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# Opioid Prescribing Habits of Dental Specialists

by  
Sepi Shafa

## THESIS

Submitted in partial satisfaction of the requirements for degree of  
MASTER OF SCIENCE

in

Oral and Craniofacial Sciences

in the

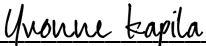
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## **Dedication and Acknowledgements**

To my co-resident, statistician, and husband, Cliff Lee, for your love and patience.

To Shahrzad, Mo, Cameron, and Ava Mostofi for their infinite joy and support.

# Opioid Prescribing Habits of Dental Specialists

Sepi Shafa

## Abstract

**Objective:** Healthcare providers of all disciplines are greatly affected by the opioid epidemic. In order to reduce the misuse of opioids in dentistry, we must understand its role in our profession. The aim of this study was to compare the opioid prescribing habits for the management of dental pain by periodontists, endodontists, and oral surgeons in the United States. The study investigated the factors associated with the opioid prescription practices of these dental specialists and identified the proportion of opioid prescriptions for each type of dental procedure provided.

**Methods:** A 30-question anonymous survey using Qualtrics software was distributed electronically to periodontists, endodontists, and oral surgeons in the United States who had their email registered with the American Academy of Periodontology, American Association of Endodontists, and Accredited Advanced Education Programs in Oral Surgery member directory as of March 2020. The survey included questions about prescribing tendencies for specific procedures, rationale questions for choosing to prescribe or not to prescribe opioids, and demographic information. Results were analyzed using McNemar tests.

**Results:** Emails were sent out to 4,528 periodontists, 3,962 endodontists, and 100 oral surgeons. A total of 574 responses from periodontists, 523 from endodontists, and 30 from oral surgeons were collected. Periodontists were significantly less likely to report prescribing opioids for less-invasive surgeries, such as extractions and crown lengthening, and more likely to prescribe for more complex procedures, such as ridge augmentation ( $p < 0.01$ ). Endodontists were significantly more likely to report prescribing opioids for surgical treatment, but overall did not report a high prevalence of opioid prescriptions. Oral surgeons were significantly less likely to report

prescribing opioids for less-invasive surgeries, such as simple extractions, and more likely to prescribe for more complex procedures, such as sinus augmentations ( $p < 0.01$ ). The main reason for not prescribing opioids for periodontists, endodontists, and oral surgeons was because NSAIDs and other analgesics were as or more effective than opioids. One of the most common reasons cited for prescribing opioids for various procedures was due to the fact that opioids required a written prescription and could not be called in, so writing the prescription in advance, eliminated the need to return to the office, especially during off-days and off-hours. Sixty-one percent of endodontists and sixty percent of periodontists responded that they would follow guidelines for opioid prescriptions if they were developed and endorsed by their respective academies. The American Association of Oral and Maxillofacial Surgeons released opioid prescribing recommendations in 2017. Oral surgery respondents cited these recommendations as the tool in their prescription decision-making.

**Conclusion:**

Practitioners are more likely to prescribe opioids as procedure morbidity increases. Based on the results of this study, respondents would adhere to evidence-based guidelines. The establishment of these guidelines for practitioners on the appropriate use of opioids would be of benefit to dental specialists.

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# **I. Introduction**

## **History of Opioids**

Prescription drugs are a vital component to improving the quality of life for individuals suffering from acute or chronic pain. However, misuse, abuse, addiction, and overdose have become a public health crisis. In order to understand the current opioid epidemic, we must follow the trajectory of its use in medicine. The second century Greek physician, Galen, administered opium, the extract of the poppy plant *Papaver somniferum*, as an analgesic for his patients. Thomas Sydenham, a 17th-century English medical pioneer, wrote: “Among the remedies, which pleased almighty God to give to man to relieve his sufferings, none is so universal and as efficacious as opium.”<sup>1</sup> In the 1800’s chemists isolated a medicinal compound from opium. This compound was called morphine after Morpheus, the god of dreams.<sup>2</sup> A continued use of opiate analgesics was used for administration with an increase in use seen in the 1980’s. At that time, the New England Journal of Medicine published that only four of 11,882 hospitalized individuals prescribed opioids became addicted.<sup>3</sup> In 1990, The Annals of Internal Medicine published findings that there was a failure to treat patients in severe pain with adequate doses of opioid analgesics and therapeutic use of opiate analgesics did not result in addiction, however, the study population consisted of only 38 people.<sup>4,5</sup> The World Health Organization’s Cancer Pain Monograph addressed poor pain management amongst cancer patients and prompted the use of opiates for those afflicted.<sup>6</sup>

The expansion of opioid analgesic use for conditions beyond cancer was addressed in Scientific American. In 1990, Melzack questioned why opiates were not used to treat those struggling with chronic pain—which is a broad classification often used for unknown etiologies.<sup>7,8</sup> The American Pain Society and Veteran’s Health Association launched their “pain

as the fifth vital sign” campaign in 1995, which rapidly increased the patients understanding and quantification of pain. As a result, the dissemination of opioid prescriptions to quell this fifth vital sign appeased both the patient and the campaign goal.<sup>9</sup> In 1996, the emergence of OxyContin® as an extended release opioid was heavily marketed by pharmaceutical companies to encourage physicians to use opioids to treat chronic pain.<sup>10</sup>

### **Neuropharmacology and Dependence**

A vital component in understanding opioid misuse is the neurochemical response to opioids in its reward circuitry and the dependence processes associated with chronic opioid use that manifest during withdrawal.<sup>11</sup> Dependence occurs when the body adjusts normal physiological functioning around opioid use and unpleasant physical symptoms of withdrawal occur when the medication is stopped. This dependence is the neurochemical response to opioid exposure in the body.<sup>12</sup>

When opioids bind to the  $\mu$ -opioid receptors on the neuron membrane, voltage gated calcium channels close, blocking positively charged calcium ions from entering the cell.<sup>13,14</sup> As a result, cyclic adenosine monophosphate (cAMP) levels decrease and potassium channels open leading to positively charged potassium ions exiting the cell. This hyperpolarized state in neuronal cells makes it less likely for cells to fire an action potential. The neurons’ dormant state makes it less likely to transmit pain signals and analgesia is achieved. In addition to its analgesic effect on the brain, this activation of  $\mu$ -opioid receptors of neurons in the nucleus accumbens of the brain releases  $\gamma$ -aminobutyric acid (GABA).<sup>15-17</sup> The release and thus intracellular decrease in GABA cause the release of dopamine via a negative feedback mechanism.<sup>18</sup> This increase in dopamine is responsible for opioids-associated euphoria, which has led to many “chasing the high.”<sup>19</sup> The development of an Opioid Risk Tool by the National Institute of Drug Abuse aims

to determine the risk of future drug dependence. Unfortunately, the opioid risk tool needs further validation for determining future risk due to its self-reporting structure.<sup>20,21</sup>

## **The Opioid Epidemic**

According to the 2018 National Survey on Drug Use and Health (NSDUH) administered by the Substance Abuse and Mental Health Services Administration (SAMHSA) of the U.S. Department of Health and Human Services, approximately 10.3 million people aged 12 or older in 2018 misused opioids in the past year, 2.1 million of which were first time users. From 2002 to 2018 there was a 2.8-fold increase in the total number of national overdose deaths involving opioid drugs and a 1.9-fold increase in the total number of national deaths involving prescription opioid pain relievers.<sup>22</sup> This indicates not only a high prevalence but also a high incidence rate in prescription opioid misuse.

The Medical Expenditure Panel Survey (MEPS) conducted a survey of both medical and dental practitioner visits. This includes the date of the dental event, type of provider seen, if the visit was due to an accident, reason for the dental event, and whether or not medicines were prescribed. The survey found that a total of \$10.7 billion was paid for outpatient prescription opioids by U.S. adults. The top four opioid products ranked by total expenses were the following: Hydrocodone (\$5.0 billion), Oxycodone (\$2.8 billion), Tramadol (\$0.6 billion) and Codeine (\$0.2 billion).<sup>23</sup> Using data extrapolated to the US Medicaid population, Leslie et al. identified that the total cumulative cost of treating opioid use disorder was more than \$72.4 billion from 1999-2013.<sup>24</sup> Additionally, there are costs to opioid use that cannot be monetized, which include the allocation of resources to the criminal justice, foster care, and educational systems which drain infrastructure.<sup>25-27</sup> Thus, opioid use has physical, social, and economic ramifications, which are detrimental as a whole.

## **Opioids and Dentistry**

The management of post-operative pain following dental procedures is often given as the basis for opioid use. Invasive procedures by dental specialists create additional areas for prescribing considerations because few guidelines exist for the use of opioids for acute pain. In 2017, the American Association of Oral and Maxillofacial Surgeons (AAOMS) released opioid prescribing guidelines for acute and postoperative pain.<sup>28</sup> The guidelines recommend oral surgeons utilize nonsteroidal anti-inflammatory drugs (NSAIDs) as a first line therapy for pain management. However, the majority of other dental practitioners and specialist are left to empirical evidence to determine the need for opioids.

Steinmetz, et al. extrapolated dental specific data from the MEPS in order to analyze practitioners' prescribing practices for visits ranging from diagnostic, restorative, and surgical procedures.<sup>23</sup> The MEPS analysis revealed that surgical, root canal, and implant procedures had the highest rates of opioid prescriptions and the greatest increases in rates over time. However, there is limited information on trend estimates of dental surgical specialists' prescription drug practices and each type of procedure that dispenses opioid analgesics.

The use of surveys in collecting data about opioid prescribing is not new or exclusive to the medical field but is seldom used in dentistry. The Journal of the American Dental Association's data from recent studies show a detailed use of opioids by dentists. Gupta et al. used data from Statewide Prescription Drug Monitoring Programs from 2010 through 2015 to examine opioid prescription rates, dosages, and types of dental visits in which opioids were prescribed. Approximately 68.41% of all opioid prescriptions were during surgical dental visits. The opioid prescription rate per 1,000 dental patients consistently increased annually.<sup>29</sup> A study using South Carolina's drug monitoring programs administrative data showed that though

dentists represented only 8.9% of prescribers, they were responsible for 44.9% of initial opioid prescriptions filled by patients.<sup>30</sup> These surveys help bring to light information that otherwise would not be evaluated, capture knowledge and attitudes, and fill gaps in knowledge.

As practitioners, our goals are to reduce morbidity and mortality by facilitating safe practices. Prescribing practices for opioid analgesics by dental specialists are a critical area that warrants attention, and implementation of clinical guidelines for opioid analgesic prescription is imperative to help ameliorate the opioid epidemic.

With many dental specialists using evidence-based reports, the need for expanding this information to include clinical practice guidelines for opioid prescription is crucial. This survey-based study aims to evaluate trends in opioid prescribing habits of dental specialists and the potential need for evidence-based guidelines.

## **II. Materials and Methods**

### **Study Design**

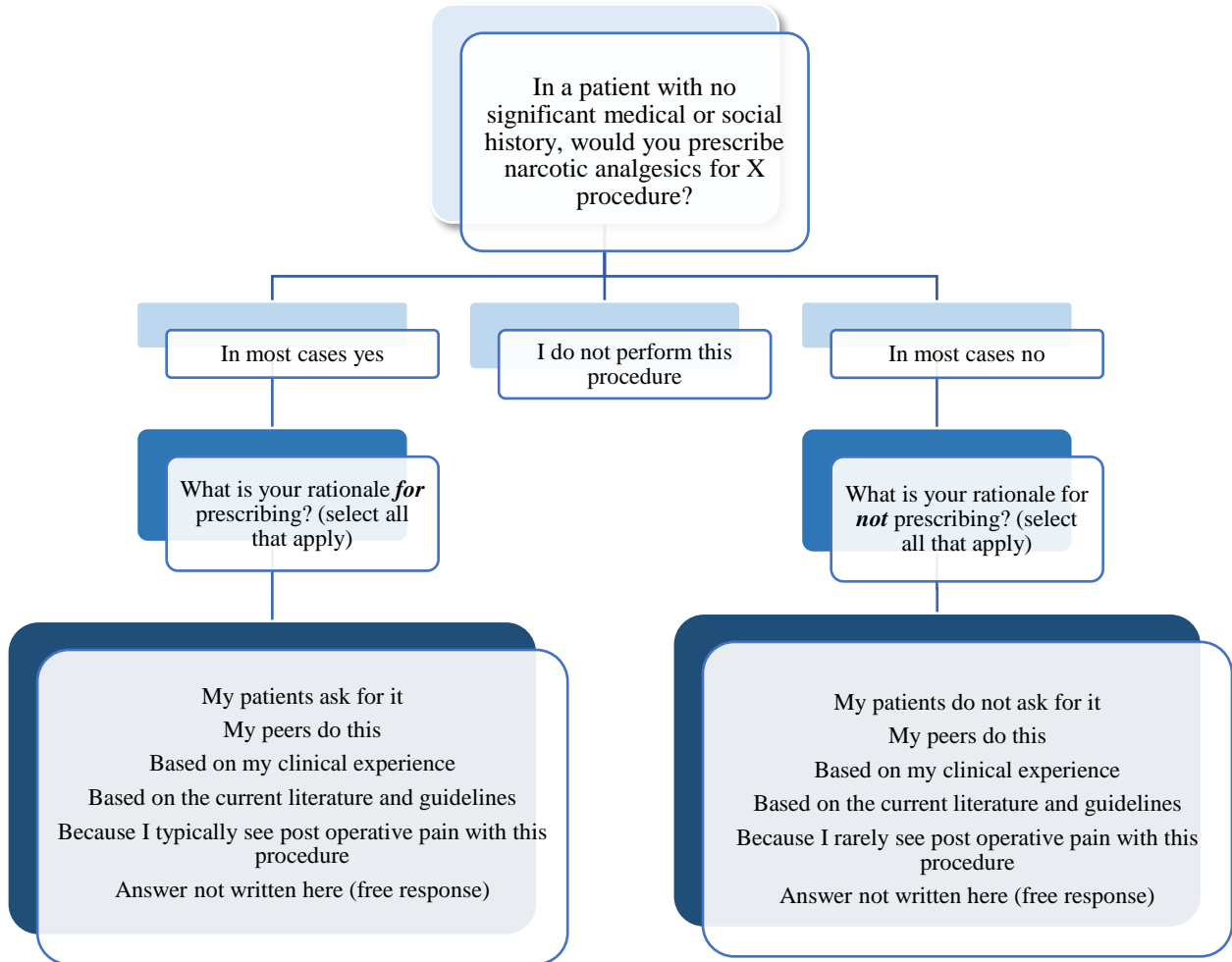
The survey and study were approved under exempt status on November 10, 2018 by the institutional review board of the University of California, San Francisco; exemption number 18-25392. The survey instruments underwent face and content validity testing. Validity testing was performed by four dentists, including a periodontist and endodontist, who independently reviewed the content and deemed it appropriate to measure the intended concepts. The reliability of the survey was tested by distributing the survey instrument to seven periodontal residents at UCSF who took the survey twice with two weeks between responses. Test-retest reliability was calculated using Cohen's kappa test and was found to range between 0.84 and 1.0 with a mean of 0.95, where kappa values between 0.8-1.0 are considered as almost perfect agreement.

The survey was distributed using Qualtrics software to the American Association of Endodontics (AAE) members on May 21, 2019, to the American Academy of Periodontology (AAP) members on September 24, 2019, and Accredited Advanced Education Programs in Oral Surgery member directory listserv on March 3, 2020 via email. The listserv included all 4,528 periodontists and 3,962 endodontists who were active members of the AAP and AAE, respectively. The survey was sent to 100 oral surgeons. Responses were anonymous and not associated with any identifying information of the respondent.

A copy of each survey is included in the appendix summary. Each survey consisted of 30 questions. Eleven of these questions asked practitioners "In an otherwise healthy patient, would you prescribe narcotic analgesics for X procedure," where X included specialty specific procedures. Response choices were limited to "In most cases no, in most cases yes, and I do not perform this procedure." Based on their response to prescribe or not to prescribe opioids, an

appropriate follow up question was asked to obtain the rationale for their decision to prescribe through a multiple-choice menu with a free response option. Prescribers were able to select multiple responses if they were applicable to them. **Figure 1** depicts the question and its follow up rationale question flow. The remaining nineteen questions asked about demographic information, dental training, and practice information. McNemar tests were used to compare responses based on procedure, and logistic regression was used to evaluate the effects of various demographic factors on opioid prescribing habits for each procedure.



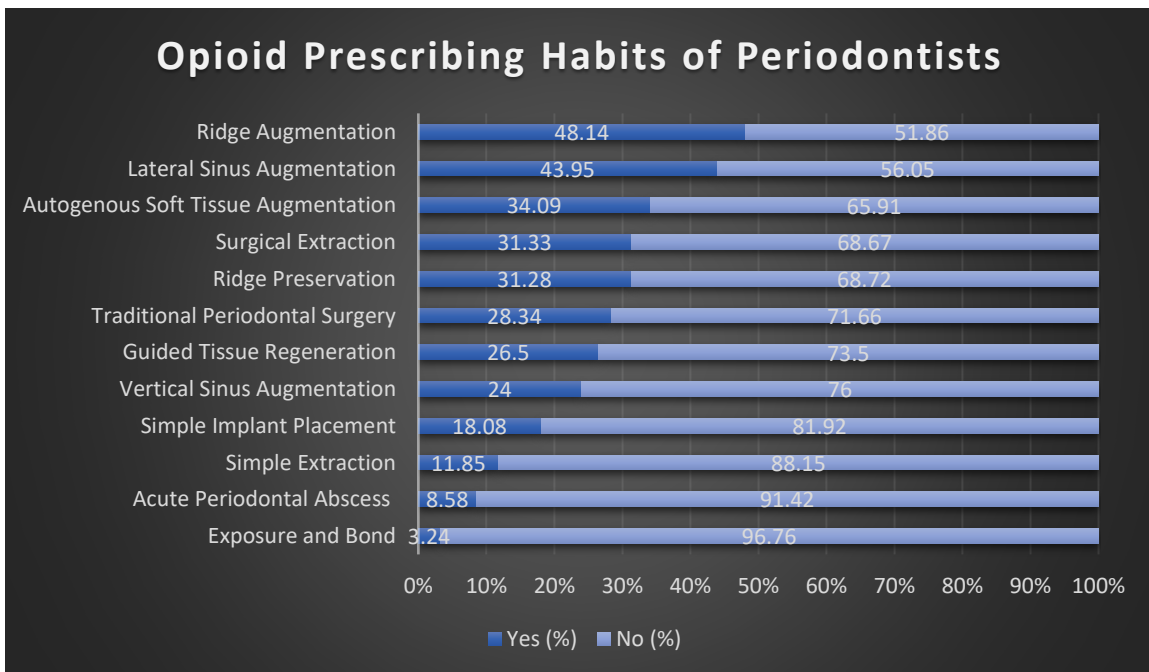


**Figure 1. Procedure questions with follow up rationale questions**

### III. Results

#### *Periodontists*

A total of 4,528 periodontists were contacted to participate in the study on September 24, 2020 via an email that contained a link to the survey. Of the 4,528 that received the email, 574 completed the survey. The survey found an increased likelihood of prescribing opioids as the complexity of the procedures increase.



**Figure 2. Percentage of periodontists who report prescribing opioids by procedures**

Opioid use was significantly higher for ridge augmentation and lateral window sinus augmentation with a 48.14% and 43.95% positive response, respectively, when compared to all other procedures as seen in **Figure 2** ( $p < 0.0001$ ). Autogenous soft tissue augmentation had significantly more opioid prescriptions than traditional periodontal surgery ( $p = 0.003$ ) and guided tissue regeneration ( $p < 0.0001$ ). Ridge preservation had significantly more opioid prescriptions

than guided tissue regeneration ( $p=0.0067$ ). Guided tissue regeneration and vertical sinus augmentation had no significant difference in prescriptions ( $p=0.1934$ ).

**Table 1. Rationale for not prescribing opioids for periodontal procedures.** Values are given in percentage

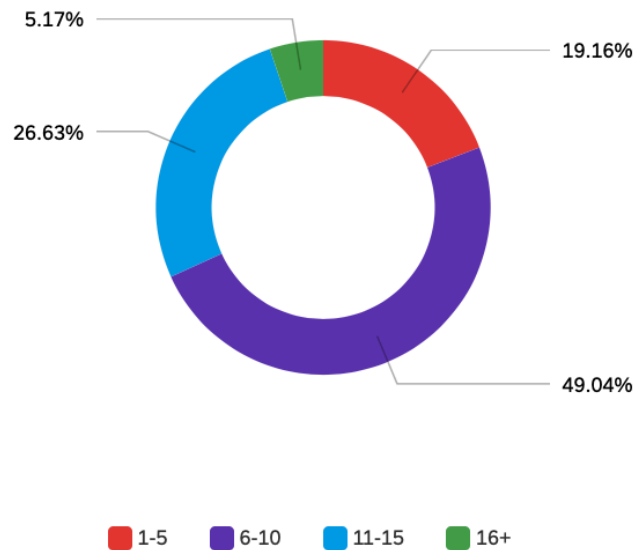
<b>Rationale</b>	<b>Acute Periodontal Abscess</b>	<b>Simple Extraction</b>	<b>Simple Implant</b>	<b>Vertical Sinus Augmentation</b>	<b>Guided Tissue Regeneration</b>	<b>Traditional Periodontal Surgery</b>	<b>Ridge Preservation</b>	<b>Surgical Extraction</b>	<b>Autogenous Soft Tissue Augmentation</b>	<b>Lateral Sinus Augmentation</b>	<b>Ridge Augmentation</b>
Patients do not ask for it	9.48	11.56	9.91	10.13	10.58	10.76	9.96	11.64	10.19	10.89	10.56
Peers do this	1.65	1.28	1.38	1.57	1.16	1.46	1.4	1.62	1.62	1.58	1.34
Based on clinical experience	<b>39.14</b>	<b>35.33</b>	<b>36.06</b>	<b>38.23</b>	<b>40.26</b>	<b>39.71</b>	<b>39.41</b>	<b>36.4</b>	<b>39.14</b>	<b>38.02</b>	<b>41.27</b>
Based on current literature & guidelines	25.25	26.98	23.04	24.68	26.32	26.69	27.91	28	28.36	28.32	30.71
Rarely see post-operative pain with the procedure	18.30	20.88	26.27	21.97	17.42	16.2	16.13	15.56	13.88	16.63	10.94
Write In	6.17	3.96	3.34	3.42	4.26	5.18	5.19	5.95	6.79	4.55	5.18

**Table 2. Rationale for prescribing opioids for periodontal procedures.** Values are given in percentage

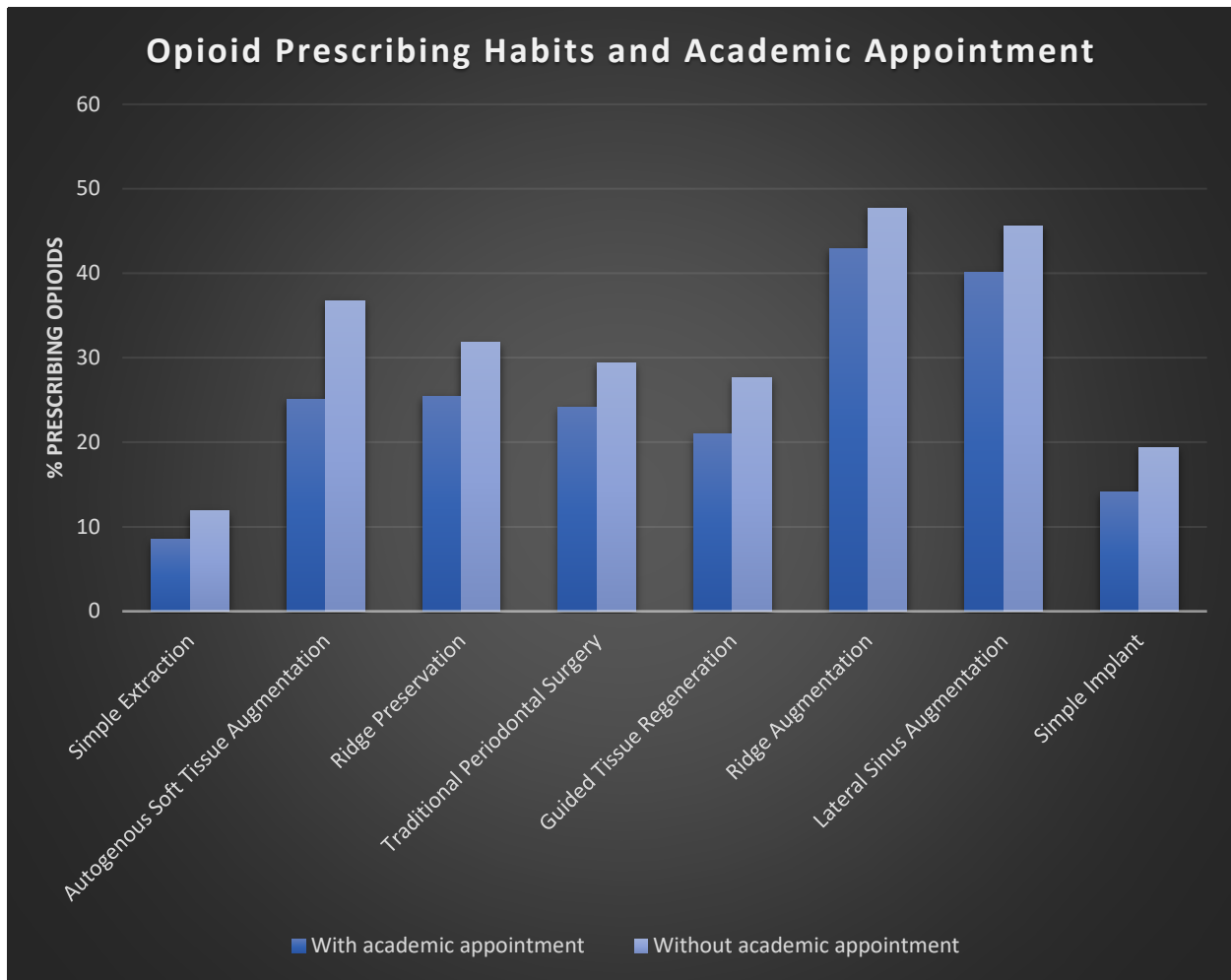
<b>Rationale</b>	Acute Periodontal Abscess	Simple Extraction	Simple Implant	Vertical Sinus Augmentation	Guided Tissue Regeneration	Traditional Periodontal Surgery	Ridge Preservation	Surgical Extraction	Autogenous Soft Tissue Augmentation	Lateral Sinus Augmentation	Ridge Augmentation
Patients ask for it	8.06	1.23	10.56	7.34	5.63	7.78	6.87	8.18	7.92	9.67	7.58
Peers do this	0	7.41	4.23	3.39	1.88	1.95	2.29	2.6	2.3	2.72	2.84
Based on clinical experience	<b>43.55</b>	<b>35.80</b>	<b>46.48</b>	<b>43.5</b>	<b>45.54</b>	<b>42.02</b>	<b>41.22</b>	<b>40.89</b>	<b>41.58</b>	<b>43.2</b>	<b>41.47</b>
Based on current literature & guidelines	8.06	3.70	7.75	7.34	7.04	8.17	9.16	7.81	7.26	9.06	8.53
Typically see post-operative pain with the procedure	32.26	35.80	27.46	33.9	36.15	35.8	34.73	36.43	37.29	32.02	35.78
Write In	8.06	16.05	3.52	4.52	3.76	4.28	5.73	4.09	3.63	3.32	3.79

Periodontists were given the option of selecting all that apply for their decision-making rationale. Of the survey respondents, the majority of periodontists' report that their prescribing rationale is based on clinical experience and that they are least likely to attribute prescribing rationale to that of their peers, as seen in **Table 1** and **Table 2**. The main free response for not prescribing opioids were that respondents have success in pain management using NSAIDs, such as a combination of acetaminophen and ibuprofen. The main free response rationale for prescribing opioids was due to the fact that it cannot be called in to the pharmacy if needed. As a result, most periodontists prescribe 6-10 tablets to serve as a rescue (**Figure 3**).

When prescribing narcotic analgesics, how many do you typically dispense?



**Figure 3. Number of tablets dispensed by prescribing periodontists**



**Figure 4. Prescribing habits of periodontists stratified by academic appointment**

**Figure 4** shows the proportion of positive responses to opioid prescription when the respondents were stratified by whether or not they had an academic appointment. Those that had an academic appointment were significantly less likely to prescribe opioids for every procedure ( $p < 0.05$ ).

The majority of opioid prescription decision making was based on clinical experience, and current literature and guidelines were rarely cited as a reason for prescribing opioids. However, the majority of respondents would follow guidelines if implemented by the American Academy of Periodontology (**Figure 5**).

If the American Academy of Periodontology developed and endorsed evidence-based guidelines for prescribing narcotic analgesics for procedures, would you follow them?



**Figure 5. AAP Endorsed Guidelines**

The demographic parameters of respondents (**Table 3**) were used to complete logistic regression analysis to further analyze their effects on opioid prescribing habits. Statistically significant differences were noted in prescribing habits based on gender, years of practice, and primary practice setting. The trends indicate that female periodontists, those without academic affiliations, and periodontists with 1-5 years of experience are less likely to prescribe narcotic analgesics, while those working predominantly in a community clinic or private practice setting were more likely (**Table 4**).



	N	%
Gender		
Male	377	72%
Female	144	27%
Prefer not to answer	6	1%
Race		
White	378	72%
Asian/Alaskan/Hawaii	7	1%
Black	7	1%
More than one	14	3%
Other	81	15%
Prefer not to answer	40	8%
Ethnicity		
Latino/Hispanic	35	7%
Not Latino/Hispanic	476	93%
Years of Practice		
0-5	124	23%
6-10	63	12%
11-15	53	10%
16-20	49	9%
20+	242	46%
Academic appointment		
Yes	212	40%
No	315	60%
Predominant work setting		
Private practice	397	74%
University	127	24%
Community health center	13	2%

**Table 3. Periodontist Demographics**

**Table 4. Logistical Regressions for prescribing opioids for periodontal procedures.** Variables with p<0.05 are highlighted in red.

<b>Expose &amp; Bond</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
Gender (Female)	0.7246	0.1943	-0.62	0.562	0.524	1.264
Academic Appointment	1.0049	0.2839	-0.37	0.824	0.711	1.519
Race (white comparison)						
Asian, Hawaiian, Native	1.0000					
Black	1.0000					
More than one	1.2641	1.118	0.63	0.556	0.271	6.223
Other	0.9676	0.7421	-0.34	0.621	0.436	2.215
Prefer not to answer	0.8261	0.2153	-0.52	0.562	0.322	2.868
Years of practice (20+ years comparison)						
16-20 years	0.8108	0.532	-0.32	0.749	0.224	2.935
11-15 years	0.5499	0.424	-0.78	0.438	0.121	2.492
6-10 years	0.8534	0.838	0.99	0.321	0.612	4.467
1-5 years	0.9660	0.494	-0.07	0.946	0.354	2.634
Practice setting (Academic)						
Community Clinic	-	-	-	-	-	-
<b>Private Practice</b>	<b>1.7113</b>	<b>1.5117</b>	<b>1.83</b>	<b>0.000</b>	<b>1.122</b>	<b>3.419</b>
_cons	0.0621	0.0442	-3.16	0	0.007	0.225
<b>Acute Periodontal Abscess</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
Gender (Female)	0.4664	0.2226	-1.6	0.110	0.183	1.188
Academic Appointment	0.8157	0.3078	-0.54	0.589	0.389	1.709
Race (white comparison)						
Asian, Hawaiian, Native	1.0000					
Black	1.0000					
More than one	1.4978	1.2368	0.49	0.625	0.297	7.557
Other	0.8876	0.4781	-0.22	0.825	0.309	2.551
Prefer not to answer	0.6682	0.5215	-0.52	0.605	0.145	3.085
Years of practice (20+ years comparison)						
16-20 years	0.8108	0.532	-0.32	0.749	0.224	2.935
11-15 years	0.5499	0.424	-0.78	0.438	0.121	2.492
6-10 years	1.6539	0.838	0.99	0.321	0.612	4.467
1-5 years	0.9660	0.494	-0.07	0.946	0.354	2.634
Practice setting (Academic)						
Community Clinic	-	-	-	-	-	-
<b>Private Practice</b>	<b>3.9709</b>	<b>2.6295</b>	<b>2.08</b>	<b>0.037</b>	<b>1.085</b>	<b>14.539</b>
_cons	0.0359	0.0247	-4.83	0	0.009	0.138

<b>Simple Extraction</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
<b>Gender (Female)</b>	<b>0.3435</b>	<b>0.150</b>	<b>-2.45</b>	<b>0.014</b>	<b>0.146</b>	<b>0.808</b>
Academic Appointment	0.9126	0.306	-0.27	0.785	0.473	1.761
Race (white comparison)						
Asian, Hawaiian, Native	2.4497	2.829	0.78	0.438	0.256	23.557
Black	1.2768	1.457	0.78	0.830	0.136	11.963
More than one	1.1255	0.946	0.14	0.888	0.217	5.847
Other	0.9273	0.436	-0.16	0.873	0.369	2.330
Prefer not to answer	0.4060	0.313	-1.17	0.242	0.090	1.838
Years of practice (20+ years comparison)						
16-20 years	1.1870	0.605	0.34	0.737	0.437	3.226
11-15 years	1.0443	0.565	0.08	0.936	0.361	3.018
6-10 years	1.8553	0.859	1.34	0.182	0.749	4.597
1-5 years	0.8816	0.405	-0.27	0.784	0.358	2.171
Practice setting (Academic)						
<b>Community Clinic</b>	<b>13.2023</b>	<b>12.478</b>	<b>2.73</b>	<b>0.006</b>	<b>2.071</b>	<b>84.1718</b>
<b>Private Practice</b>	<b>4.9953</b>	<b>3.238</b>	<b>2.48</b>	<b>0.013</b>	<b>1.402</b>	<b>17.799</b>
_cons	0.0309	0.021	-5.11	0.000	0.008	0.117
<b>Implant</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
<b>Gender (Female)</b>	<b>0.5174</b>	<b>0.1665</b>	<b>-2.05</b>	<b>0.041</b>	<b>0.275</b>	<b>0.972</b>
Academic Appointment	1.3757	0.4053	1.08	0.279	0.772	2.451
Race (white comparison)						
Asian, Hawaiian, Native	1.3999	1.5684	0.30	0.764	0.156	12.583
Black	3.6105	2.9205	1.59	0.112	0.740	17.623
More than one	0.8200	0.6639	-0.25	0.806	0.168	4.009
Other	1.1249	0.4361	0.30	0.761	0.526	2.405
Prefer not to answer	0.6507	0.3706	-0.75	0.451	0.213	1.987
Years of practice (20+ years comparison)						
16-20 years	1.0926	0.447	0.22	0.829	0.490	2.436
11-15 years	0.5460	0.265	-1.25	0.212	0.211	1.414
6-10 years	0.9695	0.391	-0.08	0.939	0.439	2.139
<b>1-5 years</b>	<b>0.4247</b>	<b>0.169</b>	<b>-2.15</b>	<b>0.032</b>	<b>0.195</b>	<b>0.927</b>
Practice setting (Academic)						
<b>Community Clinic</b>	<b>5.3491</b>	<b>4.2042</b>	<b>2.13</b>	<b>0.033</b>	<b>1.146</b>	<b>24.963</b>
Private Practice	1.5117	0.6286	0.99	0.320	0.669	3.415
_cons	0.0703	0.0323	-5.79	0.000	0.029	0.173

<b>Vertical Sinus</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
Gender (Female)	0.7634	0.2180	-0.95	0.345	0.436	1.336
Academic Appointment	1.0136	0.2781	0.05	0.961	0.592	1.735
Race (white comparison)						
Asian, Hawaiian, Native	0.6903	0.7734	-0.33	0.741	0.077	6.204
Black	4.0730	3.9364	1.45	0.146	0.613	27.075
More than one	1.3702	0.8818	0.49	0.625	0.388	4.837
Other	0.9332	0.3324	-0.19	0.846	0.464	1.876
Prefer not to answer	0.3762	0.2434	-1.51	0.131	0.106	1.337
Years of practice (20+ years comparison)						
16-20 years	1.7763	0.679	1.50	0.133	0.839	3.759
11-15 years	1.2567	0.497	0.58	0.564	0.579	2.730
6-10 years	1.0934	0.414	0.24	0.814	0.520	2.298
1-5 years	0.5537	0.199	-1.64	0.101	0.273	1.121
Practice setting (Academic)						
<b>Community Clinic</b>	<b>8.3427</b>	<b>6.7584</b>	<b>2.62</b>	<b>0.009</b>	<b>1.705</b>	<b>40.819</b>
Private Practice	1.9351	0.7486	1.71	0.088	0.907	4.131
_cons	0.1051	0.0439	-5.39	0.000	0.046	0.238
<b>GTR</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
<b>Gender (Female)</b>	<b>0.3435</b>	<b>0.150</b>	<b>-2.45</b>	<b>0.014</b>	<b>0.146</b>	<b>0.808</b>
Academic Appointment	0.9126	0.306	-0.27	0.785	0.473	1.761
Race (white comparison)						
Asian, Hawaiian, Native	2.4497	2.829	0.78	0.438	0.256	23.557
Black	1.2768	1.457	0.78	0.830	0.136	11.963
More than one	1.1255	0.946	0.14	0.888	0.217	5.847
Other	0.9273	0.436	-0.16	0.873	0.369	2.330
Prefer not to answer	0.4060	0.313	-1.17	0.242	0.090	1.838
Years of practice (20+ years comparison)						
16-20 years	1.3506	0.495	0.82	0.412	0.658	2.771
11-15 years	1.0128	0.389	0.03	0.974	0.477	2.152
6-10 years	1.0794	0.390	0.21	0.833	0.531	2.193
1-5 years	0.7471	0.242	-0.90	0.368	0.396	1.410
Practice setting (Academic)						
<b>Community Clinic</b>	<b>13.2023</b>	<b>12.478</b>	<b>2.73</b>	<b>0.006</b>	<b>2.071</b>	<b>84.1718</b>
<b>Private Practice</b>	<b>4.9953</b>	<b>3.238</b>	<b>2.48</b>	<b>0.013</b>	<b>1.402</b>	<b>17.799</b>
_cons	0.0309	0.021	-5.11	0.000	0.008	0.117

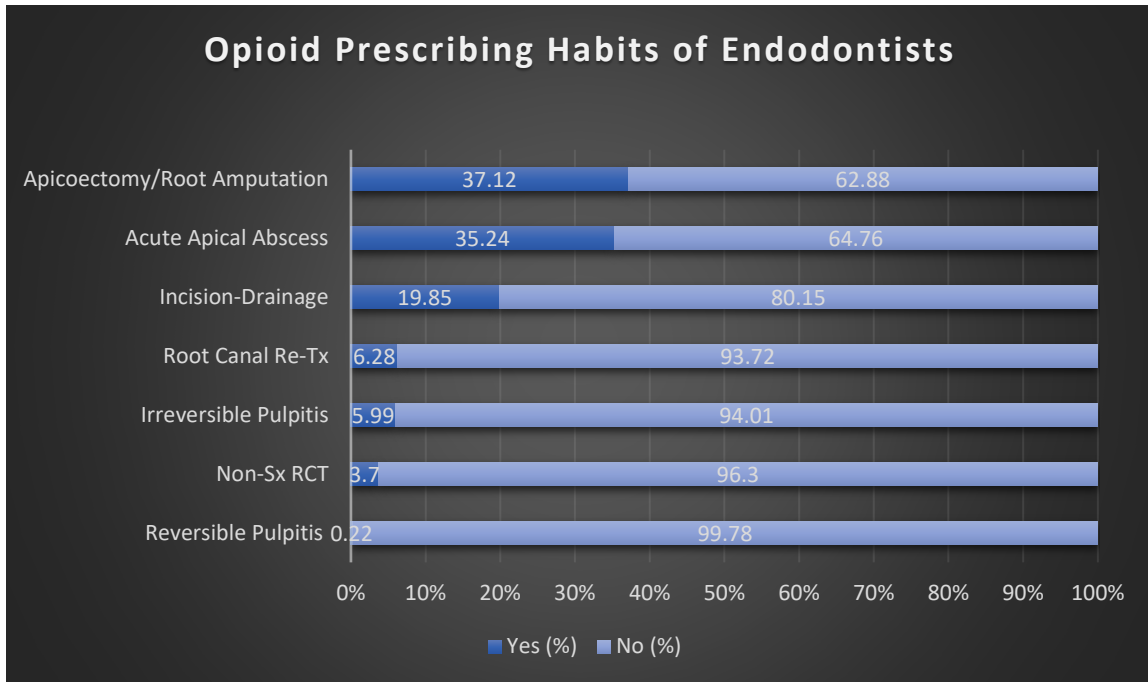
<b>Traditional Perio Surgery</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
<b>Gender (Female)</b>	<b>0.5398</b>	<b>0.1421</b>	<b>-2.34</b>	<b>0.019</b>	<b>0.322</b>	<b>0.904</b>
Academic Appointment	1.0196	0.2483	0.08	0.937	0.633	1.643
Race (white comparison)						
Asian, Hawaiian, Native	1.7404	1.5248	0.63	0.527	0.313	9.692
Black	3.7097	2.9958	1.62	0.105	0.762	18.061
More than one	1.3829	0.8310	0.54	0.590	0.426	4.490
Other	0.9922	0.3253	-0.02	0.981	0.522	1.887
Prefer not to answer	0.6617	0.3092	-0.88	0.377	0.265	1.654
Years of practice (20+ years comparison)						
16-20 years	1.1597	0.415	0.41	0.678	0.576	2.337
11-15 years	0.9135	0.340	-0.24	0.808	0.440	1.896
6-10 years	1.2296	0.415	0.61	0.541	0.634	2.384
<b>1-5 years</b>	<b>0.5707</b>	<b>0.183</b>	<b>-1.74</b>	<b>0.046</b>	<b>0.304</b>	<b>0.972</b>
Practice setting (Academic)						
<b>Community Clinic</b>	<b>17.1703</b>	<b>13.2176</b>	<b>3.69</b>	<b>0.000</b>	<b>3.798</b>	<b>77.629</b>
<b>Private Practice</b>	<b>2.3184</b>	<b>0.7971</b>	<b>2.45</b>	<b>0.014</b>	<b>1.182</b>	<b>4.548</b>
_cons	0.1285	0.0484	-5.45	0.000	0.061	0.269
<b>Ridge Preservation</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
Gender (Female)	0.8613	0.2087	-0.62	0.538	0.536	1.385
Academic Appointment	1.0680	0.2565	0.27	0.784	0.667	1.710
Race (white comparison)						
Asian, Hawaiian, Native	1.3876	1.2192	0.37	0.709	0.248	7.765
Black	2.7515	2.1944	1.27	0.204	0.576	13.135
More than one	1.5985	0.9300	0.81	0.420	0.511	4.999
Other	1.2882	0.3894	0.84	0.402	0.712	2.330
Prefer not to answer	0.3320	0.1875	-1.95	0.051	0.110	1.004
Years of practice (20+ years comparison)						
16-20 years	1.5320	0.529	1.23	0.217	0.778	3.016
11-15 years	0.7886	0.298	-0.63	0.529	0.376	1.652
6-10 years	1.6759	0.550	1.57	0.116	0.881	3.188
1-5 years	0.7032	0.213	-1.16	0.246	0.388	1.274
Practice setting (Academic)						
<b>Community Clinic</b>	<b>5.2124</b>	<b>3.6748</b>	<b>2.34</b>	<b>0.019</b>	<b>1.309</b>	<b>20.756</b>
<b>Private Practice</b>	<b>2.4613</b>	<b>0.8311</b>	<b>2.67</b>	<b>0.008</b>	<b>1.270</b>	<b>4.771</b>
_cons	0.1321	0.0473	-5.65	0.000	0.065	0.267

<b>Surgical Extraction</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
<b>Gender (Female)</b>	<b>0.5224</b>	<b>0.1319</b>	<b>-2.57</b>	<b>0.010</b>	<b>0.319</b>	<b>0.857</b>
Academic Appointment	1.0049	0.2389	0.02	0.984	0.631	1.601
Race (white comparison)						
Asian, Hawaiian, Native	0.5644	0.6233	0.78	0.438	0.256	23.557
Black	4.3899	3.9998	0.78	0.830	0.136	11.963
More than one	1.0428	0.6225	0.14	0.888	0.217	5.847
Other	1.0815	0.3302	-0.16	0.873	0.369	2.330
Prefer not to answer	0.5134	0.2385	-1.17	0.242	0.090	1.838
Years of practice (20+ years comparison)						
16-20 years	1.5230	0.526	1.22	0.223	0.774	2.997
11-15 years	0.7399	0.279	-0.80	0.425	0.353	1.551
6-10 years	1.5010	0.488	1.25	0.212	0.793	2.840
1-5 years	0.6183	0.188	-1.58	0.114	0.341	1.122
Practice setting (Academic)						
<b>Community Clinic</b>	<b>11.7008</b>	<b>8.9073</b>	<b>3.23</b>	<b>0.001</b>	<b>2.632</b>	<b>52.024</b>
<b>Private Practice</b>	<b>1.8145</b>	<b>0.5797</b>	<b>1.86</b>	<b>0.062</b>	<b>0.970</b>	<b>3.394</b>
_cons	0.2014	0.0687	-4.7	0	0.103	0.393
<b>Autogenous Soft Tissue Augmentation</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
<b>Gender (Female)</b>	<b>0.6164</b>	<b>0.1478</b>	<b>-2.02</b>	<b>0.044</b>	<b>0.385</b>	<b>0.986</b>
Academic Appointment	1.4608	0.3467	1.6	0.11	0.917	2.326
Race (white comparison)						
Asian, Hawaiian, Native	2.1473	1.7169	0.96	0.339	0.448	10.291
Black	1.5944	1.2929	0.58	0.565	0.325	7.813
More than one	2.0728	1.2005	1.26	0.208	0.666	6.450
Other	1.3450	0.3904	1.02	0.307	0.761	2.376
Prefer not to answer	0.6782	0.3073	-0.86	0.392	0.279	1.648
Years of practice (20+ years comparison)						
16-20 years	1.3674	0.486	0.88	0.379	0.681	2.744
11-15 years	1.1879	0.423	0.48	0.629	0.591	2.387
<b>6-10 years</b>	<b>2.0990</b>	<b>0.676</b>	<b>2.30</b>	<b>0.021</b>	<b>1.117</b>	<b>3.946</b>
1-5 years	1.0674	0.307	0.23	0.821	0.607	1.877
Practice setting (Academic)						
<b>Community Clinic</b>	<b>17.2841</b>	<b>14.5378</b>	<b>3.39</b>	<b>0.001</b>	<b>3.324</b>	<b>89.866</b>
<b>Private Practice</b>	<b>1.8991</b>	<b>0.5959</b>	<b>2.04</b>	<b>0.041</b>	<b>1.027</b>	<b>3.513</b>
_cons	0.2070	0.0676	-4.83	0.000	0.109	0.392

<b>Lateral Window Sinus</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
Gender (Female)	0.8295	0.1943	-0.80	0.425	0.524	1.313
Academic Appointment	1.1156	0.2627	0.46	0.642	0.703	1.770
Race (white comparison)						
Asian, Hawaiian, Native	2.3676	1.8625	1.10	0.273	0.507	11.065
Black	2.8059	2.5195	1.15	0.251	0.483	16.307
More than one	0.8444	0.5062	-0.28	0.778	0.261	2.734
Other	1.2554	0.3607	0.79	0.429	0.715	2.205
Prefer not to answer	0.6461	0.2903	-0.97	0.331	0.268	1.559
Years of practice (20+ years comparison)						
16-20 years	0.9038	0.338	-0.27	0.787	0.434	1.881
11-15 years	0.8604	0.300	-0.43	0.666	0.434	1.704
6-10 years	1.1558	0.375	0.45	0.655	0.612	2.182
1-5 years	0.7332	0.207	-1.10	0.271	0.422	1.275
Practice setting (Academic)						
<b>Community Clinic</b>	<b>17.4049</b>	<b>19.1458</b>	<b>2.60</b>	<b>0.009</b>	<b>2.015</b>	<b>150.319</b>
Private Practice	1.4769	0.4310	1.34	0.181	0.834	2.617
_cons	0.4083	0.1238	-2.96	0.003	0.225	0.740
<b>Ridge Augmentation</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
Gender (Female)	0.7485	0.1638	-1.32	0.186	0.487	1.150
Academic Appointment	0.9649	0.2111	-0.16	0.870	0.628	1.481
Race (white comparison)						
Asian, Hawaiian, Native	3.5960	3.0802	1.49	0.135	0.671	19.273
Black	8.4185	9.3176	1.92	0.054	0.962	73.678
More than one	1.3526	0.7947	0.51	0.607	0.428	4.278
Other	1.3793	0.3787	1.17	0.242	0.805	2.362
Prefer not to answer	0.7353	0.2945	-0.77	0.443	0.335	1.612
Years of practice (20+ years comparison)						
16-20 years	1.0630	0.359	0.18	0.857	0.548	2.062
11-15 years	1.1603	0.387	0.45	0.656	0.603	2.232
<b>6-10 years</b>	<b>2.0020</b>	<b>0.637</b>	<b>2.18</b>	<b>0.029</b>	<b>1.073</b>	<b>3.736</b>
1-5 years	1.2512	0.329	0.85	0.395	0.747	2.096
Practice setting (Academic)						
<b>Community Clinic</b>	<b>5.3626</b>	<b>3.9037</b>	<b>2.31</b>	<b>0.021</b>	<b>1.287</b>	<b>22.336</b>
Private Practice	1.6799	0.4628	1.88	0.060	0.979	2.883
_cons	0.6023	0.1698	-1.80	0.072	0.347	1.047

## Endodontists

A total of 3,962 endodontists were contacted to participate in the study on May 21, 2019 via an email that contained a link to the survey. Of the 3,962 that received the email, 523 completed the survey. The survey found an increased likelihood of prescribing opioids as the likelihood for pain increased.



**Figure 6. Percentage of endodontists who report prescribing opioids by procedure**

Opioid use was significantly higher for apicoectomy/root amputations and acute apical abscess with 37.1% and 35.24% positive responses, respectively, when compared to all other procedures ( $p < 0.001$ , **Figure 6**). Incision-drainage had significantly more opioid prescriptions than irreversible pulpitis and root canal re-treatment, which have statistically similar outcomes ( $p < 0.05$ ). Nonsurgical root canal treatment had significantly more opioid prescriptions than reversible pulpitis ( $p < 0.05$ ). Irreversible pulpitis and nonsurgical root canal treatment had no significant difference in prescriptions ( $p = 0.2863$ ).



**Table 5. Rationale for not prescribing opioids for endodontic procedures. Values are given in percentage**

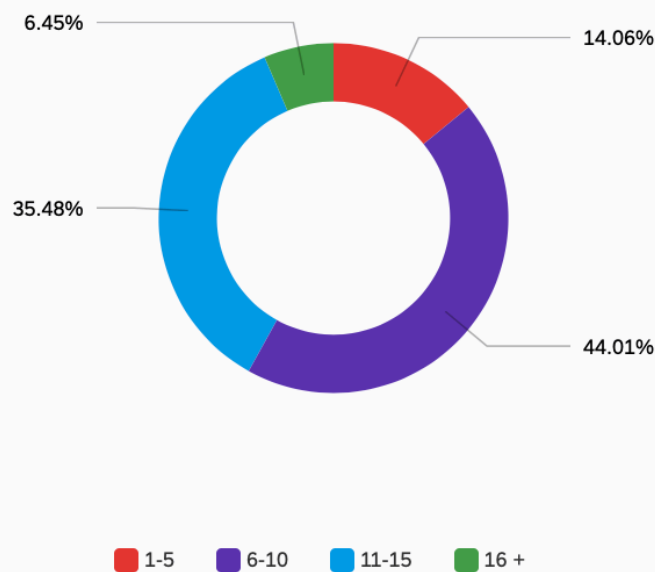
Rationale	Reversible Pulpitis	NSRCT	Irreversible Pulpitis	Root Canal Re-Tx	Incision-Drainage	Acute Apical Abscess	Apicoectomy/Root Amputation
Patients do not ask for it	11.14	10.56	11.05	10.64	7.54	9.23	8.72
Peers do this	0.79	0.80	0.68	0.85	0.74	0.68	1.12
Based on clinical experience	31.59	33.82	32.06	34.61	39.52	36.94	36.24
Based on current literature & guidelines	<b>41.15</b>	<b>40.37</b>	<b>41.06</b>	<b>40.28</b>	<b>39.89</b>	<b>40.09</b>	<b>39.37</b>
Rarely see post-operative pain with the procedure	6.55	10.16	4.77	8.94	6.80	2.48	8.95
Write In	8.78	4.28	10.37	4.68	5.51	10.59	5.59

**Table 6. Rationale for prescribing opioids for endodontic procedures.** Values are given in percentage

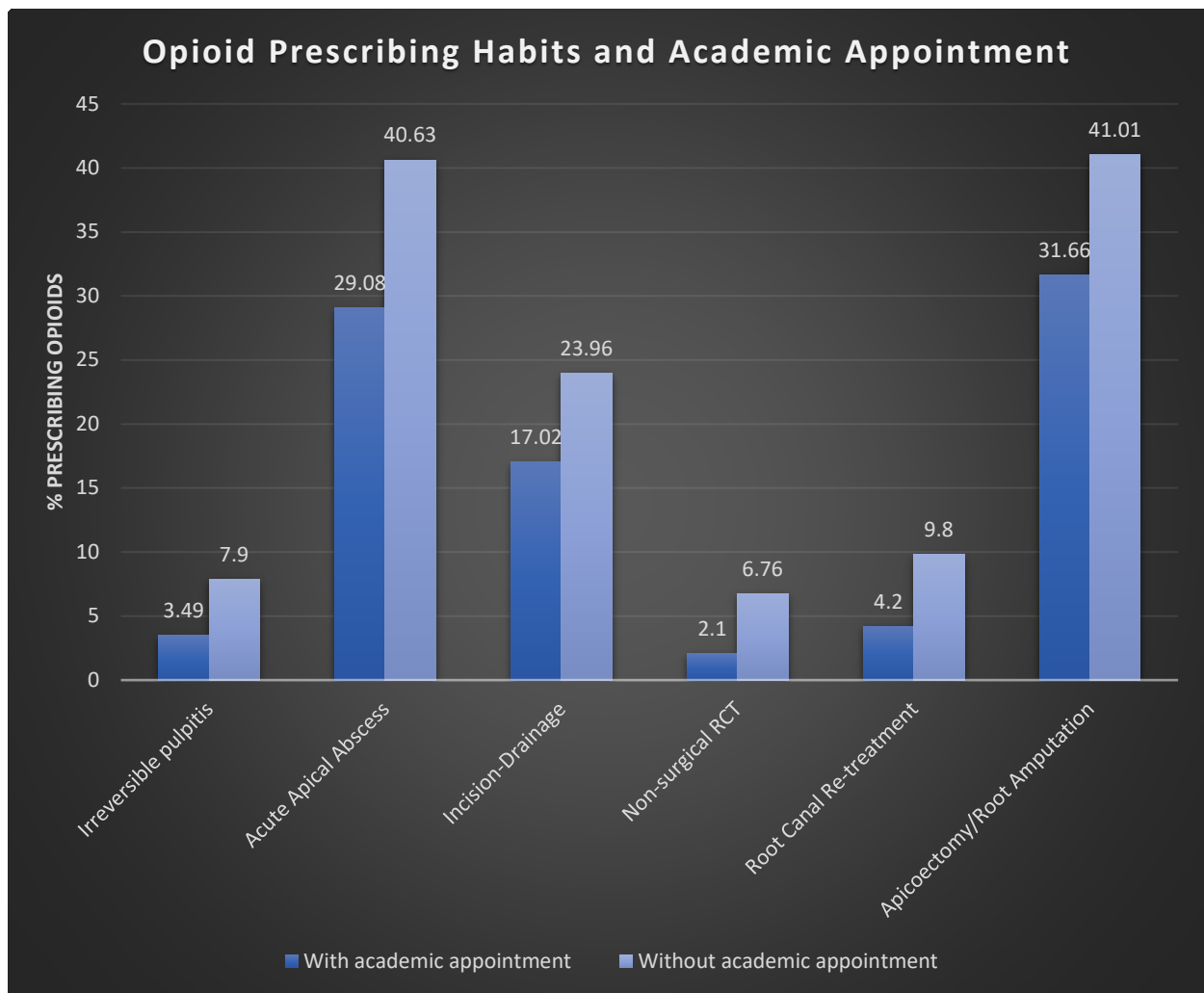
Rationale	Reversible Pulpitis	NSRCT	Irreversible Pulpitis	Root Canal Re-Tx	Incision-Drainage	Acute Apical Abscess	Apicoectomy/Root Amputation
Patients ask for it	0	13.51	5	10.94	10.34	12.8	12.08
Peers do this	0	5.41	2.5	3.13	2.07	2	2.26
Based on clinical experience	<b>25</b>	<b>54.05</b>	<b>62.5</b>	<b>46.88</b>	<b>55.17</b>	<b>44.8</b>	<b>46.79</b>
Based on current literature & guidelines	0	2.7	7.5	9.38	10.34	16	12.83
Rarely see post-operative pain with the procedure	<b>25</b>	16.22	12.5	26.56	19.31	21.6	22.64
Write In	50	8.11	10	3.13	2.76	2.8	3.4

Endodontists were given the option of selecting all that apply for their decision-making rationale. Of the survey respondents, the majority of endodontists' report that their prescribing rationale is based on clinical experience and that they are least likely to attribute their peers prescribing habits to their rationale (**Table 5** and **Table 6**). Respondents wrote that they typically render treatment to relieve pain and have success in pain management using NSAIDs or tramadol. The free response rationale for prescribing opioids was due to the fact that it cannot be prescribed over the phone if needed. Most endodontists prescribe 6-10 tablets to serve as a rescue (**Figure 7**)

When prescribing narcotic analgesics, how many do you typically dispense?



**Figure 7. Number of tablets dispensed by endodontists**



**Figure 8. Prescribing habits of endodontists stratified by academic appointment**

**Figure 8** shows the proportion of positive responses to opioid prescription when the respondents were stratified by whether or not they had an academic appointment. Those that had an academic appointment were significantly less likely to prescribe opioids for every procedure ( $p < 0.05$ ).

The majority of opioid prescription decision making was based on clinical experience and current literature and guidelines. Current literature and guidelines were cited as the main reason for not prescribing opioids for all endodontic procedures. The majority of respondents would follow guidelines if implemented by the American Association of Endodontics (**Figure 9**).

If the American Association of Endodontics developed and endorsed evidence-based guidelines for prescribing narcotic analgesics for procedures, would you follow them?



**Figure 9. AAE Endorsed Guidelines**

The demographic parameters of respondents (**Table 7**) were used to complete logistic regression analysis to determine whether a practitioner was more or less likely to report prescribing opioids and these data were further analyzed by procedure. Statistically significant differences were noted in prescribing habits for an abscess, incision and drainage, and apicoectomy/root amputations. Endodontist's with an academic appointment were significantly less likely to prescribe opioids for an abscess with an odds ratio of 0.59. Endodontist's with 11-15 years of practice were significantly more likely to prescribe opioids for an incision and drainage, with an odds ratio of 2.4. Apicoectomy/root amputations saw the most statistically significant difference in demographics. Female endodontists and those with an academic appointment were significantly less likely to prescribe opioids. When compared to respondents with over 20 years' experience, those with 6-10, 11-15, and 16-20 years' experience were all more likely to prescribe opioids for apicoectomy/root amputations (**Table 8**).

**Table 7. Endodontist Demographics**

	N	%
<b>Gender</b>		
Male	336	76%
Female	100	23%
Prefer not to answer	6	1%
<b>Race</b>		
White	316	71%
Asian/Alaskan/Hawaii	41	9%
Hispanic/Latino	17	4%
Black	10	2%
More than one	6	1%
Other	20	5%
Prefer not to answer	34	8%
<b>Years of Practice</b>		
0-5	76	17%
6-10	67	15%
11-15	78	18%
16-20	59	13%
20+	164	37%
<b>Academic appointment</b>		
Yes	212	40%
No	315	60%
<b>Predominant work setting</b>		
Private practice	397	74%
University	127	24%
Community health center	13	2%

**Table 8. Logistical Regressions for prescribing opioids for endodontic procedures.** Variables with  $p < 0.05$  are highlighted in red

<b>Reversible pulpitis</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
Gender (Female)	1.8588	1.6247	0.71	0.478	0.335	10.309
<b>Non-surgical RCT</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
Gender (Female)	0.459	0.274	-1.30	0.193	0.142	1.481
Academic Appointment	0.286	0.210	-1.70	0.089	0.068	1.209
Race (white comparison)						
Asian, Hawaiian, Native	0.837	0.671	-0.22	0.824	0.174	4.024
Black	1.000	-	-	-	-	-
More than one	1.000	-	-	-	-	-
Other	1.000	-	-	-	-	-
Prefer not to answer	2.143	1.455	1.12	0.262	0.566	8.109
Years of practice (20+ years comparison)						
16-20 years	0.7836	0.549	-0.35	0.728	0.199	3.090
11-15 years	0.9949	0.619	-0.01	0.993	0.294	3.365
6-10 years	0.7697	0.527	-0.38	0.702	0.201	2.944
1-5 years	0.8080	0.573	-0.30	0.764	0.201	3.244
CA Trained	0.886	0.706	-0.15	0.879	0.186	4.220
Practice setting (Academic)						
Community Clinic	1.000					
Private Practice	0.820	0.992	-0.16	0.870	0.077	8.775
_cons	0.250	0.427	-0.81	0.417	0.009	7.106
<b>Irreversible pulpitis</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
Gender (Female)	0.667	0.307	-0.88	0.378	0.271	1.642
Academic Appointment	0.469	0.266	-1.34	0.181	0.155	1.423
Race (white comparison)						
Asian, Hawaiian, Native	0.802	0.640	-0.28	0.782	0.168	3.835
Black	1.000	-	-	-	-	-
More than one	1.000	-	-	-	-	-
Other	1.000	-	-	-	-	-
Prefer not to answer	2.960	1.693	1.90	0.058	0.965	9.080
Years of practice (20+ years comparison)						
16-20 years	0.8813	0.511	-0.22	0.827	0.283	2.744
11-15 years	0.9259	0.514	-0.14	0.890	0.312	2.750
6-10 years	0.1698	0.179	-1.69	0.092	0.022	1.336
1-5 years	0.5875	0.405	-0.77	0.441	0.152	2.271
CA Trained	0.507	0.316	-1.09	0.275	0.150	1.718
Practice setting (Academic)						
Community Clinic	3.802	6.156	0.82	0.410	0.159	90.853
Private Practice	1.650	1.882	0.44	0.661	0.177	15.426
_cons	0.119	0.184	-1.38	0.169	0.006	2.466

<b>Root Canal Retreatment</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
Gender (Female)	0.944	0.366	-0.15	0.882	0.441	2.019
Academic Appointment	0.507	0.255	-1.35	0.176	0.189	1.357
Race (white comparison)						
Asian, Hawaiian, Native	1.521	0.835	0.76	0.445	0.519	4.460
Black	1.584	1.786	0.41	0.683	0.174	14.446
More than one	1.000	-	-	-	-	-
Other	0.831	0.885	-0.17	0.862	0.103	6.699
Prefer not to answer	1.933	1.172	1.09	0.277	0.589	6.343
Years of practice (20+ years comparison)						
16-20 years	0.6767	0.461	-0.57	0.567	0.178	2.574
11-15 years	1.2477	0.637	0.43	0.665	0.459	3.394
6-10 years	1.5751	0.799	0.90	0.370	0.583	4.257
1-5 years	1.0334	0.575	0.06	0.953	0.347	3.075
CA Trained	0.918	0.610	-0.13	0.898	0.250	3.373
Practice setting (Academic)						
Community Clinic	1.000	-	-	-	-	-
Private Practice	2.195	2.436	0.71	0.479	0.249	19.322
_cons	0.053	0.078	-2.00	0.046	0.003	0.948
<b>Incision and Drainage</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
Gender (Female)	0.758	0.209	-1.01	0.313	0.442	1.299
Academic Appointment	0.755	0.229	-0.93	0.354	0.416	1.368
Race (white comparison)						
Asian, Hawaiian, Native	0.783	0.341	-0.56	0.574	0.334	1.838
Black	0.406	0.444	-0.82	0.410	0.047	3.467
More than one	0.606	0.678	-0.45	0.654	0.068	5.437
Other	1.000					
Prefer not to answer	1.344	0.607	0.65	0.513	0.555	3.255
Years of practice (20+ years comparison)						
16-20 years	1.5839	0.620	1.17	0.240	0.735	3.412
<b>11-15 years</b>	<b>2.4036</b>	<b>0.814</b>	<b>2.59</b>	<b>0.010</b>	<b>1.238</b>	<b>4.667</b>
6-10 years	1.8664	0.672	1.73	0.083	0.921	3.781
1-5 years	1.2921	0.507	0.65	0.514	0.599	2.788
CA Trained	1.693	0.876	1.02	0.309	0.614	4.668
Practice setting (Academic)						
Community Clinic	0.796	0.974	-0.19	0.852	0.073	8.743
Private Practice	1.211	0.634	0.37	0.715	0.434	3.378
_cons	0.232	0.206	-1.64	0.100	0.041	1.324

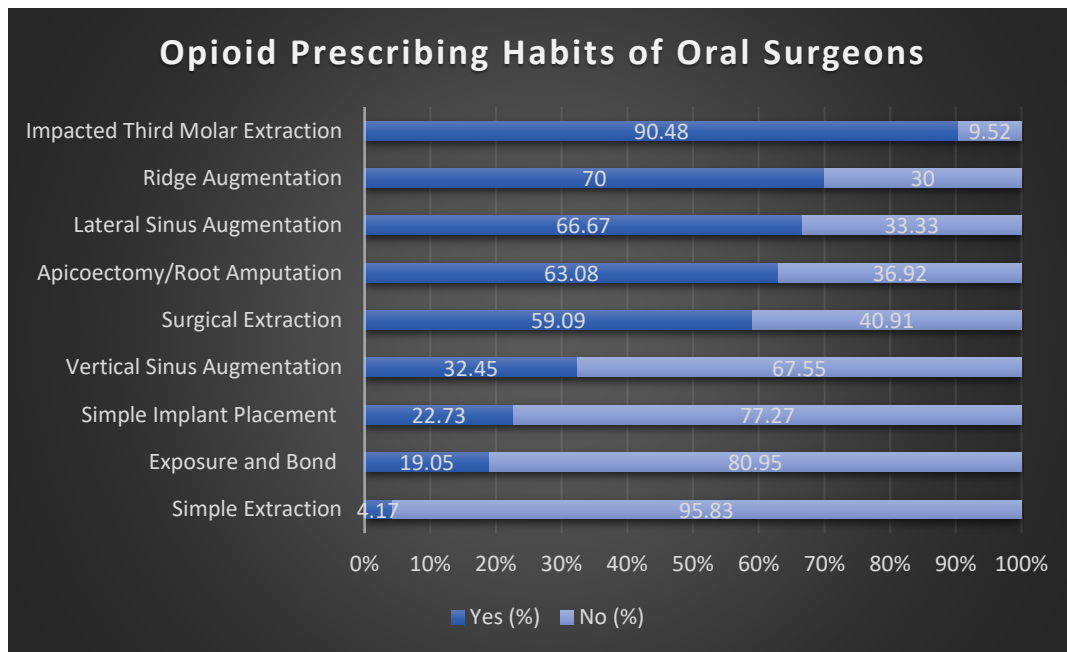


<b>Abscess</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
Gender (Female)	1.313	0.295	1.21	0.225	0.846	2.038
<b>Academic Appointment</b>	<b>0.598</b>	<b>0.155</b>	<b>-1.98</b>	<b>0.048</b>	<b>0.360</b>	<b>0.995</b>
Race (white comparison)						
Asian, Hawaiian, Native	1.046	0.377	0.12	0.901	0.516	2.120
Black	0.530	0.444	-0.76	0.449	0.103	2.738
More than one	0.335	0.377	-0.97	0.332	0.037	3.050
Other	0.533	0.319	-1.05	0.292	0.165	1.720
Prefer not to answer	1.262	0.495	0.59	0.552	0.585	2.721
Years of practice (20+ years comparison)						
16-20 years	1.2980	0.425	0.80	0.426	0.683	2.467
11-15 years	1.5899	0.469	1.57	0.116	0.891	2.836
6-10 years	1.5056	0.464	1.33	0.185	0.823	2.755
1-5 years	0.6774	0.226	-1.17	0.242	0.353	1.301
CA Trained	1.207	0.465	0.49	0.626	0.567	2.568
Practice setting (Academic)						
Community Clinic	0.480	0.455	-0.77	0.439	0.075	3.082
Private Practice	0.785	0.328	-0.58	0.562	0.346	1.780
_cons	0.335	0.240	-1.53	0.126	0.083	1.361
<b>Apicoectomy</b>	<b>Odds Ratio</b>	<b>Standard Error</b>	<b>Z</b>	<b>P &gt;  z </b>	<b>95% confidence interval</b>	
<b>Gender (Female)</b>	<b>0.553</b>	<b>0.142</b>	<b>-2.30</b>	<b>0.021</b>	<b>0.334</b>	<b>0.916</b>
<b>Academic Appointment</b>	<b>0.530</b>	<b>0.145</b>	<b>-2.32</b>	<b>0.020</b>	<b>0.310</b>	<b>0.906</b>
Race (white comparison)						
Asian, Hawaiian, Native	0.475	0.199	-1.77	0.076	0.209	1.081
Black	1.000					
More than one	0.955	0.935	-0.05	0.963	0.140	6.504
<b>Other</b>	<b>0.184</b>	<b>0.144</b>	<b>-2.17</b>	<b>0.030</b>	<b>0.040</b>	<b>0.849</b>
Prefer not to answer	1.221	0.503	0.49	0.627	0.545	2.738
Years of practice (20+ years comparison)						
<b>16-20 years</b>	<b>2.5903</b>	<b>0.896</b>	<b>2.75</b>	<b>0.006</b>	<b>1.315</b>	<b>5.102</b>
<b>11-15 years</b>	<b>4.5198</b>	<b>1.450</b>	<b>4.70</b>	<b>0.000</b>	<b>2.410</b>	<b>8.477</b>
<b>6-10 years</b>	<b>2.9040</b>	<b>0.938</b>	<b>3.30</b>	<b>0.001</b>	<b>1.542</b>	<b>5.469</b>
1-5 years	1.5441	0.533	1.26	0.208	0.785	3.038
CA Trained	1.428	0.589	0.86	0.388	0.636	3.203
Practice setting (Academic)						
Community Clinic	0.450	0.453	-0.79	0.427	0.062	3.235
Private Practice	0.558	0.243	-1.34	0.181	0.238	1.311
_cons	1.808	1.373	0.78	0.436	0.408	8.011

## Oral Surgeons

A total of 100 oral surgeons were contacted to participate in the study via email containing a link to the survey on March 3, 2020. Of the 100 that received the email, 30 completed the survey.

The survey found an increased likelihood of prescribing opioids as the complexity of the procedures increase.



**Figure 10. Percentage of oral surgeons who report prescribing opioids by procedure**

Opioid use was significantly higher for impacted third molar extractions, when compared to all other procedures, with over 90% prescribing opioids for third molar extractions ( $p < 0.0001$ , **Figure 10**). Ridge augmentations, lateral sinus augmentations, and apicoectomy/root amputations had significantly more opioid prescriptions than surgical extractions ( $p < 0.001$ ). Opioid prescriptions were higher for vertical sinus augmentations and simple implant placement when compared to exposure and bond procedures and simple tooth extractions ( $p < 0.0001$ ).

**Table 9. Rationale for not prescribing opioids for oral surgery procedures. Values are given in percentage**

Rationale	Simple Extraction	Exposure and Bond	Simple Implant	*Vertical Sinus Augmentation	Surgical Extraction	*Apicoectomy/Root Amputation	Lateral Sinus Augmentation	Ridge Augmentation	Impacted Third Molar Extraction
Patients do not ask for it	10.42	12.82	8.33	10.13	16.67	10.76	8.33	13.33	20
Peers do this	0	0	0	1.57	0	1.46	0	6.67	0
Based on clinical experience	31.25	<b>35.90</b>	<b>36.11</b>	<b>38.23</b>	29.17	<b>39.71</b>	50	<b>26.67</b>	40
Based on current literature & guidelines	<b>41.67</b>	23.08	13.89	24.68	<b>33.33</b>	26.69	16.67	13.33	40
Rarely see post-operative pain with the procedure	10.42	20.51	38.89	21.97	16.67	16.2	8.33	<b>26.67</b>	0
Write In	6.25	7.69	2.78	3.42	4.17	5.18	16.67	13.33	0

**Table 10. Rationale for prescribing opioids for oral surgery procedures. Values are given in percentage**

Rationale	Simple Extraction	Exposure and Bond	Simple Implant	*Vertical Sinus Augmentation	Surgical Extraction	*Apicoectomy/Root Amputation	Lateral Sinus Augmentation	Ridge Augmentation	Impacted Third Molar Extraction
Patients ask for it	0	0	0	5.63	7.41	6.87	10.34	8.82	8
Peers do this	0	0	28.57	1.88	0	2.29	3.45	2.94	4
Based on clinical experience	<b>100</b>	<b>50</b>	<b>57.14</b>	<b>45.54</b>	<b>40.74</b>	<b>41.22</b>	<b>41.38</b>	<b>41.18</b>	<b>34</b>
Based on current literature & guidelines	0	16.67	0	7.04	14.81	9.16	10.34	14.71	16
Typically see post- operative pain with the procedure	0	33.33	14.29	36.15	29.63	34.73	34.48	32.35	32
Write In	0	0	0	3.76	7.41	5.73	0	0	6

Of the survey respondents, the majority of oral surgeons' report that their prescribing rationale is based on clinical experience. The majority of oral surgeons cited current literature and guidelines given by AAOMS as their rationale for not prescribing, and that they have success with NSAIDs for pain management. The free response rationale for prescribing opioids was due to the fact that it cannot be called in if needed. As a result, most prescribe 6-10 tablets to serve as a rescue (Figure 11).

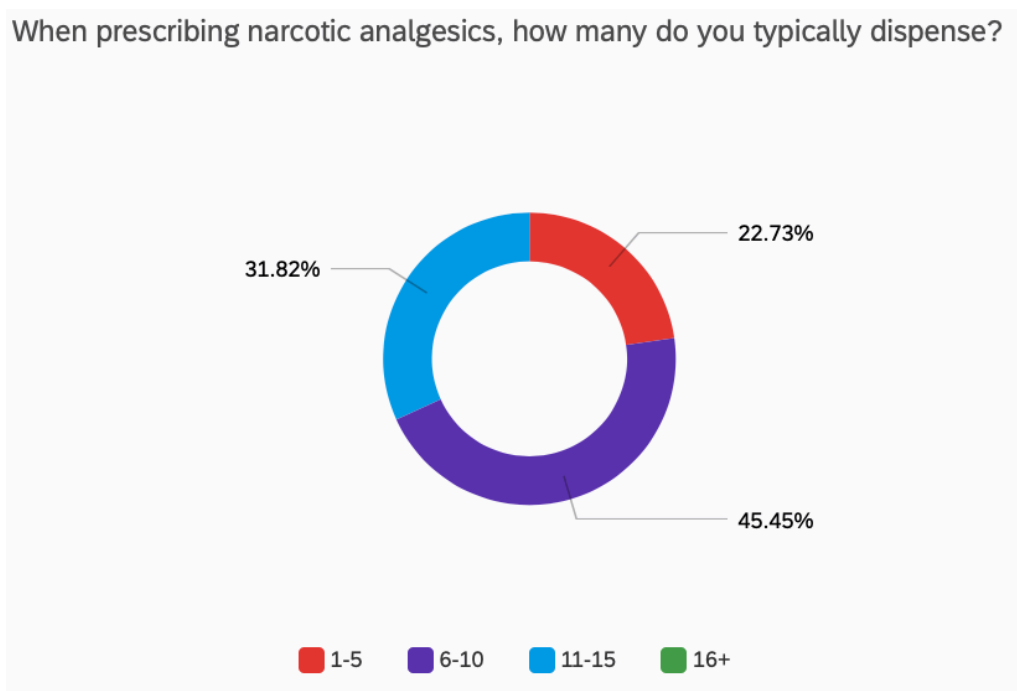


Figure 11. Number of tablets dispensed by oral surgeons

The demographic characteristics are shown in Table 11. Due to the smaller sample size of oral surgeons, logistical regression analysis was not performed.

**Table 11. Oral Surgeon Demographics**

	N	%
Gender		
Male	18	82%
Female	4	18%
Race		
White	17	76%
Asian/Alaskan/Hawaii	3	14%
Black	1	5%
Other	1	5%
Ethnicity		
Not Latino/Hispanic	22	100%
Years of Practice		
0-5	13	59%
6-10	3	14%
11-15	1	4%
16-20	0	0%
20+	5	23%
Academic appointment		
Yes	16	73%
No	6	27%
Medical Degree		
Yes	6	27%
No	16	73%
Predominant work setting		
Private practice	4	18%
University	0	0%
Community health center	18	82%

*Prescribing habits of Oral Surgeons compared to Periodontists and Endodontists*

**Table 12. Comparison of prescribing habits between specialists**

Procedure	% Yes, Oral Surgery	% Yes, Perio or Endo	p-value
Simple Extraction	4.17	11.85	0.13
Surgical Extraction	59.09	31.33	<0.001
Expose and Bond	19.05	3.24	<0.0001
Apicoectomy	63.08	37.12	<0.0001

**Table 12** shows the results comparing the prescribing habits of oral surgeons with periodontists and endodontists for common procedures. Oral surgeons were significantly more likely to prescribe opioids compared to periodontists and endodontists for all overlapping procedures except simple extractions.

## IV. Discussion

The results of this study confirm that there is a greater tendency of prescribing opioids when the morbidity of the procedure increases and that there is a difference in prescribing habits in dental specialties. Given that combining NSAIDs with acetaminophen is as effective or even superior to opioids for managing acute post-operative pain,<sup>31-37</sup> such as that asked in the survey instruments, it is surprising that practitioners continue to prescribe opioids at relatively high rates for certain procedures. Over 90% of oral surgeons prescribe opioids after impacted third molar extractions and over 50% for surgical extractions, sinus and ridge augmentations. Similarly, over 40% of periodontists prescribe opioids for ridge and lateral sinus augmentation and over 25% for most other surgical procedures. Implants and simple extractions had comparably lower prescribing habits. Endodontists tended to have much lower overall prescriptions for opioids, with only untreated acute abscesses and surgical root end treatment showing high prescriptions over 30%.

Endodontists also cited literature and current guidelines as reasons for not prescribing opioids with higher proportions compared to periodontists and oral surgeons, who tended to cite clinical experience. However, of the three specialists, oral surgeons were the only ones with clinical guidelines from their professional association. Despite this, oral surgeons prescribed significantly more opioids than periodontists and endodontists for the same procedure. Because of this, even though endodontists and periodontists said they would be willing to follow endorsed guidelines by their respective professional association, it may not necessarily be a significant factor for changing prescribing habits.

Interestingly, a highly cited reason for prescribing opioids by all the specialists was the fact that opioid prescriptions cannot be made over the phone, so a prescription was dispensed for



rescue purposes. Most opioids are designated as Schedule II drugs by the Controlled Substance Act, which requires a written prescription.<sup>38</sup> This would require that the practitioner be available to write the prescription, for the office to be open, and for the patient to travel back to the office to pick up the prescription, before going to the pharmacy to have it filled. These barriers, although implemented for safety and reducing prescriptions, are perceived as inconveniencing the practitioner and the patient and could actually be contributing to high incidence of prescription opioids after procedures.

This could be a reason why practitioners with an academic appointment were less likely to prescribe opioids for the same procedure. University clinics typically are open during normal business hours every weekday and have more staff and providers available during off-hours. In contrast, private practices may not be open every day and providing emergency prescriptions during off-hours may be much less convenient, so providing a prescription for rescue narcotics can seem like an appealing option.

New practitioners in their first five years of practice were less likely to prescribe opioids for many procedures. This could be due to the fact that it was designated a National Public Health Emergency,<sup>39,40</sup> and that significant efforts in legislation and public health awareness have made opioids a less appealing option. Another possibility is that as practitioners get more experience with patients requesting narcotics after procedures, especially in an emergency or off-hours setting, they become more likely to prescribe opioids. This finding that years of practice was a significant factor was also observed by Alghofaily et al. in 2019 in a similar study that focused on prescribing habits of endodontists.<sup>41</sup> They also observed that females were less likely to prescribe than their male colleagues, a trend that was often seen in logistical regression analyses in this study. Community health clinic periodontists had the highest odds ratios for

prescribing opioids, with significant odds ratios ranging from 5-17 (**Table 4**). The proportion of respondents who practiced in community health was significantly small, so the results may be skewed and should be interpreted with caution. However, this is similar to findings by Baker where Medicaid patients were associated with significantly higher opioid prescriptions.<sup>42</sup>

As efforts continue to be made to combat the opioid epidemic, it is important that reasons for opioid prescription habits continue to be studied and considered. Tightening restrictions on prescriptions may have potentially adverse effects and actually increase the incidence of prescriptions because practitioners have less ability to prescribe rescue narcotics. The insight into the practitioner's decision-making is valuable information, as it provides guidance for addressing gaps in knowledge and understanding the mindset of those who may be affected by the creation of guidelines. Guidelines endorsed by professional associations are wanted by their members but may not be followed if they are not clear or the emphasis on the evidence is not clear. This along with the ability to determine attitudes towards the adoption of guidelines makes a practical next step for the profession possible and brings scientific data closer to promoting effective change. Dentists must reexamine their prescribing habits and turn to evidence-based analgesic alternatives to lessen their impact on the opioid crisis.

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## Appendix

### Periodontal Survey

1. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for a **simple extraction**?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure
2. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for a **surgical extraction**?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure
3. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for an **exposure and bond**?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure
4. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for an **acute periodontal abscess**?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure
5. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for a **autogenous soft tissue augmentation**?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure
6. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for a **vertical sinus augmentation**?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure
7. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for **ridge preservation** procedures?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure



8. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for **traditional periodontal surgeries** (i.e. osseous, crown lengthening, open flap debridement, gingivectomies)?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure
  
9. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for **guided tissue regeneration**?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure
  
10. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for **ridge augmentation**?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure
  
11. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for **lateral window sinus augmentation**?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure
  
12. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for **simple implant placement**?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure

*For questions 1 through 12, if the respondent answered A, this question will be prompted:*

What is your rationale for *not* prescribing narcotic analgesics with this procedure? Select all that apply.

- a. My patients do not ask for it
- b. My peers do this
- c. Based on my clinical experience
- d. Based on the current literature and guidelines
- e. Because I rarely see post-operative pain with this procedure
- f. Answer not written here- custom answer

*For questions 1 through 12, if the respondent answered B, these questions will be prompted:*

What is your rationale for prescribing narcotic analgesics with this procedure? Select all that apply.

- a. My patients ask for it

- b. My peers do this
- c. Based on my clinical experience
- d. Based on the current literature and guidelines
- e. Because I typically see post-operative pain with this procedure
- f. Answer not written here- custom answer

When prescribing narcotic analgesics, how many do you typically dispense?

- a. 1-5
  - b. 6-10
  - c. 11-15
  - d. 16+
13. If the American Academy of Periodontology developed and endorsed evidence-based guidelines for prescribing narcotic analgesics for procedures, would you follow them?
- A. Yes
  - B. No
  - C. Not sure
14. How long have you been practicing periodontics?
- A. 0-5 years
  - B. 6-10 years
  - C. 11-15 years
  - D. 16-20 years
  - E. Greater than 20 years
15. Where do you practice?  
[Drop down of all 50 states and territories]
16. Which answer best describes the practice setting in which you work the majority of the week?
- A. Academic Clinic
  - B. Community Health Center
  - C. Private Practice
17. Do you have an active full or part time academic appointment?
- A. Yes
  - B. No
18. What is your gender?
- A. Male
  - B. Female
  - C. Other
  - D. Prefer not to answer
19. What is your Race?
- A. American Indian/Alaska Native Asian

- B. Native Hawaiian or Other Pacific Island
- C. Black or African American
- D. White
- E. More than one race
- F. Other
- G. Prefer not to answer

20. What is your Ethnicity:

- A. Hispanic or Latino
- B. Not Hispanic or Latino

#### Endodontic Survey

1. In a patient with no significant medical or social history, would you prescribe narcotic analgesic for **reversible pulpitis**, if no treatment would be rendered that day?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure
2. In a patient with no significant medical or social history, would you prescribe narcotic analgesic for **irreversible pulpitis**, if no treatment would be rendered that day?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure
3. In a patient with no significant medical or social history, would you prescribe narcotic analgesic for an **acute apical abscess** that is not draining, if no treatment would be rendered that day?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure
4. In a patient with no significant medical or social history, would you prescribe narcotic analgesic for **incision and drainage**?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure
5. In a patient with no significant medical or social history, would you prescribe narcotic analgesic for **non-surgical endodontic treatment**?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure

6. In a patient with no significant medical or social history, would you prescribe narcotic analgesic for **root canal retreatment**?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure
  
7. In a patient with no significant medical or social history, would you prescribe narcotic analgesic for **apicoectomy**?
  - A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure

*For questions 1 through 7, if the respondent answered A, this question will be prompted:*

What is your rationale for *not* prescribing narcotic analgesics with this procedure? Select all that apply.

- a. My patients do not ask for it
- b. My peers do this
- c. Based on my clinical experience
- d. Based on the current literature and guidelines
- e. Because I rarely see post-operative pain
- f. Answer not written here- custom answer

*For questions 1 through 7, if the respondent answered B, these questions will be prompted:*

What is your rationale for prescribing narcotic analgesics with this procedure? Select all that apply.

- a. My patients ask for it
- b. My peers do this
- c. Based on my clinical experience
- d. Based on the current literature and guidelines
- e. Because I typically see post-operative pain with this procedure
- f. Answer not written here- custom answer

When prescribing narcotic analgesics, how many do you typically dispense?

- A. 1-5
- B. 6-10
- C. 11-15
- D. 16+

8. If the American Association of Endodontics developed and endorsed evidence-based guidelines for prescribing narcotic analgesics for procedures, would you follow them?
  - A. Yes
  - B. No
  - C. Not sure
  
9. How long have you been practicing endodontics?

- A. 0-5 years
  - B. 6-10 years
  - C. 11-15 years
  - D. 16-20 years
  - E. Greater than 20 years
10. Where do you practice?  
[Drop down of all 50 states and territories]
11. Which answer best describes the practice setting in which you work the majority of the week?
- A. Academic Clinic
  - B. Community Health Center
  - C. Private Practice
12. Do you have an active full or part time academic appointment?
- A. Yes
  - B. No
13. What is your gender?
- A. Male
  - B. Female
  - C. Other
  - D. Prefer not to answer
14. What is your Race?
- A. American Indian/Alaska Native Asian
  - B. Native Hawaiian or Other Pacific Island
  - C. Black or African American
  - D. White
  - E. More than one race
  - F. Other
  - G. Prefer not to answer
15. What is your Ethnicity:
- A. Hispanic or Latino
  - B. Not Hispanic or Latino

### Oral Surgery

1. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for **simple tooth extraction**?
- A. In most cases no
  - B. In most cases yes

- C. I do not perform this procedure
2. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for **surgical tooth extraction** (excluding impacted third molars)?
    - A. In most cases no
    - B. In most cases yes
    - C. I do not perform this procedure
  3. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for **surgical extraction of impacted third molars**?
    - A. In most cases no
    - B. In most cases yes
    - C. I do not perform this procedure
  4. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for **surgical exposure and placement of eruption aid device on an impacted tooth**?
    - A. In most cases no
    - B. In most cases yes
    - C. I do not perform this procedure
  5. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for **ridge augmentation** procedures?
    - A. In most cases no
    - B. In most cases yes
    - C. I do not perform this procedure
  6. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for **vertical sinus augmentation** procedures?
    - A. In most cases no
    - B. In most cases yes
    - C. I do not perform this procedure
  7. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for **lateral window sinus augmentation** procedures?
    - A. In most cases no
    - B. In most cases yes
    - C. I do not perform this procedure
  8. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for **simple implant placement**?
    - A. In most cases no
    - B. In most cases yes
    - C. I do not perform this procedure

9. In a patient with no significant medical or social history, would you prescribe narcotic analgesics for **apicoectomy/root amputation** procedures?
- A. In most cases no
  - B. In most cases yes
  - C. I do not perform this procedure

*For questions 1 through 9, if the respondent answered A, this question will be prompted:*  
What is your rationale for *not* prescribing narcotic analgesics with this procedure? Select all that apply.

- a. My patients do not ask for it
- b. My peers do this
- c. Based on my clinical experience
- d. Based on the current literature and guidelines
- e. Because I rarely see post-operative pain with this procedure
- f. Answer not written here- custom answer

*For questions 1 through 9, if the respondent answered B, these questions will be prompted:*

What is your rationale for prescribing narcotic analgesics with this procedure? Select all that apply.

- a. My patients ask for it
- b. My peers do this
- c. Based on my clinical experience
- d. Based on the current literature and guidelines
- e. Because I typically see post-operative pain with this procedure
- f. Answer not written here- custom answer

When prescribing narcotic analgesics, how many do you typically dispense?

- A. 1-5
- B. 6-10
- C. 11-15
- D. 16+

10. How long have you been practicing oral surgery?

- A. 0-5 years
- B. 6-10 years
- C. 11-15 years
- D. 16-20 years
- E. Greater than 20 years

11. Do you have a medical degree?

- A. Yes
- B. No

12. Where do you practice?  
[Drop down of all 50 states and territories]
13. Which answer best describes the practice setting in which you work the majority of the week?
- A. Academic Clinic
  - B. Community Health Center
  - C. Private Practice
14. Do you have an active full or part time academic appointment?
- A. Yes
  - B. No
15. What is your gender?
- A. Male
  - B. Female
  - C. Other
  - D. Prefer not to answer
16. What is your Race?
- A. American Indian/Alaska Native Asian
  - B. Native Hawaiian or Other Pacific Island
  - C. Black or African American
  - D. White
  - E. More than one race
  - F. Other
  - G. Prefer not to answer
17. What is your Ethnicity:
- A. Hispanic or Latino
  - B. Not Hispanic or Latino



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