiotic prophylaxis (AP) prescribing. The objective of this study was to determine factors that influence their AP prescribing habits in patients at risk of infective endocarditis (IE) and prosthetic joint infections (PJI).

Methods

A 58-item questionnaire was administered to 3,584 dentist members of the National Dental Practice-Based Research Network (network). In addition to descriptive statistics, ordinal regression models were used to determine factors most likely to impact dentists' decisions to prescribe AP.

Results

Overall, 2,169 (61%) network dentists responded. Responders' decision to prescribe antibiotics was primarily influenced by official guidelines, scientific literature, and physician or medical specialist opinion. Regarding potential risks, the greatest level of concern was for the development of IE or PJI. Although litigation was deemed problematic, over 90% of responders indicated a strong concern for the best course of action for the patient's health. Dentists also indicated a high level of concern over the potential for generating antibiotic-resistant bacteria with AP use and increased risk of adverse drug reactions.

Conclusions

Dentists' AP decision making seems most influenced by official guidelines, scientific literature, and advice from a physician or medical specialist.

Practical Implications:

These results suggest that one of the most effective means to promote concordance of dentists clinical practice with the scientific basis for AP is to emphasize the importance of AHA and ADA recommendations and antimicrobial stewardship in regards to prevention of IE and PJI.

Key Words: Endocarditis, surveys, antibiotic prophylaxis, antibiotics, practice guidelines, prosthetic joint infection, prevention, adverse drug reaction

Introduction

Use of antibiotics by healthcare professionals has come under close scrutiny in recent years due to increasing concern for the development of resistant strains of bacteria and adverse drug reactions (ADR)¹⁻⁵ Allergy to antibiotics, in particular amoxicillin, is a related concern that has received considerable attention as the bulk (~90%) of patients who report this are not allergic based when properly evaluated.⁵

Antibiotics are used in dental practice for two fundamental purposes, treatment of an established site of infection and prevention of distant site infection, such as infective endocarditis (IE) and prosthetic joint infection (PJI). Antibiotic prophylaxis (AP) prior to invasive dental procedures for patients at risk for IE has been an important consideration for over 65 years.^{2, 6, 7} Although virtually all dentists in the U.S. are aware of the American Heart Association (AHA) guidelines⁸ there is evidence of a significant lack of compliance with and confusion regarding these guidelines.⁸⁻¹² Since the original AHA guidelines for the prevention of IE were published in 1955, there have been many other non-evidence-based suggestions of other patient populations for AP prior to invasive dental procedures to prevent distant site infection, most notably in patients with prosthetic joints but also for more than 25 other patient populations.¹³⁻¹⁵

There are several issues surrounding AP, and multiple potential reasons for confusion and lack of compliance with national guidelines, but these conundrums have not been fully described or investigated. We therefore developed a questionnaire study to give additional insight into the use of AP in dental practice. A previous publication from the same study covered a group of issues that included: the frequency with which dentists treat patients at risk for IE and PJI; how strongly they agreed with several aspects of the IE and PJI AP guidelines and the degree to which they were “well-defined and clear”; their interactions with cardiologists and orthopedists concerning AP and who should provide the prescription to the patient; and factors concerning

the need for and efficacy of AP for other patient populations who might be at risk for a distant site infection from specific dental procedures.¹⁶ The primary objective of this study was to quantify factors that influence dentists' decision making and alter their AP prescribing habits for patients at risk for IE and PJI.

Methods

A 15-question survey that comprised a total of 58 items, was developed in a structured process by a multi-disciplinary study team of clinicians and research experts covering oral medicine, psychology, informatics, statistics and survey methodology, and is more detailed elsewhere.¹⁷ The online questionnaire was finalized and configured for automated dissemination and emailed to 3,584 generalist and specialist dentist members of the National Dental Practice-Based Research Network ("network"), a consortium of dental practices and dental organizations focused on improving the scientific basis for clinical decision-making.^{18, 19} The full questionnaire was published as an eTable.¹⁶ All activities for these investigations were approved by Institutional Review Boards.

Dentists' prescribing practice behaviors were assessed with 16 items that queried the importance of four possible clinical factors that may influence their decision to prescribe or not prescribe AP:

(1) Official resources and training:

- American Dental Association guidelines
- Other guidelines (e.g., AHA, American Association of Orthopedic Surgeons [AAOS])
- Dental school training
- Continuing education courses or postgraduate training programs
- Scientific literature on the topic
- Risk management course

(2) Professional colleagues

- Advice from general dentists
- Advice from a dental specialist
- Advice from a physician or medical specialist

(3) Personal preferences

- Concern about AP resulting in antibiotic resistant bacteria
- Concern about an adverse drug reaction to AP
- Concern about the potential for *Clostridioides difficile* infection
- Concern about developing IE or PJI

(4) Patient factors

- Patient request or preference
- Fear of litigation
- Judgement that it was the best course of action for the patient's health

A second series of questions with nine items addressed the likelihood that the responding dentist might change his or her AP prescription practices if any of the following situations occurred:

(1) Official resources

- Professional organizations (e.g., ADA, AHA, AAOS) change their guidelines
- Received information from a continuing education lecture/course stating that change was appropriate
- The scientific literature on this topic changes

(2) Professional colleagues

- A dentist I respect influenced me to change my prescription practices
- A physician or medical specialist advises you to change your prescription practices

(3) Personal preferences

- A change in your concern about the risk of AP resulting in the development of resistant bacteria
- A change in your concern about risk of an adverse drug reaction to AP

(4) Patient factors

- Patient no longer wants AP
- Your concern about litigation changes

Along with questions concerning dentists' beliefs and behaviors, we compared respondent's demographic data from the Network's Enrollment Questionnaire for each dentist who completed the main study questionnaire, to include age, sex and practice region for comparison with responses to survey questions.

Statistical Analyses

We designed the questionnaire with a pre-conceived sense that the aforementioned 4 clinical factors (official resources; professional colleagues; personal preferences; patient factors) were

key drivers of: (1) the decision to prescribe AP; and (2) the likelihood that a dentist would change his/her AP prescription practices. We measured four clinical factors using a total of 25 questions, each of which used a five-point Likert ordinal scale. The 16 items used to measure factors that might affect the decision to prescribe AP included the following scale: not at all important; slightly important; moderately important; very important; extremely important. The 9 items used to measure factors that may affect the likelihood that the dentist would change his/her AP prescription practices used the following scale: extremely unlikely; somewhat unlikely; neither likely or unlikely; somewhat likely; extremely likely.

Because the primary objective of the study was to quantify the importance placed on clinical factors and the likelihood of changing prescription practices, the primary results comprise descriptive statistics in Figures 1 and 2, which are presented as counts and percentages. Power analysis estimated that 2,400 completed questionnaires would yield sufficient precision to estimate response percentages with a margin of error of 3.15% +/- 0.34 (SD) on average per region, with 95% confidence level.

Additionally, we were interested in whether dentists' demographic factors are significantly associated with the importance placed on clinical factors and the likelihood of changing prescription practices and this constituted a secondary objective of this study. This objective was met by conducting a series of multiple ordinal logistic regression analyses, which are detailed in supplemental tables. Analyses were conducted using SAS Enterprise Guide version 7.1 on platform of SAS version 9.4 (SAS Institute Inc., Cary, NC, USA)

Results

Overall, 2,169 eligible dentists (61%) responded to the questionnaire and included 1,706 (79%) general practitioners and 458 (21%) specialists (Supplemental Table 1).^{16, 17} The majority of respondents were male (70%), with an age range from 25-86 years (mean \pm standard deviation

=53.5 ± 11.7). The largest number (7%) of specialists were orthodontists (Table 1). The vast majority (95%) of respondents had dental training in the U.S. Three hundred and fifty-one (16%) respondents had additional masters or doctoral-level degrees. Eighteen percent of respondents had a general practice residency and 8% advanced education in general dentistry training. A majority (80%) were members of the ADA, and 33% were members of the Academy of General Dentistry.

Importance placed on clinical factors when deciding to prescribe AP

Figure 1 includes results from the series of questions about the importance of factors affecting their decision to prescribe, or not prescribe AP. A high percentage of respondents indicated that ADA-sponsored and other official guidelines, followed by scientific literature, were either very or extremely important in their decision-making (84%, 90% and 73%, respectively) (Figure 1.a. and Supplemental Table 2) Continuing education programs, post-graduate training, and risk management courses had less influence in their decision making. Dental school training had the least impact, with 37% indicating that this was either slightly important or not important at all.

When asked about the importance of advice from professional colleagues, 67% of respondents indicated that advice from a physician or medical specialist was either extremely or very important in their decision making (Figure 1.b.). They were less influenced by a general dentist or dental specialist they respect in the community.

Regarding four specific risks from AP use, a high percentage of dentists were either very or extremely concerned about: development of antibiotic-resistant bacteria (62%); ADR (54%); and *Clostridioides difficile* infection (53%), but the greatest level of concern was for the development of IE or PJI (68%) (Figure 1.c.).

Dentists were then asked about patient factors that would influence their decision on AP use

(Figure 1.d.). Patient request or preference had only a moderate influence on dentists' decision to use AP. Fear of litigation had a greater influence. However, just over 90% responded that their concern for the best course of action for the patient's health was either very or extremely important in any decision to give AP.

Likelihood of changing prescription practices

The respondents reported how likely they were to change their AP prescription practices if the following situations occurred (Figure 2): Almost all (97%) indicated that they were either somewhat or extremely likely to change their AP prescription practice if professional organizations (e.g., ADA, AHA, AAOS??) changed practice guidelines, and 79% would be similarly influenced by a change reported in the scientific literature (Figure 2.a.). Far fewer (59%) respondents were influenced to this extent by information from a continuing education lecture/course that reported a change in behavior was appropriate.

When asked about the impact of professional colleagues on the likelihood of changing their prescription practices, almost half (46%) indicated that they were either somewhat or extremely unlikely to be influenced by a dentist they respect, but that they were more likely to be influenced a physician or medical specialist (Figure 2.b.).

A subsequent question asked about their personal preferences and what might change their concern about AP risks (Figure 2.c.). Respondents were only somewhat likely to change their AP prescribing practice because of a change in their level of concern about AP causing antibiotic-resistant bacteria or ADR (42% and 41%, respectively). Finally, when asked about patient factors that would influence their decision making, respondents were either somewhat or extremely unlikely to be influenced by a patient refusing AP (57%), and they were more likely to be influenced by a change in their level of concern about litigation, with a more even breakdown in responses (Figure 2.d.).

Regression analyses on the importance placed on clinical factors when deciding to prescribe AP or to change prescribing practices was compared with each dentist demographic factor, the statistical significance and magnitude of which varied by demographic factor (Tables 2 and 3).

Compared with males, female dentists attach a higher level of importance to ADA guidelines, dental school training, continuing education courses, advice from a physician or medical specialist, concern about the risk of antibiotic prophylaxis resulting in antibiotic resistant bacteria, or *Clostridioides difficile* infection, and the best course of action for the patient's health. Female dentists are more likely to change their AP behavior if a continuing education lecture/course stated that change was appropriate.

General dentists, compared to specialists, are more likely to be influenced by continuing education courses, advice from general dentists and dental specialists, and fear of litigation. They are also more likely to change their AP prescribing behavior if a continuing education lecture/course states that change was appropriate, a dentist (s)he respects influenced their decision to change prescription practices, the patient no longer wants AP.

Dentists who completed an AEGD Program attach a higher level of importance in AP decision making to ADA guidelines and risk management courses. Similarly, dentists who completed a GPR Program are likely to ascribe a lower level of importance to advice from general dentists and dental specialists or fear of litigation. However, change in ADA practice guidelines are more likely to result in AP behavior change.

Older dentists are less likely to be affected by advice from general dentists, concern about the risk of an ADR, patient request or preference and fear of litigation.

Discussion

This study focused on factors that influence decisions related to AP use, and factors that influence

dentists' AP-prescribing practices. Both the confusion and non-compliance regarding AP use in clinical practice is well-recognized.⁴ For example, our group previously demonstrated that a majority (70%) of dentists had patients assigned to the AHA moderate risk group who were still receiving AP more than five years after publication of the 2007 AHA guidelines, which recommended against this practice.⁸ The more recent literature on antibiotic use in US dental practices comes from both patient cohort data and from surveys, and they suggest confusion, misuse and overuse in general.^{4, 9, 10, 12, 20-22} Similar findings have been documented in other countries as well.^{23, 24 25}

Our findings strongly suggest there is considerable heterogeneity of opinion and practice behavior for a range of factors concerning AP use in patients at risk for IE and PJI, as well as many other patient populations.¹⁵ For example, we previously reported^{16, 17} that 42% of dentists "somewhat or strongly agreed" that AP prevents PJI, in spite of the 2003 and 2012 ADA/AAOS guidelines suggesting that there is a lack of evidence that AP prevents PJI.^{26, 27} Of interest, there has never been a clinical trial of AP efficacy for IE or PJI, although there are data to suggest an association between poor oral hygiene and gingival disease and IE.²⁸

The overall objective of professional association recommendations concerning AP is to provide guidance for clinicians and reduce confusion concerning the use of AP in specific patient populations. It is unclear if the confusion or lack of compliance with the formal AHA and ADA recommendations are due to a lack of clarity in these guidelines or if clinicians are more influenced by other factors. In the case of the AHA guidelines for IE prevention, recommendations are quite specific regarding patient populations recommended for AP and dental procedures that should be covered. There is considerable confusion and controversy regarding use of AP in people at risk for PJI, due in part to the confusing and conflicting guidelines published since the 2003 guidelines that were approved by both the ADA and the AAOS.²⁶ There are position statements, based on systematic reviews, by both the Canadian

Dental Association in 2013 and the ADA in 2015, reaffirming their positions that the evidence for a relationship between dental procedures and PJI did not support the practice of AP.^{29, 30}

Our results demonstrate a high degree of heterogeneity among dentists concerning factors that influence their decisions to prescribe AP and factors that might change their prescribing practices. This was the case for both advice from professional colleagues and dentists' concerns about risks of development of antibiotic resistance among bacteria, ADR and *C. difficile* infections. Some respondents indicated that their concern about AP promoting antibiotic-resistant bacteria and ADR was slightly important or not important at all (14% and 18% respectively). Of interest, 22% of respondents indicated that the risk of *C. difficile* infection was only "slightly important" or "not important at all", suggesting a lack of appreciation for published data that suggest clindamycin, a common second-line drug used for AP, is strongly associated with *C. difficile* infection and should only be used in limited situations.³ They were also less influenced by the impact of a change in patient desires regarding AP use and more concerned about associated litigation potential.

There was also considerable heterogeneity on the influence of lectures and continuing education programs on AP-prescribing beliefs and behaviors. Although formal professional guidelines and scientific literature were ranked as important by some, 27% of respondents felt that scientific literature ranged from "moderately important" to "not at all important".

This investigation has limitations. The study questionnaire quantified factors affecting dentists' use of AP, but these data may not accurately reflect actual patient management behavior. Although the response rate was high (61%) for a survey of this nature, non-respondents might have reported different opinions on these factors. Also, although network practitioners have much in common with U.S. dentists in general, and the ADA Survey of Dental Practice demonstrated the similarity of network and non-network dentists,³¹ network members do volunteer to participate

in the Network and therefore are not a random sample of generalists and specialists.^{16, 32-34} Additionally, the original draft of our questionnaire had over 90 questions that were intended to cover most, if not all, of the important aspects of AP use. However, we had to reduce its size so that it could be completed in 15-20 minutes; and in doing so, we had to eliminate questions on some factors that may influence dentists' beliefs and behaviors.

There appeared to be consistency regarding the participants inclusion of patient desires regarding the decision to use AP in that a patient request or preference had only moderate influence on the decision to use AP (Fig. 1.d.) and respondents were unlikely to be influenced by a patient who refused AP (Fig. 2.d.). Clearly, the decision to use AP involves shared decision making³⁵ between clinicians and patients alike. Many people either never received or cannot recall instructions from their physician or surgeon regarding AP use,³⁶ or, after many years of receiving AP may not be comfortable with discontinuing its use just because of a change in guidelines or clinician recommendation. Understandably, given the potential risks involved with some patient populations and clinical scenarios, dentists have a natural tendency to defer to a patient's physician or orthopedist regarding AP use even when the guidelines are clear for that population or clinical scenario. Such contacts with the patient's physician should focus on the need for AP and not on the likelihood of a given dental procedure to cause bacteremia and result in distant site infection; a decision that can only be made by the treating dentist.

Conclusions

There is a strong imperative to limit antibiotic use, in general, and AP specifically, to indications where scientific evidence of efficacy outweighs potential risks to a patient and to society.

Scientific evidence and clinical guidelines exist for IE and PJI to guide dentists' use of AP. The heterogeneity and differing impacts on AP prescribing beliefs and behaviors of dentists identified by this study, however, strongly suggest a need for an increased focus on this topic.

Novel interventions that could include protocol-driven care, as one example that is already in use in many dental offices related to other aspects of care, should be examined.

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Table 1 Demographic characteristics of all 2,169 practitioners who completed the AP questionnaire, based on the responses from the network enrollment questionnaire^{1,2}

	Total	
	N	Col %
Specialty training		
Orthodontist	145	6.7
Periodontist	87	4.0
Endodontist	84	3.9
Pediatric Dentistry	72	3.3
Oral & Maxillofacial Surgeon	33	1.5
Prosthodontist	32	1.5
Other	26	1.2
Doctoral and other degrees		
DDS/DMD/BDS	2163	99.7
Masters	245	11.3
MPH	39	1.8
PhD	38	1.8
MBA	15	0.7
MD	12	0.6
JD	2	0.1
Missing	2	0.1
Additional general dentistry training		
Completed a General Practice Residency (GPR) program	391	18.0
Completed an Advanced Education in Dentistry (AEGD) Program	162	7.5
Which of the following dental organizations are you currently a member?		
Member ADA	1729	79.7
Member Academy of General Dentistry	704	32.5
Missing	2	0.1

¹Some dentists belong to multiple groups. These categories are not mutually exclusive so the % exceeds 100

² Age, gender, race, practice location, practice network region, practice time and type, and number of practice locations published previously.^{16, 17}

Table 2. Ordinal logistic regressions of the importance placed on clinical factors when deciding to prescribe AP, by dentist demographic factors

	Gender (Female vs Male)	General practitioner vs Specialist	AEGD (Yes vs No)	GPR (Yes vs No)	Years of graduation
a. Official Resources					
i. American Dental Association guidelines	1.28 (1.06-1.54)	1.11 (0.91-1.37)	1.43 (1.04-1.96)	1.13 (0.91-1.41)	1.00 (0.99-1.02)
ii. Other guidelines (e.g. American Heart Association, American Association of Orthopedic Surgeons, etc.)	1.20 (0.99-1.46)	0.97 (0.78-1.19)	1.25 (0.90-1.72)	0.96 (0.77-1.19)	1.00 (0.98-1.02)
iii. Dental school training	1.38 (1.16-1.64)	1.05 (0.87-1.28)	0.93 (0.69-1.25)	0.88 (0.72-1.08)	0.99 (0.97-1.01)
iv. Continuing education course or post-graduate training program	1.45 (1.21-1.73)	1.33 (1.09-1.63)	1.27 (0.94-1.72)	0.91 (0.74-1.12)	1.01 (0.99-1.03)
v. Scientific literature on the topic	1.08 (0.90-1.29)	0.75 (0.61-0.92)	1.28 (0.94-1.73)	1.13 (0.92-1.40)	1.00 (0.98-1.02)
vi. Risk management course	1.18 (0.99-1.41)	1.12 (0.92-1.37)	1.38 (1.02-1.86)	1.22 (0.99-1.50)	1.00 (0.98-1.02)
b. Professional colleagues					
i. Advice from general dentists	1.10 (0.92-1.31)	2.16 (1.77-2.64)	0.98 (0.73-1.32)	0.81 (0.66-0.99)	0.98 (0.96-0.99)
ii. Advice from a dental specialist	1.08 (0.91-1.29)	1.30 (1.07-1.59)	0.85 (0.64-1.15)	0.76 (0.62-0.94)	0.99 (0.97-1.00)
iii. Advice from a physician or medical specialist	1.26 (1.05-1.50)	0.83 (0.68-1.02)	1.01 (0.75-1.37)	0.98 (0.80-1.21)	1.00 (0.99-1.02)
c. Personal preferences					
i. Concern about the risk of antibiotic prophylaxis resulting in antibiotic resistant bacteria	1.39 (1.16-1.66)	1.06 (0.87-1.30)	1.09 (0.81-1.48)	1.04 (0.85-1.28)	0.99 (0.97-1.00)
ii. Concern about the risk of an adverse drug reaction to antibiotic prophylaxis	1.12 (0.94-1.34)	1.04 (0.85-1.27)	1.18 (0.88-1.59)	1.09 (0.89-1.34)	0.98 (0.96-1.00)
iii. Concern about Clostridium difficile infection	1.28 (1.07-1.52)	1.21 (0.99-1.47)	1.00 (0.74-1.34)	1.07 (0.87-1.31)	0.99 (0.98-1.01)
iv. Concern about the risk of developing infective endocarditis or prosthetic joint infection	1.51 (1.27-1.81)	1.04 (0.85-1.27)	0.84 (0.63-1.14)	0.94 (0.76-1.15)	0.99 (0.97-1.01)
d. Patient factors					
i. Patient request or preference	1.01 (0.85-1.21)	0.83 (0.68-1.02)	1.11 (0.83-1.50)	0.91 (0.74-1.12)	0.98 (0.96-0.99)
ii. Fear of litigation	1.10 (0.92-1.31)	1.25 (1.03-1.52)	0.79 (0.59-1.06)	0.80 (0.65-0.98)	0.98 (0.96-1.00)
iii. It is the best course of action for the patient's health.	1.38 (1.13-1.67)	0.81 (0.65-1.01)	0.96 (0.69-1.32)	1.13 (0.90-1.42)	1.01 (0.99-1.03)

For each regression, the outcome of interest was the importance that the respondent placed on the given factor when deciding to prescribe AP. The outcome used this scale: not at all important; slightly important; moderately important; very important; extremely important.

For each set of regressions, the dentist demographic factor (e.g., gender, generalist/specialist) was the only explanatory covariate tested. The reference group for each factor was the second value of the factor mentioned (e.g. for gender, males were the reference group and female ratings were compared to males).

AEGD: completed Advanced Education in Dentistry (AEGD) Program

GPR: completed a General Practice Residency (GPR) program

The magnitude of the effect of the dentist demographic factor on the outcome of interest is expressed as an odds ratio with its 95% confidence interval.

Table 3. Ordinal logistic regressions of the likelihood of changing your AP practices, by dentist demographic factors

	Gender (Female vs Male)	General practitioner vs Specialist	AEGD (Yes vs No)	GPR (Yes vs No)	Years of graduation
a. Official Resources					
i. Professional organizations (e.g. American Dental Association, American Heart Association, etc.) change practice guidelines	0.93 (0.73-1.18)	0.92 (0.70-1.20)	0.95 (0.64-1.40)	1.36 (1.02-1.83)	0.99 (0.96-1.01)
ii. Received information from a continuing education lecture/course stating that change was appropriate	1.38 (1.15-1.66)	1.29 (1.05-1.58)	0.98 (0.73-1.34)	0.98 (0.79-1.21)	0.99 (0.97-1.01)
iii. The scientific literature on the topic changes	0.98 (0.81-1.17)	0.85 (0.69-1.04)	1.12 (0.83-1.53)	1.21 (0.98-1.50)	0.99 (0.97-1.01)
b. Professional colleagues					
i. A dentist I respect influenced my decision to change my prescription practices.	0.89 (0.75-1.07)	1.54 (1.26-1.88)	1.07 (0.80-1.44)	0.77 (0.62-0.94)	0.99 (0.97-1.01)
ii. A physician or medical specialist advises you to change your prescription practices.	1.07 (0.90-1.28)	1.15 (0.94-1.40)	1.21 (0.90-1.62)	0.78 (0.63-0.96)	1.00 (0.98-1.01)
c. Personal preferences					
i. A change in your concern about the risk of antibiotic prophylaxis resulting in antibiotic resistant bacteria	1.05 (0.87-1.25)	1.02 (0.83-1.24)	1.16 (0.86-1.57)	0.75 (0.61-0.92)	0.98 (0.96-1.00)
ii. A change in your concern about the risk of an adverse drug reaction to antibiotic prophylaxis	0.96 (0.80-1.15)	1.14 (0.93-1.39)	1.29 (0.96-1.75)	0.70 (0.57-0.87)	0.99 (0.97-1.01)
d. Patient factors					
i. The patient no longer wants antibiotic prophylaxis	0.90 (0.75-1.07)	1.30 (1.06-1.58)	1.19 (0.89-1.60)	0.83 (0.67-1.02)	0.99 (0.97-1.01)
ii. Your concern about litigation changes.	0.95 (0.80-1.14)	1.09 (0.90-1.33)	1.22 (0.91-1.64)	0.99 (0.81-1.21)	0.99 (0.97-1.01)

For each regression, the outcome of interest was the likelihood of changing AP practices. The outcome used this scale: extremely unlikely; somewhat unlikely; neither likely or unlikely; somewhat likely; extremely likely. [Jing - correct?]

For each set of regressions, the dentist demographic factor (e.g., gender, generalist/specialist) was the only explanatory covariate tested. The reference group for each factor was the second value of the factor mentioned (e.g. for gender, males were the reference group and female ratings were compared to males).

AEGD: completed Advanced Education in Dentistry (AEGD) Program

GPR: completed a General Practice Residency (GPR) program

The magnitude of the effect of the dentist demographic factor on the outcome of interest is expressed as an odds ratio with its 95% confidence interval.

Figure 1: How important is each of the following in your decision to prescribe (or not prescribe) antibiotic prophylaxis?

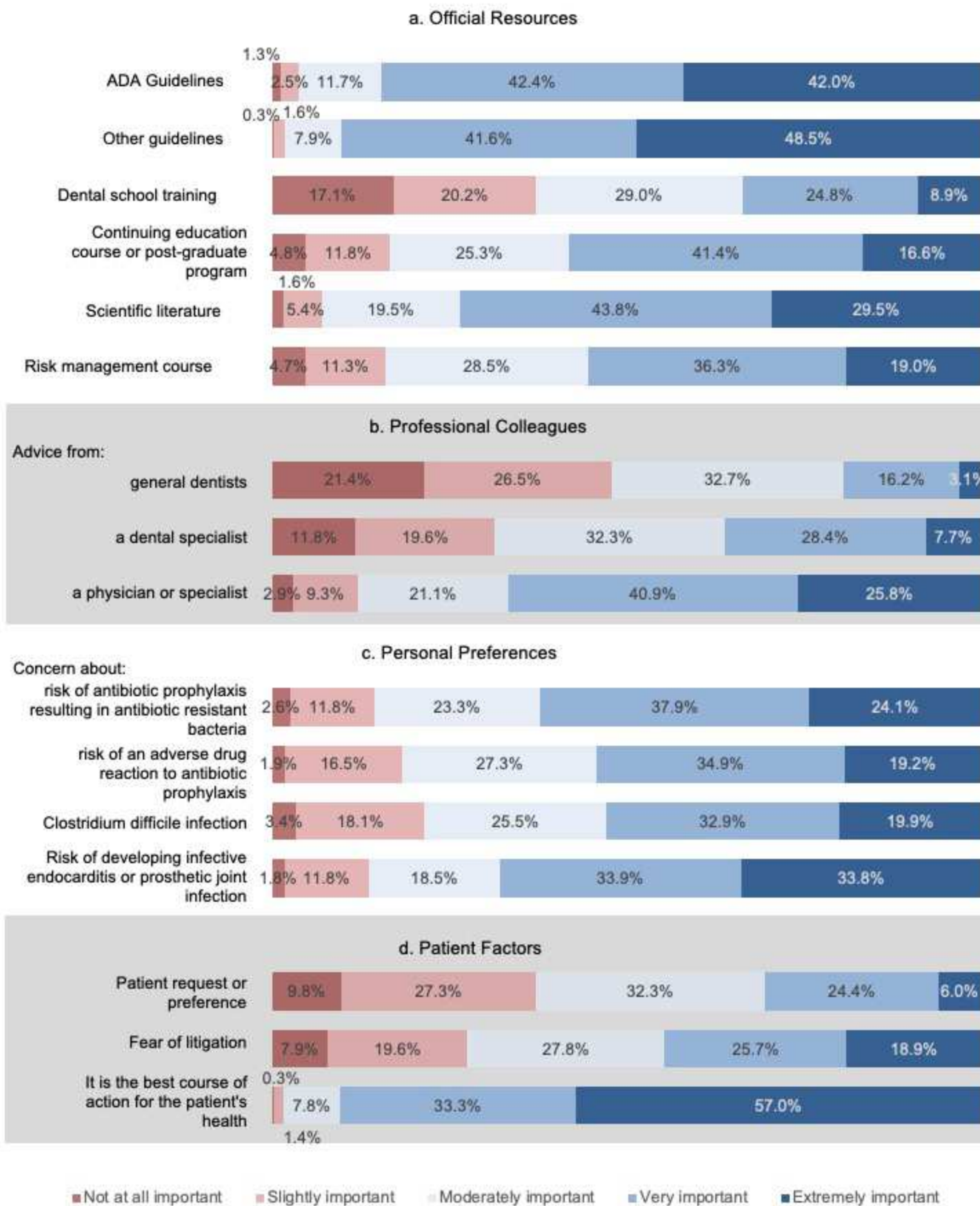
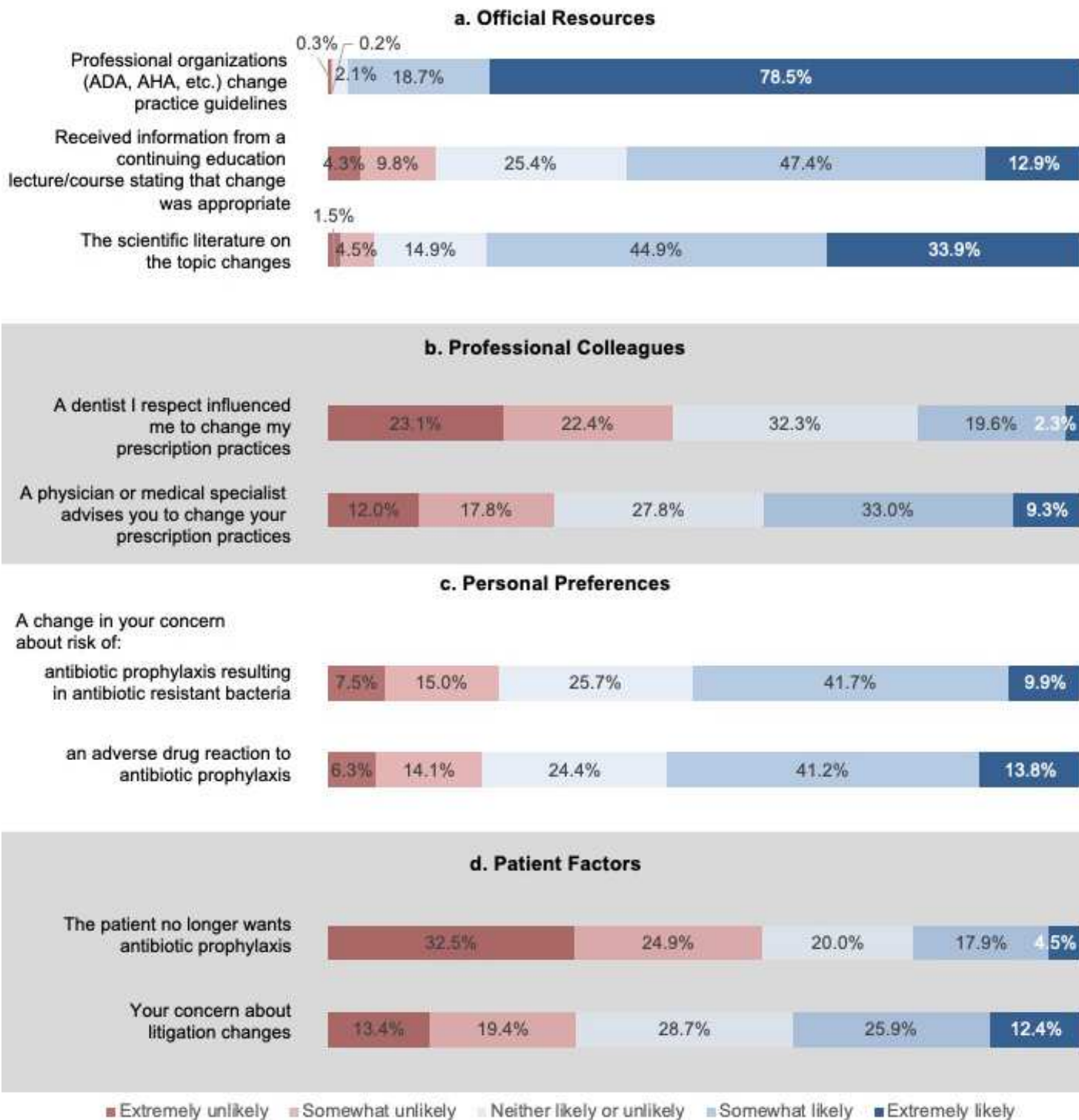


Figure 2: How likely are you to change your antibiotic prophylaxis prescription practices if the following situations occur?



Supplemental Table 1 Demographic characteristics of all 2,169 practitioners who completed the AP questionnaire, based on the responses from the network enrollment questionnaire^{1,2}

		Total	
		N	Col %
Age			
	25-35	94	4.3
	35-45	501	23.1
	45-55	444	20.5
	55-65	686	31.6
	65+	421	19.4
	Missing	23	1.1
Gender			
	Male	1507	69.5
	Female	649	29.9
	Missing	13	0.6
Racial Identification			
	White or Caucasian	1751	80.7
	Asian	216	10.0
	Black or African American	87	4.0
	American Indian or Alaska Native	5	0.2
	Native Hawaiian or other Pacific Islander	4	0.2
	Other	76	3.5
	Missing	30	1.4
Ethnicity			
	Not Hispanic or Latino	2021	93.2
	Hispanic or Latino	115	5.3
	Missing	33	1.5
Are you a general practitioner or specialist?			
	General Practitioner	1706	78.7
	Specialist	458	21.1
	Missing	5	0.2

Did you graduate from a dental school in the United States, Canada, or some other country?

United States	2057	94.8
Canada	10	0.5
Other	89	4.1
Missing	13	0.6

Practice Region

Northeast Region	459	21.2
Southwest Region	437	20.1
South Central Region	418	19.3
Western Region	313	14.4
South Atlantic Region	293	13.5
Midwest Region	247	11.4
Missing	2	0.1

Primary Practice Location

Suburban	968	44.6
Inner city or urban area	884	40.7
Rural	298	13.7
Missing	19	0.9

Do you practice full-time or part-time? (i.e., <32 hours/week)

Full-time	1798	82.9
Part-time	344	15.9
Missing	27	1.2

Total	2169	100.0
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Supplemental Table 2 Count and Percentage for All Figures

	N	Col %
1. How important is each of the following in your decision to prescribe (or not prescribe) antibiotic prophylaxis?		
a. Official Resources		
i. American Dental Association guidelines		
.	2	0.1
Not at all important	28	1.3
Slightly important	55	2.5
Moderately important	253	11.7
Very important	919	42.4
Extremely important	912	42.0
ii. Other guidelines (e.g. American Heart Association, American Association of Orthopedic Surgeons, etc.)		
.	2	0.1
Not at all important	6	0.3
Slightly important	35	1.6
Moderately important	171	7.9
Very important	902	41.6
Extremely important	1053	48.5
iii. Dental school training		
.	2	0.1
Not at all important	371	17.1
Slightly important	438	20.2
Moderately important	629	29.0
Very important	537	24.8
Extremely important	192	8.9
iv. Continuing education course or post-graduate training program		
.	3	0.1
Not at all important	104	4.8
Slightly important	255	11.8
Moderately important	549	25.3
Very important	898	41.4
Extremely important	360	16.6

v. Scientific literature on the topic

.	2	0.1
Not at all important	34	1.6
Slightly important	118	5.4
Moderately important	424	19.5
Very important	951	43.8
Extremely important	640	29.5

vi. Risk management course

.	3	0.1
Not at all important	101	4.7
Slightly important	246	11.3
Moderately important	619	28.5
Very important	788	36.3
Extremely important	412	19.0

b. Professional colleagues**i. Advice from general dentists**

.	2	0.1
Not at all important	465	21.4
Slightly important	574	26.5
Moderately important	709	32.7
Very important	352	16.2
Extremely important	67	3.1

ii. Advice from a dental specialist

.	2	0.1
Not at all important	257	11.8
Slightly important	426	19.6
Moderately important	701	32.3
Very important	616	28.4
Extremely important	167	7.7

iii. Advice from a physician or medical specialist

.	2	0.1
Not at all important	62	2.9
Slightly important	202	9.3
Moderately important	457	21.1
Very important	887	40.9

Extremely important	559	25.8
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c. Personal preferences

i. Concern about the risk of antibiotic prophylaxis resulting in antibiotic resistant bacteria

.	4	0.2
Not at all important	57	2.6
Slightly important	256	11.8
Moderately important	506	23.3
Very important	823	37.9
Extremely important	523	24.1

ii. Concern about the risk of an adverse drug reaction to antibiotic prophylaxis

.	3	0.1
Not at all important	41	1.9
Slightly important	358	16.5
Moderately important	592	27.3
Very important	758	34.9
Extremely important	417	19.2

iii. Concern about *Clostridioides difficile* infection

.	4	0.2
Not at all important	74	3.4
Slightly important	392	18.1
Moderately important	554	25.5
Very important	713	32.9
Extremely important	432	19.9

iv. Concern about the risk of developing infective endocarditis or prosthetic joint infection

.	4	0.2
Not at all important	38	1.8
Slightly important	256	11.8
Moderately important	402	18.5
Very important	735	33.9
Extremely important	734	33.8

d. Patient factors

i. Patient request or preference

.	4	0.2
Not at all important	213	9.8
Slightly important	592	27.3

Moderately important	700	32.3
Very important	529	24.4
Extremely important	131	6.0

ii. Fear of litigation

.	4	0.2
Not at all important	171	7.9
Slightly important	425	19.6
Moderately important	603	27.8
Very important	557	25.7
Extremely important	409	18.9

iii. It is the best course of action for the patient's health.

.	4	0.2
Not at all important	7	0.3
Slightly important	30	1.4
Moderately important	170	7.8
Very important	722	33.3
Extremely important	1236	57.0

How likely are you to change your antibiotic prophylaxis prescription practices if the following situations occur?

a. Official Resources

i. Professional organizations (e.g. American Dental Association, American Heart Association, etc.) change practice guidelines

.	4	0.2
Extremely unlikely	6	0.3
Somewhat unlikely	5	0.2
Neither likely or unlikely	45	2.1
Somewhat likely	406	18.7
Extremely likely	1703	78.5

ii. Received information from a continuing education lecture/course stating that change was appropriate

.	4	0.2
Extremely unlikely	93	4.3
Somewhat unlikely	213	9.8
Neither likely or unlikely	551	25.4
Somewhat likely	1028	47.4
Extremely likely	280	12.9

iii. The scientific literature on the topic changes

.	5	0.2
Extremely unlikely	33	1.5
Somewhat unlikely	98	4.5
Neither likely or unlikely	324	14.9
Somewhat likely	973	44.9
Extremely likely	736	33.9

b. Professional colleagues

i. A dentist I respect influenced my decision to change my prescription practices.

.	4	0.2
Extremely unlikely	502	23.1
Somewhat unlikely	486	22.4
Neither likely nor unlikely	701	32.3
Somewhat likely	426	19.6
Extremely likely	50	2.3

ii. A physician or medical specialist advises you to change your prescription practices.

.	4	0.2
Extremely unlikely	260	12.0
Somewhat unlikely	386	17.8
Neither likely nor unlikely	603	27.8
Somewhat likely	715	33.0
Extremely likely	201	9.3

c. Personal preferences

i. A change in your concern about the risk of antibiotic prophylaxis resulting in antibiotic resistant bacteria

.	4	0.2
Extremely unlikely	163	7.5
Somewhat unlikely	326	15.0
Neither likely nor unlikely	557	25.7
Somewhat likely	904	41.7
Extremely likely	215	9.9

ii. A change in your concern about the risk of an adverse drug reaction to antibiotic prophylaxis

.	5	0.2
Extremely unlikely	137	6.3
Somewhat unlikely	305	14.1
Neither likely nor unlikely	529	24.4

Somewhat likely	893	41.2
Extremely likely	300	13.8

d. Patient factors

i. The patient no longer wants antibiotic prophylaxis

.	4	0.2
Extremely unlikely	704	32.5
Somewhat unlikely	541	24.9
Neither likely nor unlikely	434	20.0
Somewhat likely	388	17.9
Extremely likely	98	4.5

ii. Your concern about litigation changes.

.	4	0.2
Extremely unlikely	291	13.4
Somewhat unlikely	421	19.4
Neither likely nor unlikely	622	28.7
Somewhat likely	562	25.9
Extremely likely	269	12.4

Total

2169	100.0
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