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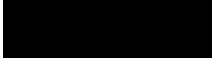
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Name of Candidate: CPT Kyle Reed
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DATE:


Brent Clark, LTC, DC
DENTAC RESEARCH DIRECTOR, FORT BRAGG
Committee Chairperson

15 June 2018


Charles Lambert, LTC, DC
PROGRAM DIRECTOR, AEGD-2, FORT BRAGG
Committee Member

15 June 2018


Manuel Pelaez, LTC, DC
RESEARCH ADVISOR, AEGD-2, FORT BRAGG
Committee Member

15 June 2018

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Kyle P. Reed
2-yr AEGD Program, Fort Bragg, NC
Uniformed Services University, Bethesda, MD
Date: 06/01/2018

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Knowledge and Usage of the Periodontal Screening and Recording Among Military Dental Providers and Hygienists

Kyle P. Reed, DDS
Manuel Pelaez, DMD, MS
Thomas A. Beltran, BS

Master of Science in the
Department of Oral Biology
Graduate School of
The Uniformed Services University of the Health Sciences

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Accepted on behalf of the Faculty of the Graduate School by the thesis committee:

Date

Manuel Pelaez, DMD
Research Director/Mentor

Date

Jason Bullock, DMD
AEGD Assistant Director

Date

Charles Lambert, DDS
AEGD Program Director

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Knowledge and Usage of the Periodontal Screening and Recording Among Military Dental

Providers and Hygienists

Kyle P. Reed, DDS

Manuel Pelaez, DMD, MS

Thomas A. Beltran, BS

Author Information

Dr. Kyle P. Reed is a postgraduate resident at the 2-Year Advanced Education in General Dentistry program at Fort Bragg, North Carolina, affiliated with the Army Postgraduate Dental School and Uniformed Services University of the Health Sciences Postgraduate Dental College.

Dr. Manuel Pelaez is the research director and periodontics mentor at the 2-Year Advanced Education in General Dentistry program at Fort Bragg, North Carolina.

Thomas A. Beltran is the statistical assistant, Department of Clinical Investigation, at Womack Army Medical Center at Fort Bragg, North Carolina.

Corresponding Author

Kyle P. Reed, DDS

Bldg H, 3817 Gruber Road

Fort Bragg, NC 28310

304-377-7675 / kyle.p.reed5.mil@mail.mil

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CPT Kyle P. Reed, DDS, is a resident of the Army Postgraduate Dental School and Uniformed Services University of the Health Sciences Postgraduate Dental College.

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CPT Kyle P. Reed
2-yr AEGD Program, Fort Bragg, NC
Uniformed Services University, Bethesda, MD
Date: 1 JUN 2018

Abstract

This study evaluated the knowledge base of the Periodontal screening and recording (PSR) examination in a cohort of active duty, government service, and government contract dental providers. A novel 10 question survey was created using the Army Technical Bulletin Medical 250 (TB MED 250) Appendix F, which outlines all of the criteria for performing and interpreting the PSR examination. Participants were not made aware of the survey, or when it would be administered, and were informed that participation was completely voluntary. The hypothesis was that the dental providers at the Fort Bragg Dental Health Activity (DHA) did not possess a thorough working knowledge of the PSR examination. Survey results showed a median score of 70% on the survey with only 8 of the 103 participants scoring 100% which shows thorough knowledge of the PSR examination. It was concluded that the Fort Bragg DHA has a deficiency in knowledge of the PSR examination which is a critical portion of the annual examination process for all US Army Soldiers. Future research on this topic should simultaneously be expanded across the Army Dental Corps, and trained locally at the Fort Bragg DHA, and retested after a training protocol is implemented.

Introduction

Periodontal disease is the one of the most prevalent conditions affecting the human population and continues to be the leading cause of tooth loss amongst adults ¹⁻¹⁰. Treatment modalities for periodontal disease continue to improve and increase in number; however, proper disease detection is critical to implement such treatment modalities. More importantly, diagnosis or referral of patients suspected to have periodontal disease is the responsibility of any general dentist performing routine examinations ¹¹⁻¹³. Diagnosis of periodontal disease can only be accurately assessed when a thorough periodontal evaluation is conducted.

A myriad of indices has been developed and implemented in the past with varying degrees of success. Those include, but are not limited to the: Periodontal Index ¹⁴, Periodontal Disease Index (PDI) ¹⁵, Periodontal Treatment Needs System (PTNS) ¹⁶, Periodontal Profile Score (PPS) ¹⁷, Community Periodontal Index of Treatment Needs (CPITN) ¹⁸, and the Extent and Severity Index (ESI) ¹⁹. Those different methods all had favorable characteristics for the detection of periodontal disease but were never universally accepted with the exception of the CPITN, which is endorsed by the World Health Organization (WHO), and remains commonly used throughout the world ¹⁸. The development of the Periodontal Screening and Recording (PSR) in 1992 by the American Academy of Periodontology (AAP) and the American Dental Association, and with financial support by the Procter & Gamble Corporation, offered an organized and efficient technique for screening all patients at initial presentation and recall appointments ²⁰. The PSR, which was adapted from the CPITN, was universally implemented by the dental community following its creation, and has become an integral part of the US Military dental examination process.

Shortly after implementation, Frisco and colleagues conducted a study and found that 77% of general dentists, and 88% of periodontists, rated the PSR good to excellent ²¹. If that study were repeated now, nearly 25 years later, those numbers would likely be similar, or higher. Providers praised the PSR because of its clinical sensitivity, speed, simplicity, cost-effectiveness, efficiency, and use as an effective patient education tool. While radiographs are a useful tool that aids in periodontal diagnosis and disease progression, Khocht, et al., found that PSR scores were significantly more correlative to probing depths (PD) and clinical attachment levels than radiographs ²².

PSR is an index that numerically quantifies probing depths along with several other clinical findings in order to identify possible periodontal disease, or indicate when a comprehensive periodontal examination is warranted. The clinical findings that factor into the index include bleeding on probing (BOP), presence of supra- and/or subgingival calculus, and defective restorative margins. A commonly forgotten or misunderstood aspect of the PSR is the asterisk. Findings that would warrant denotation of an asterisk include: gingival recession $\geq 3.5\text{mm}$, presence of mucogingival defects, clinically detectable furcation involvement, or tooth mobility. Recent research has shown that the PSR is capable of predicting the appropriate diagnosis $\geq 79\%$ of the time with PSR scores of 0, 1, 2, and 4²³. There is ambiguity with a PSR score of 3 as operator-to-operator discrepancies resulted in inconsistent findings²³. However, any time there is an emphasis on efficiency some providers favor hastiness over accuracy. Another concern is that the PSR exam and its criteria are not equally taught and utilized in dental curriculums²⁴.

A significant issue with the PSR is using proper instrumentation. In order to perform the PSR exam as it was designed, the provider should use a probe that has rounded ball tip 0.5mm in diameter, and a dark band along the probe, which begins at 3.5mm from the tip and ends at 5.5mm from the tip of the probe. The ball tip aids in detection of subgingival calculus and defective margins, and limits false readings from over-measurement of PD, while the colored band facilitates rapid interpretation of PD²⁵. The WHO-621 probe, the plastic PSR probe, and others that meet the criteria mentioned will lend the provider to efficiency and accuracy in performing PSR exams. Improper utilization of the PSR exam has large scale implications due to possible misdiagnosis of a chronic condition that will most likely worsen over time²⁵. Due to lack of knowledge, inadequate funds, or lack of availability, a UNC-15 or UNC-12 probe may be

used in which case the provider makes an educated guess to approximate the 3.5 and 5.5mm values by labeling a PD of 4-5mm as a 3 and a PD of 6mm or greater as a 4. While an experienced provider may feel this method is accurate or predictable for them, it facilitates the likeliness for mistakes.

Ensuring accuracy of a PSR can only be achieved by thorough knowledge of the codes and what they mean. For scoring purposes the mouth is divided into sextants and the code assigned to each sextant is representative of the deepest measured PD or presence of BOP, defective margins, or calculus. During the exam, the provider will place their PSR probe into the gingival sulcus of and move the tip circumferentially around each tooth while maintaining the probe at an angulation nearing parallel to the long axis of the tooth. Code 0 is assigned to any sextant that does not exhibit BOP, presence of calculus, defective margins, and the line of the colored band measuring 3.5mm remains completely visible throughout the sextant. Code 1 is assigned to any sextant that exhibits BOP, but no calculus or defective margins, and a PD of $<3.5\text{mm}$. Code 2 is given to a sextant that has detectable calculus or defective margins, with or without BOP, and a PD $<3.5\text{mm}$. Code 3 is assigned to a sextant with at least one site recording a PD $\geq 3.5\text{mm}$ but $<5.5\text{mm}$ irrespective of the presence of BOP or calculus. Code 4 is utilized when a PD is equal to or exceeds 5.5mm and is again regardless of BOP or calculus. Code X is assigned to any sextant that is completely edentulous. Lastly, an asterisk can be applied to the code for any sextant when it exhibits a finding of: gingival recession $\geq 3.5\text{mm}$, presence of mucogingival defects, clinically detectable furcation involvement, or tooth mobility. Charting these results can be simplified by portraying the numbers in a simple grid with two rows and three columns representing the sextants as you would look at the patient. The sextants are technically supposed to be labelled S1-S6 with S1 representing the maxillary right posterior

sextant, S2 representing the maxillary anterior sextant, S3 representing the maxillary left post posterior sextant, S4 representing the mandibular left posterior sextant, S5 representing the mandibular anterior sextant, and S6 representing the mandibular right posterior sextant. For convenience, the sextants are defined as: first premolar moving distally to the third molar for maxillary and mandibular arches, and from cuspid to cuspid on both arches for the anterior sextants. An example of the charting for a patient presenting with BOP and gingival recession measuring 4mm on tooth #14, supragingival calculus on teeth #23-26, and missing teeth #28-32 is depicted below to facilitate understanding.

S1	S2	S3
0	0	1*
X	2	0
S6	S5	S4

Once the PSR exam is completed and the results are charted, the information needs to be used to drive clinical decisions. The AAP recommends that any patient who is found to have two or more sextants with a Code 3 designator, or any sextant with a Code 4 would be deemed at high risk for having periodontal disease and should receive a complete periodontal evaluation. Similarly, patients who have received only one Code 3 designator should receive complete periodontal evaluation of that sextant and associated charting. These are the recommendations from the AAP on how a general practitioner should use the PSR but this does not mean a provider should feel discouraged from performing a complete periodontal evaluation on any patient the provider believes would benefit from such an exam. Potential deficiencies of the PSR

exam include an inability to account for crestal alveolar bone levels. It is possible for a patient to have alveolar bone loss without periodontal pocket formation and would therefore receive a Code 2 or less, producing a false negative – this is the patient that has a reduced periodontium. Other deficiencies include the aforementioned failure to utilize proper instrumentation. Dental hygienists can and should be capable of performing a PSR exam and relaying the gathered information to the dentist, but ultimately accuracy is the responsibility of the dentist. A dentist should periodically validate the accuracy of his or her dental hygiene staff to eliminate this possible inaccuracy. Overutilization of radiographs could lead a provider to not actually performing the exam and performing what some providers call a, ‘visual PSR.’ A PSR that does not involve some version of a periodontal probe will be inaccurate nearly 100% of the time ²⁵.

PSR examinations can be performed by providers of differing training levels. From an efficiency standpoint, a dental hygienist receives training exclusive to diagnosing and treating periodontal diseases and would be the provider most likely to perform a PSR. This does not absolve the dentist from being responsible for all diagnoses for patients in their practice. In Army dentistry, due to the disproportionate number of Soldiers compared to dentists and hygienists and the fact that every Soldier is required to receive a prophylaxis procedure annually, a training program was created to equip Active Duty dental technicians (68E) with a skill set to perform prophylaxis procedures on certain patients. The training program revolves around teaching these Soldiers how to properly perform a PSR and screen patients for certain periodontal conditions. Any patient who has a PSR score of 2 or less that is associated with supragingival calculus can receive a routine prophylaxis from these additionally trained technicians. Any Active Duty dental technician who has received this training and been properly credentialed receives a skill modifier and is now a 68EX2. Civilian dental technicians who receive similar training gain the

title of expanded functions dental assistant (EFDA). It is vitally important that the entire dental team including dentists, dental hygienists, 68EX2s, and EFDAs know, understand, and properly utilize the PSR in order to properly diagnose and appropriately treat patients.

Army Technical Bulletin Medical 250 (TB MED 250) is the definitive guide for clinical dentistry in the US Army. Appendix F, outlines all of the criteria for performing and interpreting the PSR examination, a vital component of the annual dental readiness examination performed on every Soldier. To assess a possible deficiency in the utilization of the PSR, a survey was created to test provider knowledge of the PSR criteria and its application in a cohort of dental providers and hygienists at Fort Bragg, NC. The author hypothesizes that the survey population does not possess a thorough working knowledge of the PSR and how to properly implement it into clinical practice.

Materials and Methods

A novel 10 question survey was created using TB MED 250 Appendix F. The questions were created by the principal investigator, and approved by the advisor for accuracy, and to ensure only one correct answer per question. The survey also included demographic questions including: gender, age, years practicing dentistry, type of professional, and for dentists specifically, their specialty. The survey was given to all Government Service (GS), Government contract, and Active Duty Army dentists, dental hygienists, and 68EX2s working at the Fort Bragg, NC Dental Health Activity.

The survey was given at an organizational meeting without warning by the principal investigator. The use of cellular devices, computers, or any other electronic equipment was not permitted. All potential participants were explicitly informed that participation was completely voluntary and instructed to not place any identifying information on the surveys to eliminate any bias in results. For simplicity, all providers who were in a specialty residency were instructed to

fill out the demographic questions as if they were already a specialist of the type for which they were training. After giving instructions, the principal investigator left the room for 20 minutes to allow sufficient time to complete the survey. All participants placed their surveys in a collection bin in the front of the room upon completion and the bin was collected by the principal investigator. The surveys were kept in a locked drawer in the principal investigator's office where they were processed and entered into the survey data collection tool and sent to the statistician for analysis.

Exploratory data analyses were conducted on the KHNs and the Shapiro-Wilk test was used to assess the normality of the data distribution. For continuous data, measures of central tendency are reported as medians and measures of dispersion are reported as inter quartile ranges (IQR). Participants with a correct response rate less than the first quartile minus 1.5 times the IQR were declared to be outliers.

Pearson's chi-squared tests were used to assess pairwise differences between categorical variables. The Kruskal-Wallis test was used to examine group differences as well as to assess differences in correct response rate based on gender, age, experience, and profession. Data were analyzed using SPSS 25 (IBM, Armonk, NY, USA). Statistical significance for all statistical tests was declared at $P < 0.05$.

Results

One hundred three participants completed the written survey. Two participants were identified as outliers for having a correct response rate less than 30%. These participants were omitted from further analysis. Among the remaining 101 participants, the median correct response rate was 70% (IQR 55-85).

The sample consisted of 52 men (51.5%) and 49 women (48.5%). Significant differences were found between men and women with respect to age ($P < 0.01$), years practicing dentistry

($P < 0.01$), and profession ($P < 0.001$). However, no difference was observed between the genders with respect to specialty ($P = 0.92$) or correct survey responses ($P = 0.56$). Table 1 shows participant characteristics by gender.

Participants' correct response rate did not vary by age ($P = 0.29$). However, correct response rate was affected by experience ($P = 0.04$), profession ($P < 0.01$), and specialty ($P = 0.02$). Figures 1 and 2 show the median correct response rates by experience and profession respectively. Figure 3 shows the median correct response rate by experience and specialty.

Discussion

The PSR is a critical part of Army dental care as official doctrine requires its use at least once every 12-15 months for every Soldier. Soldiers are required to have a dental exam and prophylaxis annually in order to be considered dentally "well." The Army Dental Corps defines dental wellness as having no findings or diagnoses that require treatment. While wellness is the goal for all dental patients, the Army emphasizes that Soldiers must at least have readiness. The Army Dental Corps defines readiness as a Soldier having had a dental examination within the last 15 months and no dental condition that would likely cause pain, infection, or tooth loss within a 12 month period. With this information, it becomes evident how integral the PSR is to the US Army and its Soldiers being ready to accomplish a mission, particularly in a combat or austere environment devoid of dental support. In order to accurately detect Soldiers with periodontal disease, and those at risk of its development, knowledge of the PSR should be thorough and complete to ensure accurate diagnosis and timely treatment.

A median correct response of 70% on knowledge of the PSR examination may seem somewhat acceptable on the surface, however, it shows that Army dental providers do not thoroughly understand an integral part of the examination process that they perform every day. When broken down by experience in the field of dentistry, those participants who had been

practicing 5-10 years showed the greatest knowledge of the PSR. After practicing for 10 years or greater, the results showed a precipitous decline in knowledge of the PSR (Figure 1). With regards to profession, dental hygienists scored the highest on the survey with a median and minimum score of 80 (Figure 2). Lastly, the other significant difference was with respect to specialty of dentists. Dentists who had received at least two years of post-doctoral residency training in general dentistry scored higher than general dentists who had not, and specialists surveyed including oral surgeons, endodontists, prosthodontists, pediatric dentists, orthodontists, and periodontists, scored the lowest with median scores ranging 55-80 based on years practicing dentistry (Figure 3). The threshold for an acceptable score for this survey was set to 100% by the principal investigator and advisor and only 8 participants met that criteria.

The 68EX2s scored the lowest on the survey with a median score of 40 (Figure 2). 68EX2s are trained within the Army to both know and understand the PSR examination in order to determine which patients would meet the criteria for inclusion within their practice. Their training emphasizes knowledge of this system to ensure safe and effective treatment of Army Soldiers.

This survey was novel in nature and no previous data could be analyzed for comparison. The survey questions were developed by the principal investigator based on the Army doctrine TB MED 250 which used references from the American Dental Association and the American Academy of Periodontology. The questions were edited by the advisor who is a board-certified periodontist. Limitations of this study include a relatively small sample size, and that it was only conducted at one Army installation. Another limitation is that wording of the survey questions could have been misconstrued by participants due to only having one editor screening their quality.

Conclusion

Quality is a core fundamental of the care provided by the members of the Army Dental Corps to the US Army Soldiers. The purpose of this study was test the hypothesis that providers at the Fort Bragg Dental Health Activity possess a knowledge deficiency in the PSR examination. Results from the survey confirm the hypothesis with a median score of 70% and only 26 of the 103 participants scoring the requisite 90%. The novelty of the study and the small sample size significantly impact the implications that can be drawn from this research. Now that this deficiency in Army dental care has been identified, future research on this topic can proceed in two different directions simultaneously. Knowledge base of the PSR can be effectively tested across the Army Dental Corps, all of the Department of Defense dental branches, and even amongst dentists and hygienists in the private sector. The other direction would be to establish a training protocol at the Fort Bragg DHA to close the knowledge gap and retest to determine its efficacy. If the training protocol that is developed proves to be successful, this training could be implemented across all branches of the military to ensure that our Soldiers always receive the best care possible.

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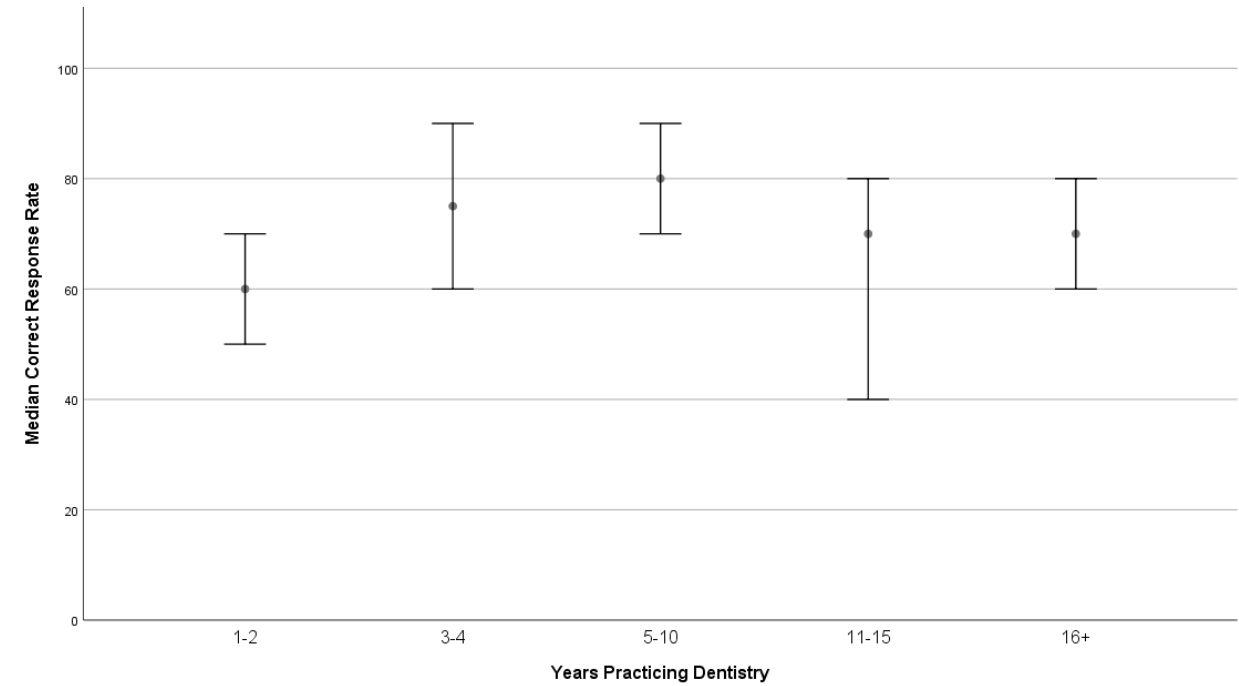
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Table 1.

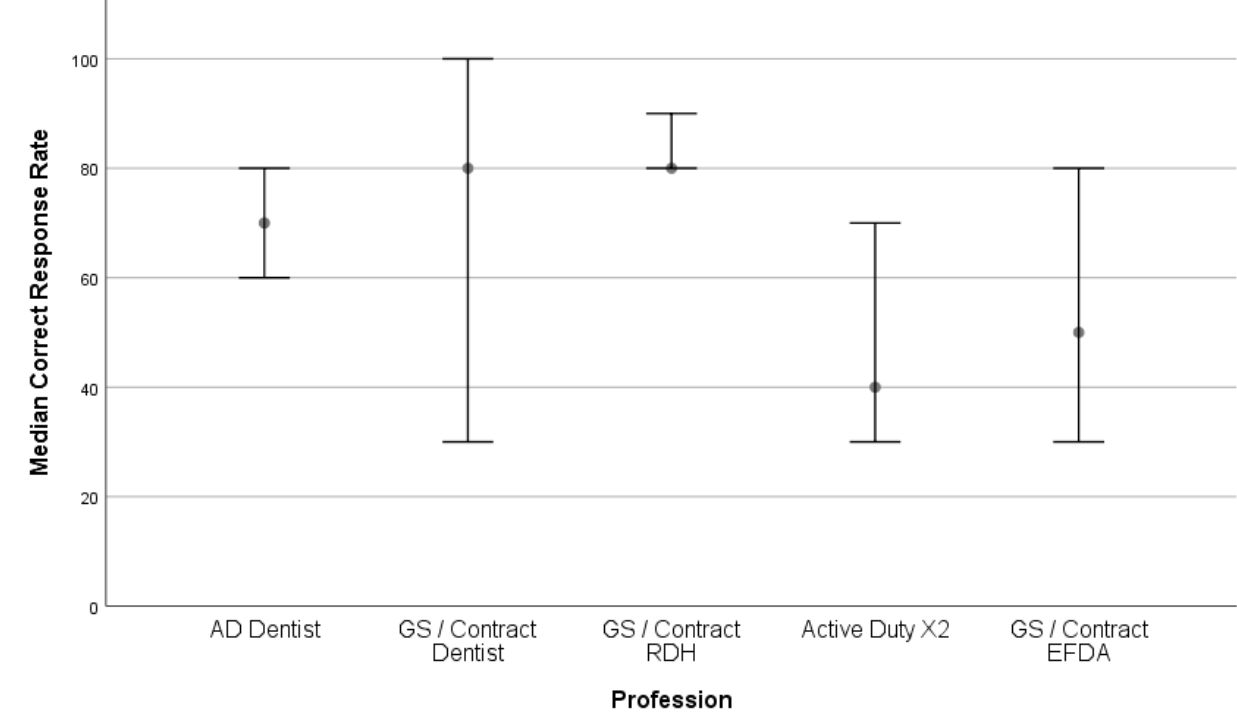
		Male	Female	Total	P Value ¹
Age	≤30	32.7%	16.3%	24.8%	<0.01
	31-35	25.0%	16.3%	20.8%	
	36-40	13.5%	14.3%	13.9%	
	41-45	9.6%	16.3%	12.9%	
	>45	19.2%	36.7%	27.7%	
Years Practicing Dentistry	1-2	25.0%	8.2%	16.8%	<0.001
	3-4	25.0%	6.1%	15.8%	
	5-10	25.0%	30.6%	27.7%	
	11-15	9.6%	20.4%	14.9%	
	≥16	15.4%	34.7%	24.8%	
Profession	AD Dentist	86.5%	36.7%	62.4%	<0.001
	GS / Contract Dentist	7.7%	6.1%	6.9%	
	GS / Contract RDH	1.9%	38.8%	19.8%	
	Active Duty X2	3.8%	2.0%	3.0%	
	GS / Contract EFDA	0.0%	16.3%	7.9%	
Specialty	Comprehensive Dentist	26.5%	19.0%	24.3%	0.92
	General Dentist	40.8%	57.1%	45.7%	
	Other Specialist	32.7%	23.8%	30.0%	

Figure 1.



Error bars represent 95% Confidence Intervals

Figure 2.



Error bars represent 95% Confidence Intervals

Figure 3.

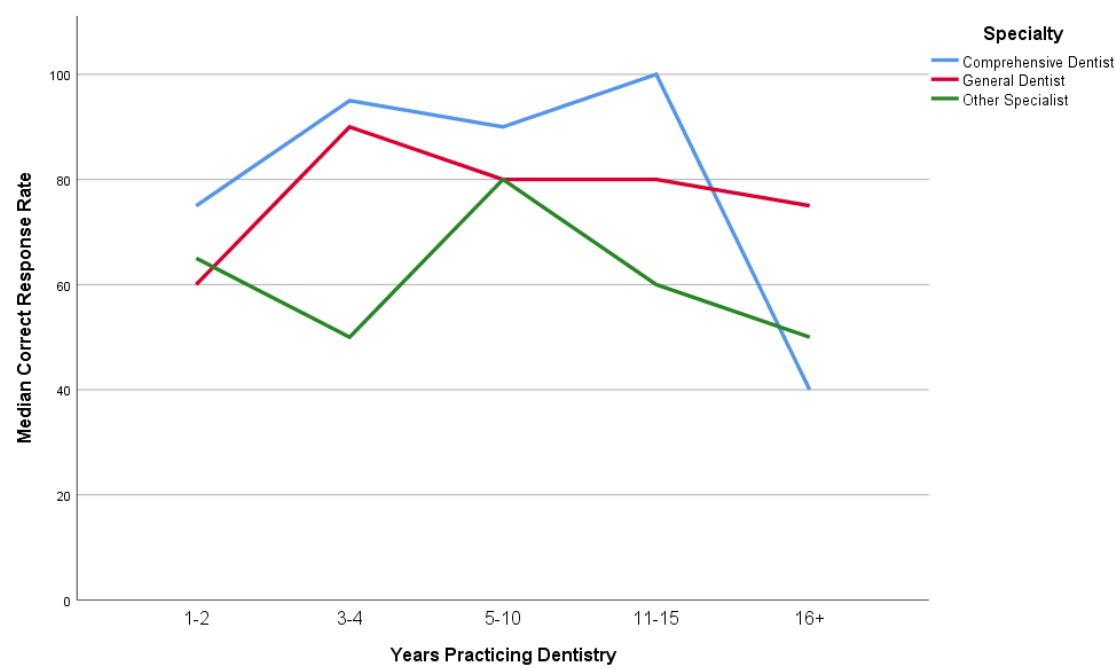


Table 1. Patient characteristics

Figure 1. Median number of correct survey responses based on years practicing dentistry

Figure 2. Median number of correct survey responses based on type of dental profession

Figure 3. Median number of correct survey responses based on dental specialty