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THESIS APPROVAL PAGE FOR MASTER OF SCIENCE IN ORAL BIOLOGY

Title of Thesis: " Perceived Competence in Endodontic Procedures Among Army DC Officers. "

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Master of Science Degree 30-Jun-2022

THESIS/MANUSCRIPT APPROVED: DATE:

PHILLIPS.MATTHEW.BENJAMIN.1249434139 Digitally signed by PHILLIPS.MATTHEW.BENJAMIN.1249434139 Date: 2022.06.22 14:20:02 -04'00' 22-Jun-2022

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Perceived Competence in Endodontic Procedures Among Officers in the US Army Dental Corps: A Web-based Survey

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ABSTRACT The Individual Critical Task List (ICTL) was developed by the Army to ensure all dental providers can perform certain procedures that are frequently encountered in a deployed environment. The endodontic task list includes obtaining a diagnosis, providing palliative treatment, and performing non-surgical root canal therapy for anterior and premolar teeth. The purpose of this study was to evaluate the self-perceived competence in endodontic procedures among dentists in the US Army Dental Corps (DC). A link to a SurveyMonkey (Momentive.ai, San Mateo) survey was sent to all DC dental providers. Survey data indicated that most participants reported feeling very confident in obtaining a diagnosis, providing palliative treatment (addressing acute swellings or replanting avulsed teeth), and completing root canal procedure on anterior teeth. Perceived competence was significantly reduced as treatment moved posteriorly for premolars or molars. Of all respondents, 50% reported their endodontic requirement during dental school being five or less teeth. Furthermore, over 50% of respondents had not completed a root canal in over five years. Our study identifies opportunities to improve providers' confidence in performing a variety of essential, endodontic treatments. Furthermore, Army dental specialists other than endodontists reported the longest timeframe (> 5 years) from their last completed endodontic procedure.

INTRODUCTION

Today, the 28th Chief of the Army's Dental Corps (DC), has established a mission of "a ready Dental Corps delivering global dental services to enable sustained readiness of the Total Force." (U.S. Army Center of Excellence, 2022) All components (COMPOs) of the U.S. Army (Army Active Duty, Army National Guard, Army Reserves; COMPOs 1, 2, 3 respectively) continue to recognize the importance of proper oral care and dental readiness of all its Soldiers. A modern Force that is well trained and equipped may not be as effective if the Soldier's medical and dental readiness are not at an optimum level. The Department of Defense (DoD) established a minimum goal of at least 75% of the total military force being medically ready for deployment based on six specific medical measures that identify individual medical readiness (IMR).

Dental readiness is one of the six reportable metrics that determine IMR. (DoD Instruction Number 6025.19, 2020) The Dental Fitness Class, now known as the Dental Readiness Class (DRC) categories (1, 2, 3, 4) were developed to identify Soldiers that are the highest risk of developing dental emergencies on deployment. The DRC categories 3 and 4 classify the Soldier a high risk for a dental emergency and these Soldiers are not considered worldwide deployable. Furthermore, the Secretary of Defense (Health Affairs) in 2006 established the goal of 95% of active and reserve forces meeting DRC 1 and 2 status and at least 65% meet DRC 1. (DoD Instruction Number 6025.19, 2020)

Dental emergencies, also known as dental disease non-battle injuries (D-DNBI), have had a major impact during past military conflicts in austere environments. From an operational cost standpoint, it has been estimated that the total dollar amount equates to $44M over a 24 month period or $1.8M as month. (MAJ Paul M. Colthirst DC, 2013) More importantly, there is much risk and burden logistically to evacuate a Soldier. In their study of the medical readiness of the USAR COMPO, RAND Corporation author's state, "a dental emergency can require three convoy vehicles with

up to nine personnel for security in-theatre for the sole purpose of medical evacuation." (John W. Simicek D.D.S., 2014) Finally, another important metric was analyzed previously which is the incidence of D-DNBI in a deployment setting. It was estimated during campaigns of Operation Iraqi Freedom and Enduring Freedom to be 144.05 per 1,000 Soldiers per year. Furthermore, a diagnosis requiring some form of endodontic treatment was required for 15-20% of D-DNBI visits (John W. Simicek D.D.S., 2014).

Endodontists are highly skilled dental specialists in diagnosing and treating tooth pain and performing root canal treatment. (American Association of Endodontists, 2022) In the Army, they serve a crucial role to the Combatant Commanders by improving readiness of their Soldiers. However, in a deployment setting most endodontic treatment will not be provided by an endodontist. There are ten areas of concentration (AOC) within the 63 series of the DC. Nine of these AOCs deploy as a general dentist (excluding oral surgeons (63N)) and are expected to provide a myriad of care, even if it is far removed from their daily clinical practice. The DC mission of "a ready Dental Corps" is addressing this confounding factor by recent development of a task list for all deployable dentists.

Task lists have been used for years in the military such as Mission Essential Task Lists (METL) for units or Warrior Tasks and Battle Drills (WTBD) for Soldier skills. Army Medicine responded and released OPORD 17-17 that initiated the production of ICTLs to all Army Medical Departments Corps Chief's Offices and specifically to each corps, Corps Specific Branch Proponent Officer (CSBPO). The ICTLs directly align with Knowledge Skills and Abilities (KSAs) used by the Air Force and Navy to create the Joint KSAs. After multiple reviews and vetting from specialty consultants, the ICTLs were published in the Central Army Registry, integrated into the Digital Training Management System (DTMS), and fully implemented in August 2019. (Army Dentistry Dental Corps Bulletin, 2019)

The ICTLs encompasses the majority of essential wartime skills needed to provide the DC Officer fundamental skills as well as warrior tasks. These skills will develop the foundation to guide the provider to render care in austere environments which include diagnosis and management of both combat and non-combat dental emergencies. The fundamental idea is that ALL dental providers (excluding 63Ns) across ALL COMPOS will not only possess, but feel comfortable executing , ALL the basic skill sets of a 63A listed in the ICTL.

The 63A ICLT worksheet includes 38 sub-tasks that require virtual or simulated proficiency that is verified through the Corporate Dental System (CDS) or DTMS on a biannual basis. The sub-task list of importance for this study, pertinent to specialty of endodontics include sub-tasks in obtaining a diagnosis, providing palliative treatment, management of trauma (avulsions and dentoalveolar fractures), and providing non-surgical root canal therapy (NSRCT) for single rooted teeth and premolars. Given the recent implementation of the ICTLs, this study gave a timely opportunity to assess the DC's readiness to this new standard.

The purpose of this study is to investigate the perceived competence in endodontic procedures, as

outlined in the 63A ICTL, among Officers in the U.S. Army DC.

METHODS

This was a web-based survey that was approved by the Dwight D. Eisenhower Army Medical Center Human Research Protections Office as exempt (21-13539/941510) from IRB requirements. Electronic survey invitations via SurveyMonkey (Momentive.ai, San Mateo) were e-mailed from the Office of the Corps Chief to all Officers in the Army DC. Following the initial invitation, one additional e-mail reminder was sent after 2 weeks, and the survey window closed after a total of four weeks. Those whom responded to the electronic invitation were the subjects of the study. Each participant was asked a series of 1-14 multiple choice questions, based on their responses. The first question asks for participant's AOC, and if the response included 63E (endodontist) or 63N (oral surgeon) they were prevented from further questioning. All other participants were asked questions pertaining to their degree of confidence in obtaining a diagnosis, placing a rubber dam, performing palliative care, and performing non-surgical root canal therapy on single and multi-rooted teeth. To quantify the participant's degree of confidence, a visual analogue scale (0-100) was utilized. To familiarize the respondents with the rating scale, a preliminary example was provided. They were also asked questions regarding how they obtain continuing education. Finally, the participants were asked questions regarding their pre-doctoral education.

Responses to the survey were contained within the SurveyMonkey system and stored until completion of the study. Correlations, comparisons, and trends were analyzed utilizing SPSS, and Microsoft Excel for statistical analysis.

RESULTS

Of the 618 survey requests sent, 224 DC Officers responded with a response rate of 36%. The distribution of participant's based on AOC is as follows; general dentists (63A)– 39% (n=88), comprehensive dentists (63B)– 31% (n=70), periodontists (63D)- 7% (n=15), prosthodontists (63F)- 10%, public health dentists (63H)- 4% (n=8), pediatric dentists (63K)- 8% (n=18), and oral pathologists (63P)- 1% (n=3) **(Figure 1)**.

Survey data indicated that most participants reported feeling very confident in obtaining a diagnosis, providing palliative treatment (addressing acute swellings replanting avulsed teeth, and pulpotomy), and completing non-surgical root canal therapy on anterior teeth **(Figure 2).**

The results pertaining to treatment site indicate that confidence was reduced as treatment moved posteriorly for premolars and molars. Participant's reported confidence levels for completing a pulpectomy on premolar and molar teeth were 87% and 81%, respectively. Furthermore, the participant's confidence in providing definitive NSRCT align with the previous trend. For NSRCT on premolar teeth, the confidence level was 81% and for molar teeth, 70%.

Of the general dentists (63A), 64.9% reported completing a root canal within the last year. This is in stark contrast to the specialty-trained dentists, whom have

combined, 6.1% reporting completion of a root canal in the past year **(Figure 3)**.

Out of all participants, 54% (n=121) reported completion of an Advanced Education in General Dentistry (AEGD). Of respondents that did attend an AEGD program, 41% receive mentorship from other general dentists and 62.4% are mentored by endodontists. A surprising finding is that 19.8%, in this same group, reported having no resources for endodontic continuing education.

The pre-doctoral NSRCT graduation requirement of zero to five teeth was reported by more than half of survey participants. Only 4.5% of respondents reported having an endodontic graduation requirement from dental school being greater than twenty teeth **(Figure 4)**.

DISCUSSION

Future conflicts are always in consideration with military leadership as the battlefield is dynamic and ever-changing. Lessons of the past, provide retrospective analysis of missed opportunities or areas of future focus. Even with a dentally fit Force, the incidence of DNBI of campaigns in Iraq and Afghanistan identified areas of improvement. Until recently, there was no unified way to verify that healthcare providers were ready to carry out their mission in an operational environment. Army Medicine identified another prospect of enhancing healthcare provider's integration of skills and technology that will lead to successful completion of the mission. This translates into greater investment of time, knowledge, and skill enhancement of each individual DC Officer.

As an Army DC Officer, there are many opportunities to further your career as both a dentist and an Officer. The DC encourages its Officers to seek Army leadership education opportunities such as Captains Career Course (CCC), Intermediate Level Education (ILE), or possibly Command and General Staff College (CGSC) if selected by the selection board. As a dentist, the DC encourages Officers to seek specialty training through applying to graduate dental education. One of the more recent opportunities for DC Officers, is implementation of a task list that will enhance their skill set that goes beyond dental specialty training. This also highlights the difference between military and civilian dentistry, which is providing dental care in austere environments.

The Army DC obtains its providers by either the Health Professions Scholarship Program (applied for after acceptance into or during dental school) or Direct Commission in which a dentist joins after obtaining a dental degree. With there being 69 accredited dental schools in the US (American Dental Association, 2022), this provides a spectrum of clinical experience and training. The landscape of pre-doctoral endodontic education in the US and Canada was evaluated in 2014 and it was found that graduates averaged 5.9 root canals on live patients. More than one third of program directors felt that their graduates were not competent in performing molar endodontics. Furthermore, the completed clinical case requirments has remained unchanged since 1975 (Woodmansey, 2015). This aligns with the findings of this study; with more than half respondents reporting a pre-doctoral endodontic requirement of five teeth or less.

Another confounding factor pertinent to pre-doctoral education, is the effect of COVID-19 on current training standards and curriculum. On April 14, 2020, temporary flexibility in accreditation standards in response to COVID-19 for the Class of 2020 was released (CODA, 2020). This flexibility is under frequent review and in October 2020, CODA released its revised accreditation standards for the class of 2021 (CODA, 2020). These recommendations lead to reduced clinical requirements, and to compensate, there was more utilization of virtual platforms for learning.

Even with these factors most participants reported a high level of confidence with obtaining a diagnosis, placing a rubber dam, and providing palliative treatment (managing acute swellings, trauma, and pulpectomies). This highlights the high quality of didactic training that is received in US dental schools.

However, clinical experience with endodontic procedures is needed to improve a providers' competence. The Army does provide the opportunity for further education in general dentistry through an AEGD. In this study, half of the respondents reported completing an AEGD. The remaining participants that had not completed an AEGD reported endodontic CE being obtained by mentorship within their respective clinics. This highlights the importance of having active duty endodontists that can share their knowledge and clinical experience.

A finding that was anticipated was an increased lapse of time in "last NSRCT" in the population of specialists (6.1% in the past year). There is minimal need or opportunity for specialties outside of endodontics to incorporate it into their daily workload. This confirms the need for familiarization with specific procedures that DC providers' are not frequently performing.

ICTL readiness will we tracked in DTMS by various methods. Some of the sub-tasks will be tracked by codes reported in each providers' submitted workload. With certain endodontic procedures, however, the approval will be based on a bench-top competency assessment (Army Dentistry Dental Corps Bulletin, 2019). Since its recent inception, there is little historic reference for the ICTL implementation and guidance. The competency-based system that it utilizes seems to be the best way to calibrate each provider with differences in training and experience.

Competence comprises an integration of knowledge, skills and attitudes indicating a capability to perform professional tasks safely and ethically. The process in becoming competent is complex, as this is developed with student-focused learning and not just numerical targets (Chuenjitwongsa, 2018). There is no didactic requirement for the ICTL but it gives familiarization with certain procedures and valuable time with experienced specialists. The task list has the potential to produce more well-rounded providers that can adapt to any environment, whether deployed or not. Since there is no way to assess the competence via survey, we felt it appropriate to assess the participant's perceived competence with confidence statements.

CONCLUSION

With the recent implementation of the ICTL's, this study gave a timely assessment of the DC's readiness to this new standard. The findings identified areas of opportunity to improve DC providers' confidence in

essential, endodontic procedures. Furthermore, this study highlights the need for familiarization in endodontic procedures among non-endodontic specialists. Our hope is that the findings of this study can be used by DENTAC Commanders for novel methods of training their providers. Furthermore, this data can be used for the advancement of dental education in the USA.

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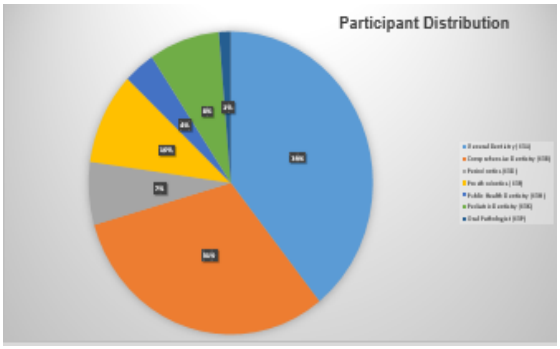

Figure 1.

Distribution of the 224 participants based on AOC.

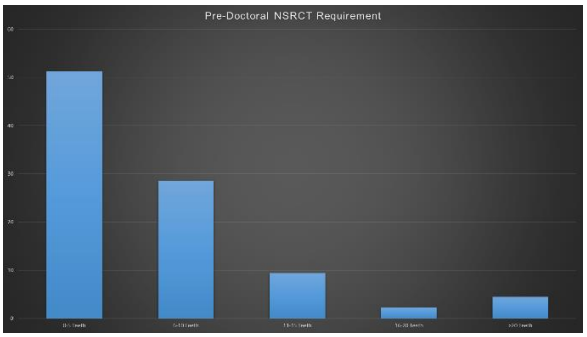

Figure 4.

Reported pre-doctoral NSRCT endodontic requirement.

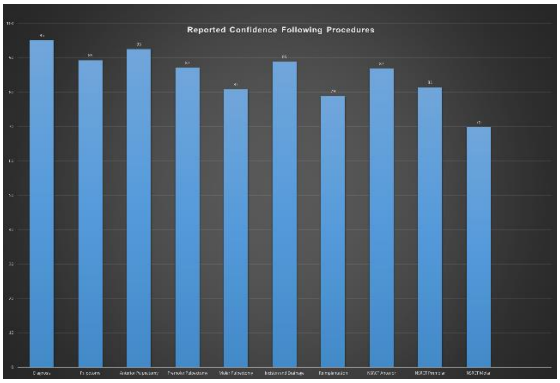

Figure 2.

Participant's confidence levels in various procedures

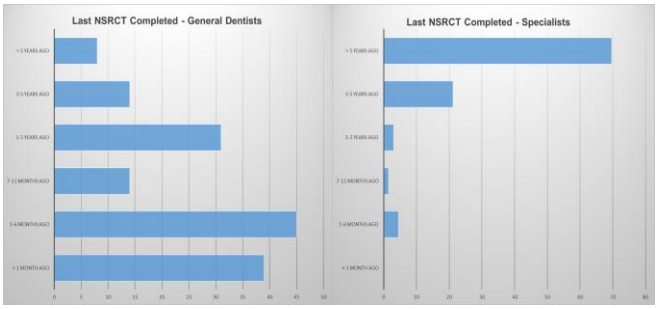

Figure 3.

Time since last NSRCT reported from general dentists compared to all other specialists.