Published in final edited form as:

J Am Dent Assoc. 2017 October ; 148(10): 728–736. doi:10.1016/j.adaj.2017.05.003.

Management of Dentin Hypersensitivity by Practitioners in the National Dental Practice-Based Research Network

Dorota T. Kopycka-Kedzierawski, DDS, MPH,

Associate Professor, Eastman Institute for Oral Health, University of Rochester, 625 Elmwood Ave, Rochester, NY 14620, Ph: 585-275-0706, fax: 585-273-1237,
Dorota_KopyckaKedzierawski@urmc.rochester.edu

Cyril Meyerowitz, DDS, MS,

Professor, Eastman Institute for Oral Health, University of Rochester, 625 Elmwood Ave, Rochester, NY 14620

Mark S. Litaker, PhD,

Correspondence to: Dorota T. Kopycka-Kedzierawski.

National Dental PBRN Collaborative Group

The National Dental PBRN Collaborative Group comprises practitioner, faculty, and staff investigators who contributed to this network activity. A list of these persons is at <http://www.nationaldentalpbrn.org/collaborative-group.php>; University of Alabama at Birmingham, Birmingham, AL

Contribution for each author:

Dr. Kopycka-Kedzierawski contributed to: 1) the conception and design of the study, acquisition of data, interpretation of data, (2) drafting the article or revising it critically for important intellectual content, (3) final approval of the version to be submitted.

Dr. Meyerowitz contributed to: 1) the conception and design of the study, acquisition of data, (2) drafting the article or revising it critically for important intellectual content, (3) final approval of the version to be submitted

Dr. Litaker contributed to: 1) the conception and design of the study, analysis and interpretation of data, (2) drafting the article or revising it critically for important intellectual content, (3) final approval of the version to be submitted

Dr. Heft contributed to: 1) the conception and design of the study, (2) drafting the article or revising it critically for important intellectual content, (3) final approval of the version to be submitted

Dr. Tasgaonkar contributed to: 1) acquisition of data, (2) drafting the article or revising it critically for important intellectual content, (3) final approval of the version to be submitted.

Dr. Day contributed to: 1) acquisition of data, (2) drafting the article or revising it critically for important intellectual content, (3) final approval of the version to be submitted.

Dr. Porter-Williams contributed to: 1) acquisition of data, (2) drafting the article or revising it critically for important intellectual content, (3) final approval of the version to be submitted.

Dr. Gordan contributed to: 1) interpretation of data, (2) drafting the article or revising it critically for important intellectual content, (3) final approval of the version to be submitted

Dr. Yardic contributed to: 1) acquisition of data, (2) drafting the article or revising it critically for important intellectual content, (3) final approval of the version to be submitted.

Dr. Lawhorn contributed to: 1) acquisition of data, (2) drafting the article or revising it critically for important intellectual content, (3) final approval of the version to be submitted.

Dr. Gilbert contributed to: 1) the conception and design of the study, interpretation of data, (2) drafting the article or revising it critically for important intellectual content, (3) final approval of the version to be submitted

All authors should have made substantial contributions to all of the following: (1) the conception and design of the study, or acquisition of data, or analysis and interpretation of data, (2) drafting the article or revising it critically for important intellectual content, (3) final approval of the version to be submitted. Further information on the ICGME Guidelines for Authorship can be found here: <http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html>

All authors should be listed with their affiliations, their academic degrees and their scientific or clinical contributions to the paper.

Again, the editor and publisher reserve the right to ask for justification for each author's inclusion. Practical implications.

Disclosure. None of the authors reported any disclosures.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Associate Professor /Director of Biostatistics, Department of Clinical and Community Sciences, UAB School of Dentistry, Room 112, SDB Box 39, 1720 2nd Avenue South, Birmingham, AL 35294-0007

Marc W. Heft, DMD, PhD,

Professor and Director, Department of Oral & Maxillofacial Surgery, College of Dentistry, University of Florida, Gainesville, FL 32610-0416

Nirmala Tasgaonkar, DDS,

Assistant Professor, Division of Community Dentistry and Oral Disease Prevention, Eastman Institute for Oral Health, University of Rochester, 625 Elmwood Ave, Rochester, NY 14620

Marianne R. Day, DDS,

Assistant Professor, College of Dentistry, University of Nebraska Medical Center, 4000 E Campus Loop S, Lincoln, NE 68583-0740

Andretta Porter-Williams, DDS,

David Raines Community Health Center, 3021 W. 70th Street, Shreveport, LA 71106

Valeria V Gordan, DDS, MS, MS-CI,

Professor and Director for Dental Practice-Based Research, University of Florida, College of Dentistry

Robin L. Yardic, DDS,

HealthPartners Apple Valley Dental Clinic, 15290 Pennock Lane, Apple Valley, MN 55124

Timothy M. Lawhorn, DDS,

Private Practice, Missoula, MO

Gregg H. Gilbert, DDS, MBA, and

Professor and Chair, Department of Clinical & Community Sciences, Room SDB 109, School of Dentistry, University of Alabama at Birmingham, 1720 Second Avenue South, Birmingham, AL 35294-0007

National Dental PBRN Collaborative Group

Abstract

Objectives—Dentin hypersensitivity (DH) is a condition commonly encountered in clinical dental practice. The primary objective of this study was to identify the treatments recommended to manage DH among United States dentists.

Methods—A multicenter study of 1862 patients with DH, diagnosed and treated by 171 National Dental Practice-Based Research Network dentists was conducted.

Results—The most common treatment recommended was over-the-counter desensitizing (OTC) potassium nitrate toothpaste (alone or in combination with other treatments) to 924 (50%) patients; followed by application of fluoride varnish (FV) to 516 (28%) patients; and then by prescription of fluoride toothpaste to 314 (17%) patients. Restorative treatments were recommended to 151 (8%) of patients. The most common single treatment recommendation was desensitizing OTC potassium nitrate toothpaste, recommended to 335 (18%) patients. The most frequent combination of two treatment modalities was FV and desensitizing OTC potassium nitrate toothpaste,

recommended to 100 (5%) patients. A total of 48% (890/1862) of patients with DH were recommended one treatment modality and 35% (644/1862) were recommended a combination of two treatment modalities, most frequently (100/1862, 5%) an application of FV along with desensitizing OTC potassium nitrate toothpaste.

Conclusions—Desensitizing OTC potassium nitrate toothpaste and fluoride products were the most widely recommended products to manage DH in the practice setting.

Practical implications—Our results suggest that the majority of network clinicians preferred noninvasive treatment modalities when treating DH.

Keywords

Dentin Hypersensitivity; National Dental Practice-Based Research Network; treatment modalities

Introduction

Dentin hypersensitivity (DH) is a common complaint encountered in dental practice. It may disturb patients during eating, drinking and tooth brushing and has an impact on patients' oral health-related quality of life.^{1, 2} DH has been defined as a "short, sharp pain arising from exposed dentin in response to stimuli typically thermal, evaporative, tactile, osmotic or chemical and that cannot be ascribed to any other form of dental defect or pathology".³ Reported prevalence of DH has been in a wide range of 8% to 57%.^{3–12} A recent study by Cuhna-Cruz reported DH prevalence of 12%.¹² This wide variability in prevalence likely results from the different methods used to diagnose this condition and reliance exclusively on questionnaire data.¹³ Although dentin hypersensitivity is prevalent in adult populations, no universally used or highly reliable desensitizing agents or treatment modalities have been identified.^{14, 15} A plethora of treatment modalities has been used to manage DH. In an effort to minimize pain or discomfort, current treatment modalities target the pulpal tissue directly or by closing the dentin tubules with a sealing agent. Various treatment modalities used in routine clinical practice are applied by clinicians directly or prescribed for at-home use, with varying degrees of effectiveness.¹³ According to a survey of dentists conducted by the Canadian Advisory Board on Dentin Hypersensitivity, approximately 50% report lack of confidence in managing patients' pain due to DH.³ A prior study describing treatment modalities of DH in the US practice setting reported questionnaire data only.¹⁶ The purpose of this study was to assess treatment modalities and recommendations used by US dentists when treating patients with DH.

Methods

This was a multicenter study. Practitioners and patients were recruited from all six National Dental Practice-Based Research Network (National Dental PBRN) regions. The structure, purpose and function of the network is described elsewhere.¹⁷ In addition to the dentists participating in the study, the study population consisted of dental patients (19 years old or older) who complained of having sensitive teeth and subsequently were diagnosed with DH.

Study procedures, inclusion/exclusion criteria

Practitioners and patients

Any network practitioner (i.e., general dentist or specialist) who was enrolled in the network at the full participation level was eligible to enroll in the study. Practitioners who participated in the study completed all necessary human subjects and conflict of interest training as required by the network. The study was reviewed and approved by the institutional review board of the home institution of the lead investigator (D.K.K), as well as those for each of the six regions within The National Dental PBRN. Each patient provided informed consent to participate in the study.

After enrolling in the study and providing informed consent, practitioners completed an online questionnaire before enrolling patients to the study. The purpose of the pre-study questionnaire was to identify in a broader national context the preferred methods to diagnose and manage DH in the practice setting and to assess practitioners' beliefs about DH predisposing factors. The results of the pre-study questionnaire are described elsewhere.¹⁸

The inclusion criteria for the patients were: completed the informed consent requirements and was willing to be available for the duration of the study; aged ≥ 19 years; reported having a sensitive tooth or teeth diagnosed with DH (3rd molars were excluded); had access to a telephone, and agreed to receive text messages, emails, or telephone calls related to the study (the patient's preferred method of contact was ascertained); willing to be contacted on a regular basis by each of these entities: the practice, a network study Regional Coordinator, and the network's Coordinating Center; willing to provide contact information of one person living at a different address who knew the patient's whereabouts in the event the patient could not be reached. The exclusion criteria for patients were: having a medical condition that could interfere with reliable pain reporting (e.g., cognitive impairment); having a chronic pain condition (fibromyalgia, lower back pain, irritable bowel syndrome, TMJ disorder); having odontogenic pain (pain due to pulpitis, dental infection); reported having taken analgesics (e.g., nonsteroidal anti-inflammatory drugs or narcotics) more than three times in the past week.

At the baseline visit, the practitioners completed the patient's oral examination, confirmed the diagnosis of DH (made when the practitioner had excluded other etiologies of odontogenic pain), completed a dental history form, and recommended and/or prescribed or applied treatment for DH. Study patients completed a demographic form and a patient-reported pain form.

Sample size and statistical analyses

Sample size considerations were based on precision of estimation of percentages, represented by the widths of 95% confidence intervals adjusted for the effect of clustered sampling due to enrollment of multiple patients per dental practice. Adjustment for clustering used variance inflation factors calculated for a range of likely values of intraclass correlation (ICC). Power to detect a difference between proportions of dentists using each of the treatment modalities was estimated based on cluster-adjusted chi-square

tests to approximate the power of the proposed GEE analysis. Based on this analysis, the target sample size of the study was set at approximately 180 practitioners and 1900 patients.

Statistical Analysis

Counts of treatment recommendations were tabulated for single recommendations and for common combinations. Descriptive statistics were calculated as frequencies and percentages for categorical variables. Means and standard deviations or medians and interquartile ranges were calculated for continuous variables and counts. Comparisons among categorical variables were based on the chi-square statistic. Count variables compared between subgroups using Wilcoxon rank sums test. Mixed-model logistic regression analyses were conducted to evaluate potential predictors of treatment recommendations that were indicated during the baseline patient examination. Four outcome variables were modeled. The first was indication of one or more of five treatment recommendations that included fluoride application: fluoride, fluoride gel, fluoride varnish, fluoride paste or fluoride rinse. The second outcome variable was recommendation of desensitizing OTC potassium nitrate toothpaste. The third outcome was the combination of the first two sets of recommendations and the fourth outcome variable was practitioner indication that no treatment was recommended. A term representing practitioner was included as a random cluster effect in all models in order to account for correlations among patients evaluated by the same practitioner. An exchangeable correlation structure was used. All analyses were performed by SAS statistical package, version 9.4.

Results

One hundred seventy one practitioners enrolled 1868 patients in this study; the median number of patients per practitioner was 12 with the interquartile range (IQR) of 10 patients. Six enrolled patients were not eligible for the study because they did not meet all inclusion criteria, so they were withdrawn from the study. The total number of patients that formed the study population was 1862.

Patient and teeth characteristics

Table 1 summarizes the sociodemographic characteristics of the study patients, by patient gender. Stratification was done by gender in this table because subsequent analyses demonstrated that females had a significantly higher number of sensitive teeth as compared to males. Seventy four percent of patients (n=1377) were females and 26% (n=485) were males. The mean age of patients was 45.7 (SD 13.6) years for males and 44.4 (SD 13.6) years for females, (p=.06). Male patients were better educated than female patients (p<0.0001); 54% of males attained bachelor's or graduate degree; in contrast, 44% of females indicated bachelor's or graduate degree. Overall, patients in the study were well educated; 85% had either some college, bachelor's or graduate degree. Eighty two percent of the study patients were Caucasian and 88% were non-Hispanic/Latino. A higher percentage of male patients than females patients had dental insurance, either public or private; the differences between female and male patients related to the dental insurance status were statistically significant (p=.01). Overall, sixty nine percent of patients had private dental insurance, 20% had none, 8% had public dental insurance and almost 4% indicated that they

had both private and public dental insurance. Overall, almost sixty percent of the study patients indicated that preventive dental visits and problem focused dental examinations were usually covered 100% by their dental insurance, 20% of patients indicated that they have *copay* for these visits and 20% of patients indicated paying out-of-pocket for both visit types. Female patients had more sensitive teeth than males: 4.3 (5.0) versus 3.7 (4.4) ($p=.003$).

Table 2 presents the characteristics of the teeth that were sensitive. Among all study patients, 7785 teeth were sensitive. Patients had a mean (S.D.) of 4.2 (4.8) sensitive teeth with a range of 1–28. On average, 49% of the sensitive teeth had restorations present. Among the sensitive teeth that were restored, 26% had resin restoration(s) present, 18% were restored with amalgam(s), followed by PFM crowns (7%), porcelain crowns (2%) and cast metal crowns (1%). More than half (54%) of the sensitive teeth had visible dentin present; 70% of the sensitive teeth had gingival recession present.

Treatment modalities

Network practitioners recommended a range of different treatment modalities when treating DH in the practice setting; some practitioners recommended one treatment modality, others recommended a combination of treatments. The most common treatment recommended by network clinicians was over-the-counter (OTC) desensitizing potassium nitrate toothpaste, alone or in combination with other treatments. This regimen was recommended to 924 (50%) patients, followed by application of fluoride varnish (FV) recommended to 516 (28%) patients, treatment categorized as “other”, including desensitizing OTC strips recommended to 393 (21%) patients and prescription of fluoride toothpaste recommended to 314 (17%) patients. Restorative treatments were recommended to 151 (8%) patients. Network clinicians recommended that 300 (16%) patients stop, decrease or increase the product/habit/behavior related to DH. Figure 1 depicts the most common treatment modalities recommended by the study dentists.

The summarized results on given advice to stop, decrease or increase the product/habit/behavior related to DH are presented in Table 3. Most often, practitioners advised their patients to stop and/or decrease aggressive brushing, stop whitening products and to start using desensitizing OTC toothpaste or desensitizing strips along with using a soft toothbrush and improving oral hygiene. A total of 48% (890/1862) of patients with DH received a recommendation of one treatment modality, including no treatment, advice and product/habit, behavior change related to DH. A total of 35% (644/1862) of patients were recommended a combination of two treatment modalities, most frequently (100/1862, 5%) an application of fluoride varnish along with desensitizing OTC potassium nitrate toothpaste. A total of 250 (13%) patients were recommended three treatment modalities, while 65 (3%) were recommended four treatment modalities. The most common single treatment modality recommended to the patients who were recommended only one treatment modality was desensitizing OTC potassium nitrate toothpaste. It was recommended to 18% of all patients (334/1862) and to 38% (334/890) of the patients who received a single treatment recommendation/modality. Figure 2 summarizes the frequencies of the most frequent single treatment modalities recommended.

Figure 3 provides the frequencies of two treatment modalities most often recommended. The most frequent combination of two treatment modalities recommended was a combination of desensitizing OTC potassium nitrate toothpaste with application of fluoride varnish, recommended to 100 (5%) study patients. It was followed with a recommendation of a combination of desensitizing OTC potassium nitrate toothpaste with treatment characterized as “other”, including desensitizing OTC strips, fluoride products, wearing a night guard and making minor occlusal adjustments.

Patient and Practitioner Characteristics Predictive of treatment Recommendations

Table 4 provides results of the logistic regression analyses that were conducted to evaluate potential factors that are significantly associated with four treatment recommendations that were indicated during the baseline patient examination. The first was indication of one or more of five treatment recommendations that included any fluoride application: fluoride, fluoride gel, fluoride varnish, fluoride paste or fluoride rinse. Number of sensitive teeth present, number of sensitive restored, number of sensitive teeth with visible dentin, number of sensitive teeth with gingival recession, number of sensitive teeth restored with resin, any past treatment recommended for sensitive teeth and any current OTC treatment for DH were significantly associated with the decision to recommend fluoride regimens to study patients.

The second outcome variable was a recommendation of desensitizing OTC potassium nitrate toothpaste. Number of sensitive teeth present, number of sensitive teeth with gingival recession and any current OTC treatment for DH were significantly associated with the decision to recommend desensitizing OTC potassium nitrate toothpaste to the study patients.

The third outcome was the combination of the first two sets of recommendations. Number of sensitive teeth, number of sensitive teeth restored, number of sensitive teeth with gingival recession, number of sensitive teeth restored with resin and current OTC treatment for DH were significantly associated with the decision to recommend any fluoride formulations and desensitizing OTC potassium nitrate toothpaste. The fourth outcome variable was practitioner indication that no treatment was recommended. Current OTC treatment for DH and network region were significantly associated with not recommending any treatment to the study patients.

Discussion

Dentin hypersensitivity is a noteworthy clinical condition encountered in dental practice as it is relatively prevalent in the general population. There are many products available for treatment of DH with no conclusive evidence for their treatment effectiveness, especially in the environment of “real world” routine clinical practice. By conducting an in-office clinical study, we obtained results derived from real-world clinical scenarios of how patients with DH are cared for in dental offices across the US during routine clinical practice. Our findings show that network clinicians use different treatment modalities when treating DH in the practice setting, most frequently recommending a combination of desensitizing OTC potassium nitrate toothpaste alone or in a combination of application of fluoride varnish. Results from a recent systematic review and meta-analysis suggest that there is sufficient evidence to support the use of potassium-, stannous fluoride-, potassium and stannous

fluoride-, calcium sodium phosphosilicate- and arginine- containing desensitizing toothpastes for DH, but not the use of strontium-containing desensitizing toothpaste.¹⁹ In a randomized clinical trial, a single application of FV, Allsolutions 5% sodium fluoride vs. Duraphat reduced cervical DH for 24 weeks.²⁰ In the pre-study questionnaire, we asked clinicians who intended to participate in the clinical study what their most frequent choices were when treating DH. Based on the questionnaire responses, the most frequent first choice was desensitizing OTC potassium nitrate toothpaste (48%), followed by fluorides (38%), and glutaraldehyde/HEMA (3%).¹⁸ Based on a survey of dentists in a network from the northwestern US states, fluoride products were the most common treatment modalities used.¹⁶ Other commonly recommended treatments for DH were applications of bonding agents (81%), restorative treatments (63%), applications of glutaraldehyde/HEMA (58%) and potassium nitrates (47%). Recently a network of dentists predominantly from the northeastern US states conducted a randomized clinical trial to assess the outcomes of hypersensitive noncarious cervical lesion treatment choices,²¹ the overall objective of which was to determine the efficacy of chemoactive dentifrice use, dentin bonding agent with sealing, and flowable resin-based composite restoration. Results suggested that placement of the sealant or resin restoration was effective in reducing hypersensitive noncarious cervical lesions over the six-month study period. According to Parolia et al, DH affects patients of any age, with its peak occurrence in middle-aged adults, being most prevalent among 30–40 year old female patients.^{8, 11} Seventy-four percent of our study patients were female, suggesting that DH affects more female patients than male patients and/or women voiced their concerns about this condition to their dentists more often than males. Study patients had on average 4 hypersensitive teeth and the majority of study patients, regardless of their gender, were middle-aged adults. The mean age of patients in our study was 45.7 years for males and 44.4 years for females. In a study by Cunha-Cruz et al., the prevalence of DH was higher among women, patients with gingival recession, and patients who used at-home tooth whitening products.¹² Furthermore, patients with hypersensitivity had, on average, 3.5 hypersensitive teeth. The prevalence of DH was higher among patients who were 18–44 years of age.¹² Gilliam and colleagues reported DH as most prevalent among 30–40 year old female patients.¹¹

Of note in our study, about 49% of the sensitive teeth had restorations present. More than half (54%) of the sensitive teeth had visible dentin present and 70% had gingival recession present, suggesting that the majority of patients with sensitive teeth had either exposed dentin or gingival recession or both. This finding is consistent with the most accepted theory related to DH, the hydrodynamic theory, which proposes that stimuli (thermal, physical or osmotic changes) cause displacement of the fluid that exists within the dentinal tubules and this mechanical disturbance activates the nerve endings in the pulp.²² When reporting predisposing factors of DH in the pre-study questionnaire, 66% of practitioners reported that recessed gingiva was their first choice of predisposing factors for DH, followed by abrasion, erosion, abfraction and/or attrition lesions (59%) and bruxism (32%). Several patient and teeth characteristics were significantly associated with the likelihood of four different treatment regimens recommended to the study patients. Interestingly, number of sensitive teeth, number of sensitive teeth with gingival recession and current OTC treatment for DH, were each significantly associated with these treatment modality recommendations: any

fluoride regimens; any fluoride formulations along with desensitizing OTC potassium nitrate toothpaste; or desensitizing OTC potassium nitrate toothpaste alone. Recent in-office or OTC whitening procedures and history of gum/periodontal surgery were not associated with any of the above treatment regimens. DH may present clinically on any tooth surface, but most often it occurs on the buccal cervical margins of teeth. As suggested by the Canadian Advisory Board on Dentin Hypersensitivity, providers should initiate management of this condition by applying desensitizing treatment that is noninvasive; i.e., desensitizing toothpaste and/or topical agents.³ When managing noncarious cervical hypersensitive lesions, including erosion and abfraction lesions, as a rule, the least invasive therapy should be used, including preventive management such as dietary counseling and protective products or materials.²³ A plethora of treatment modalities used for treating DH by dental clinicians suggests that there is no single treatment that may meet the ideal criteria and there is no gold standard for treating DH. The ideal desensitizing modality should not irritate the pulp, and should be relatively painless when applied or shortly thereafter, easily applied, fast acting, permanent, and cost effective, and it should not discolor the tooth.²⁴ Our results suggest that the majority of network clinicians preferred noninvasive treatment modalities. Some practitioners used a stepped approach to treatment with multiple applications/prescriptions of treatments at one time. Invasive treatments of DH are also performed by placing a restoration on an otherwise healthy tooth.³ Restorative treatments accounted for 8% of treatment recommendations. The major strength of this study was the direct reporting of clinical procedures/recommendations or prescriptions implemented by 171 network clinicians on 1862 US patients in the routine practice setting. A majority of dentists who participated in the study were general practitioners (169/171), treating patients in a private practice setting. This is the first study conducted in the US presenting clinical data on routine treatments of DH in the practice setting that relied on clinical data rather than on questionnaire responses.

This study does have some limitations and interpretation of its results should take these into account. Although network practitioners have much in common with dentists at large, it is possible that their treatment of DH is not representative of dentists at large.^{25, 26} Additionally, network members are not recruited randomly; their participation in the network (*e.g.*, an interest in participating in clinical research studies) may make them unrepresentative of dentists at large. While we cannot assert that network dentists are entirely representative of US dentists, we can state that they have much in common with dentists at large, while also offering substantial diversity in these characteristics. This assertion is warranted because: 1) substantial percentages of network dentists are represented in the various response categories of the characteristics in the Enrollment Questionnaire; 2) findings from several network studies document that network dentists report patterns of diagnosis and treatment that are similar to patterns determined from non-network dentists^{27–29} and 3) the similarity of network dentists to non-network dentists using the best available national source, the ADA Survey of Dental Practice.³⁰

Conclusions

Desensitizing OTC potassium nitrate toothpaste and fluoride products were the most widely recommended products to manage DH in the practice setting. The majority of sensitive teeth

of 1862 patients enrolled in the study had restorations, gingival recession and/or visible dentin present.

Acknowledgments

This work was supported by NIH grant U19-DE-22516. An Internet site devoted to details about the nation's network is located at <http://NationalDentalPBRN.org>. We are very grateful to the network's Regional Coordinators who worked with network practitioners to conduct the study (Midwest Region: Kimberly Johnson, RDH, MDH; Western Region: Stephanie Hodge, MA; Northeast Region: Rita Cacciato, RHD, MS; South Atlantic Region: Deborah McEdward, RDH, BS, CCRP; South Central Region: Claudia Carcelén, MPH, Shermetria Massengale, MPH, CHES, Ellen Sowell, BA; Southwest Region: Meredith Buchberg, MPH, Colleen Steward MPH; Western Region: Camille Baltuck, RDH). Opinions and assertions contained herein are those of the authors and are not to be construed as necessarily representing the views of the respective organizations or the National Institutes of Health. The informed consent of all human subjects who participated in this investigation was obtained after the nature of the procedures had been explained fully.

References

1. Goh V, Corbet EF, Leung WK. Impact of dentine hypersensitivity on oral health-related quality of life in individuals receiving supportive periodontal care. *J Clin Periodontol*. 2016; 43(7):595–602. [PubMed: 27028655]
2. Lima TC, Vieira-Barbosa NM, Grasielle de Sa Azevedo C, et al. Oral Health-Related Quality of Life Before and After Treatment of Dentin Hypersensitivity With Cyanoacrylate and Laser. *J Periodontol*. 2017; 88(2):166–72. [PubMed: 27712461]
3. Canadian Board on Dentine Hypersensitivity. Consensus-based recommendations for the diagnosis and management of dentin hypersensitivity. *J Can Dent Assoc*. 2003; 69(4):221–6. [PubMed: 12662460]
4. Amarasena N, Spencer J, Ou Y, Brennan D. Dentine hypersensitivity in a private practice patient population in Australia. *J Oral Rehabil*. 2011; 38(1):52–60. [PubMed: 20722772]
5. Amarasena N, Spencer J, Ou Y, Brennan D. Dentine hypersensitivity - Australian dentists' perspective. *Aust Dent J*. 2010; 55(2):181–7. [PubMed: 20604761]
6. Chu CH, Lam A, Lo EC. Dentin hypersensitivity and its management. *Gen Dent*. 2011; 59(2):115–22. quiz 23–4. [PubMed: 21903521]
7. Cummins D. Advances in the clinical management of dentin hypersensitivity: a review of recent evidence for the efficacy of dentifrices in providing instant and lasting relief. *J Clin Dent*. 2011; 22(4):100–7. [PubMed: 22403985]
8. Parolia A, Kundabala M, Mohan M. Management of dentinal hypersensitivity: a review. *J Calif Dent Assoc*. 2011; 39(3):167–79. [PubMed: 21563596]
9. Poulsen S, Errboe M, Lescay Mevil Y, Glenny AM. Potassium containing toothpastes for dentine hypersensitivity. *Cochrane Database Syst Rev*. 2006; (3):Cd001476. [PubMed: 16855970]
10. Liu HC, Lan WH, Hsieh CC. Prevalence and distribution of cervical dentin hypersensitivity in a population in Taipei, Taiwan. *J Endod*. 1998; 24(1):45–7. [PubMed: 9487867]
11. Gillam DG, Seo HS, Bulman JS, Newman HN. Perceptions of dentine hypersensitivity in a general practice population. *J Oral Rehabil*. 1999; 26(9):710–4. [PubMed: 10520145]
12. Cunha-Cruz J, Wataha JC, Heaton LJ, et al. The prevalence of dentin hypersensitivity in general dental practices in the northwest United States. *J Am Dent Assoc*. 2013; 144(3):288–96. [PubMed: 23449905]
13. Dababneh RH, Khouri AT, Addy M. Dentine hypersensitivity - an enigma? A review of terminology, mechanisms, aetiology and management. *Br Dent J*. 1999; 187(11):606–11. discussion 03. [PubMed: 16163281]
14. Holland GR, Narhi MN, Addy M, Gangarosa L, Orchardson R. Guidelines for the design and conduct of clinical trials on dentine hypersensitivity. *J Clin Periodontol*. 1997; 24(11):808–13. [PubMed: 9402502]
15. Orchardson R, Gillam DG. Managing dentin hypersensitivity. *J Am Dent Assoc*. 2006; 137(7):990–8. quiz 1028–9. [PubMed: 16803826]

16. Cunha-Cruz J, Wataha JC, Zhou L, et al. Treating dentin hypersensitivity: therapeutic choices made by dentists of the northwest PRECEDENT network. *J Am Dent Assoc.* 2010; 141(9):1097–105. [PubMed: 20807910]
17. Gilbert GH, Williams OD, Korelitz JJ, et al. Purpose, structure, and function of the United States National Dental Practice-Based Research Network. *J Dent.* 2013; 41(11):1051–9. [PubMed: 23597500]
18. Kopycka-Kedzierawski DT, Meyerowitz C, Litaker MS, et al. Management of Dentin Hypersensitivity by National Dental Practice-Based Research Network practitioners: results from a questionnaire administered prior to initiation of a clinical study on this topic. *BMC Oral Health.* 2017; 17(1):41. [PubMed: 28086862]
19. Bae JH, Kim YK, Myung SK. Desensitizing toothpaste versus placebo for dentin hypersensitivity: a systematic review and meta-analysis. *J Clin Periodontol.* 2015; 42(2):131–41.15. [PubMed: 25483802]
20. Ritter AV, de LDW, Miguez P, Caplan DJ, Swift EJ Jr. Treating cervical dentin hypersensitivity with fluoride varnish: a randomized clinical study. *J Am Dent Assoc.* 2006; 137(7):1013–20. quiz 29. [PubMed: 16803829]
21. Veitz-Keenan A, Barna JA, Strober B, et al. Treatments for hypersensitive noncarious cervical lesions: a Practitioners Engaged in Applied Research and Learning (PEARL) Network randomized clinical effectiveness study. *J Am Dent Assoc.* 2013; 144(5):495–506. [PubMed: 23633698]
22. Brannstrom M, Astrom A. The hydrodynamics of the dentine; its possible relationship to dentinal pain. *Int Dent J.* 1972; 22(2):219–27. [PubMed: 4505631]
23. Carvalho TS, Colon P, Ganss C, et al. Consensus report of the European Federation of Conservative Dentistry: erosive tooth wear--diagnosis and management. *Clin Oral Investig.* 2015; 19(7):1557–61.
24. Grossman LI. A Systematic Method for the Treatment of Hypersensitive Dentin. *The Journal of the American Dental Association.* 1935; 22(4):592–602.
25. Makhija SK, Gilbert GH, Rindal DB, et al. Practices participating in a dental PBRN have substantial and advantageous diversity even though as a group they have much in common with dentists at large. *BMC Oral Health.* 2009; 9:26. [PubMed: 19832991]
26. Makhija SK, Gilbert GH, Rindal DB, et al. Dentists in practice-based research networks have much in common with dentists at large: evidence from the Dental Practice-Based Research Network. *Gen Dent.* 2009; 57(3):270–5. [PubMed: 19819818]
27. Gordan VV, Garvan CW, Heft MW, et al. Restorative treatment thresholds for interproximal primary caries based on radiographic images: findings from the Dental Practice-Based Research Network. *Gen Dent.* 2009; 57(6):654–63. quiz 64–6, 595, 680. [PubMed: 19906618]
28. Gordan VV, Garvan CW, Richman JS, et al. How dentists diagnose and treat defective restorations: evidence from the dental practice-based research network. *Oper Dent.* 2009; 34(6):664–73. [PubMed: 19953775]
29. Norton WE, Funkhouser E, Makhija SK, et al. Concordance between clinical practice and published evidence: findings from The National Dental Practice-Based Research Network. *J Am Dent Assoc.* 2014; 145(1):22–31. [PubMed: 24379327]
30. ADA.org. American Dental Association Survey Center: The 2010 Survey of Dental Practice. Vol. 2012. Chicago: American Dental Association; 2012.

Figure 1.

Figure 2.

Figure 3.

Table 1

Patient demographics by patient gender

	Males (n=485, 26%)	Females (n=1377, 74%)	p-value
Age in years (mean, SD)	45.7 (13.6)	44.4 (13.6)	0.06
Education			
Less than high school diploma	6 (1%)	10 (0.7 %)	<0.0001
High school graduate	74 (15%)	178 (13%)	
Some college or Associate degree	140 (29%)	579 (42%)	
Bachelor's degree	163 (34%)	347 (25%)	
Graduate degree	98 (20%)	255 (19%)	
Decline to answer	2 (0.4%)	8 (0.6%)	
Race			
Caucasian	387 (84%)	1146 (88%)	0.06
African-American	45 (10%)	93 (7%)	
Asian	22 (5%)	38 (3%)	
Other/multiple races	8 (2%)	25 (2%)	
Ethnicity			
Hispanic or Latino	33 (7%)	118 (9%)	0.24
Not Hispanic or Latino	431 (93%)	1212 (91%)	
Dental insurance status			
None	81 (17%)	284 (21%)	0.01
Private	341 (71%)	919 (68%)	
Public	49 (10%)	98 (7%)	
Other	12 (2%)	61 (4%)	
Payment for preventive and problem focused visit			
Both visit types will be covered 100% by the dental insurance	286 (59%)	804 (59%)	0.09
Patient will pay a co-payment for both visit types	112 (23%)	268 (20%)	
Patient will pay 100% out-of-pocket for both visit types	85 (18%)	292 (21%)	
Number of sensitive teeth (mean, SD)	3.7 (4.4)	4.3 (5.0)	0.003
Upper arch (mean, SD)	2.1 (2.4)	2.1 (2.7)	0.33
Lower arch (mean, SD)	1.6 (2.4)	2.2 (2.9)	<0.0001

Table 2

Characteristics of the sensitive teeth for n=1862 patients

Restoration type (number within patients)	Mean	SD	Minimum	Maximum
Amalgam	.6	1.3	0	11
Resin	.9	1.7	0	28
PFM crown	.2	.8	0	12
Porcelain crown	.1	.4	0	7
Cast metal crown	.05	.4	0	8
Other restorations	.04	.4	0	6
Restoration type on the tooth that is sensitive (Percentages)				
Amalgam	18	32.4	0	100
Resin	26	37.2	0	100
PFM crown	7	21.8	0	100
Porcelain crown	2	12.7	0	100
Cast metal crown	1	9.5	0	100
Other restorations	.9	8.2	0	100
Number of sensitive teeth per patient	4.2	4.8	1	28
Percent of sensitive teeth with visible dentin	54	46.8	0	100
Percent of sensitive teeth with gingival recession	70	41.5	0	100
Percent of sensitive teeth restored	49	43.6	0	100

Table 3

Most frequent types of advice given to stop/decrease/increase product/habit/behavior.

Advice given to stop/decrease/increase product/habit/behavior	N (%)
Stop:	
Aggressive toothbrushing	45 (34%)
Whitening products	34 (26%)
Bruxism, clenching, reduce stress	21 (16%)
Tartar control/abrasive toothpaste	15 (11%)
Acidic drinks	8 (6%)
Tobacco products	3 (2%)
Decrease:	
Aggressive brushing	23 (38%)
Acidic drinks/snacks	12 (20%)
Grinding/clenching/stress	11 (18%)
Whitening products	9 (14%)
Abrasive toothpaste	2 (3%)
Increase (start):	
OTC desensitizing toothpaste or strips	88 (48%)
Soft toothbrush/improve hygiene	46 (25%)
Fluoride products	23 (13%)
Wearing a night guard/occlusal guard	14 (8%)

Table 4

Patient and Practitioner Characteristics Associated with Treatment Recommendations, as Determined by Logistic Regressions of Treatment Recommended

	Any fluoride treatment recommended	OTC potassium nitrate desensitizing toothpaste recommended	Any fluoride and OTC potassium nitrate desensitizing toothpaste recommended	No treatment recommended
	p-value *	p-value *	p-value *	p-value *
Patient characteristics				
Gender	0.45	0.88	0.54	0.48
Ethnicity	0.42	0.38	0.41	0.28
Race	0.24	0.39	0.53	0.28
Insurance status	0.06	0.47	0.89	0.60
Education	0.42	0.41	0.15	0.67
Number of sensitive teeth	0.01	0.006	0.0009	0.42
Number of sensitive teeth restored	0.02	0.26	0.007	0.87
Number of sensitive teeth with visible dentin	0.05	0.22	0.100	0.14
Number of sensitive teeth with gingival recession	0.04	0.005	0.004	0.23
Number of sensitive teeth restored with amalgam	0.87	0.12	0.12	0.21
Number of sensitive teeth restored with resin	0.008	0.44	0.001	0.14
Number of sensitive teeth restored with PFM	0.11	0.25	0.24	0.70
Number of sensitive teeth restored with Porcelain crown	0.28	0.59	0.76	0.98
Number of sensitive teeth restored with cast metal crown	0.06	0.16	0.45	0.21
Number of sensitive teeth restored with other restorations	0.63	0.84	0.37	0.26
Number of sensitive teeth not restored	0.13	0.03	0.007	0.33
Any past treatment for sensitive teeth	0.006	0.63	0.18	0.12
Duration of current treatment	0.55	0.32	0.80	0.45
Currently using OTC treatment for sensitive teeth	0.02	0.02	0.01	0.02
Recent professional or OTC tooth whitening	0.12	0.14	0.14	0.27
History of gum/periodontal surgery	0.09	0.66	0.94	0.81
Practitioner characteristics				
Region	0.13	0.08	0.29	0.04
Practice location	0.40	0.50	0.18	0.63
Age group	0.17	0.70	0.62	0.16

	Any fluoride treatment recommended	OTC potassium nitrate desensitizing toothpaste recommended	Any fluoride and OTC potassium nitrate desensitizing toothpaste recommended	No treatment recommended
	p-value *	p-value *	p-value *	p-value *
Race	0.09	0.45	0.42	0.12

* p-values from individual mixed-model logistic regression analyses