

Spring 5-2022

## Disaster Victim Identification Competencies: A Comparison of Dental Hygiene and Dental Assistant Students

Samantha Clara Vest  
*Old Dominion University*, svest001@odu.edu

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Vest, Samantha C.. "Disaster Victim Identification Competencies: A Comparison of Dental Hygiene and Dental Assistant Students" (2022). Master of Science (MS), Thesis, Dental Hygiene, Old Dominion University, DOI: 10.25777/cr27-wb65  
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DISASTER VICTIM IDENTIFICATION COMPETENCIES: A COMPARISON OF DENTAL  
HYGIENE AND DENTAL ASSISTANT STUDENTS

by

Samantha Clara Vest  
BSDH May 2019, Old Dominion University

A Thesis Submitted to the Faculty of  
Old Dominion University in Partial Fulfillment of the  
Requirements for the Degree of

MASTER OF SCIENCE

DENTAL HYGIENE

OLD DOMINION UNIVERSITY  
May 2022

Approved By:

Brenda Bradshaw (Director)

Marsha Voelker (Member)

Ann Bruhn (Member)

Tara Newcomb (Member)

Sinjini Sikdar (Member)

## ABSTRACT

### DISASTER VICTIM IDENTIFICATION COMPETENCIES: A COMPARISON OF DENTAL HYGIENE AND DENTAL ASSISTANT STUDENTS

Samantha Clara Vest  
Old Dominion University, 2022  
Director: Prof. Brenda Bradshaw

**Purpose:** The purpose of this study was to assess cognitive and affective learning outcomes of allied dental students following a disaster victim identification (DVI) multi-media learning experience. **Methods:** A convenience sample (n=41) of senior dental hygiene and dental assisting students from two institutions completed an IRB-exempt DVI learning experience which included a multimedia intervention with a pretest/posttest survey to assess cognitive and affective changes. The multimedia intervention was a PowerPoint presentation with educational text, audio/video recordings, and presented in a virtual synchronous format by one of the researchers. After completing the learning experience, participants were presented with 10 sets of mismatched antemortem (AM) and postmortem (PM) digital bitewing radiographs to test their cognitive ability to indicate identification matches. The researcher-designed seven item 3-point Likert scale pretest/posttest survey completed in Qualtrics by all participants to assess perceived cognitive and affective learning outcomes. **Results:** Following the learning experience, dental hygiene (n=27) and dental assistant (n=14) students accurately matched at least four out of five radiographic DVI sets for an accuracy rate of 80%. However, a Fisher's exact test revealed a statistically significant ( $p=0.013$ ) increase of DVI match performance for dental hygiene compared to dental assistant students. Most participants (n=38, 92%) indicated they felt moderately or extremely confident to assist with DVIs because of curricula from their respective programs. A linear trend test assessed pre and posttest perceived cognitive knowledge of DVI

skills and affective attitudes regarding perceived importance of professional DVI volunteerism for mass fatality incidents and revealed statistically significant ( $p < 0.05$ ) increases for both.

**Conclusion:** Results show a multimedia learning experience may significantly increase allied dental students' cognitive and affective abilities to aid in DVI efforts. Additional research with larger samples of allied dental students could provide more information about the efficacy of including such learning experiences in curricula where there are current gaps.

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## **ACKNOWLEDGEMENTS**

Thank you first and foremost to my thesis director, Brenda Bradshaw, for her time, expertise, mentorship, and support throughout this project. I could not have done any of this without her! I also would like to thank the remainder of my committee: Marsha Voelker, Ann Bruhn, Tara Newcomb, and Sinjini Sikdar for their guidance in helping make this project happen.

This thesis is dedicated to my parents, Amy, and Trevor Vest. I could not have achieved this without their love, advice, and wallets. To the rest of my family and friends, thank you for believing in me and being there for every accomplishment.

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## **CHAPTER 1**

### **INTRODUCTION**

Forensic odontology was defined in 1970 by Keiser-Neilsen as “that branch of forensic medicine which in the interest of justice deals with the proper handling and examination of dental evidence and with the proper evaluation and presentation of the dental findings.”<sup>1</sup> The forensic odontology scope of practice encompasses scientific methodologies related to human age estimation, bitemark evaluation, and identification of deceased individuals used for legal investigations.<sup>2</sup> Teams that assist with forensic odontology can include medical examiners, coroners, dentists, dental hygienists and dental assistants. These professionals collaborate with forensic odontologists for medico-legal purposes including scientific collection, handling, and reporting of dental evidence. Additionally, these teams are relied upon following natural and man-made disasters resulting in an overwhelming number of unknown decedents requiring identification.<sup>2-4</sup>

Mass fatality incidents (MFIs) are defined by the National Association of Medical Examiners (NAME) as “any incidents resulting in more decedents to be recovered and examined than can be managed in the local medical examiner/coroner jurisdiction.”<sup>5</sup> The International Criminal Police Organization (INTERPOL), recommends all countries have standardized procedures and specially trained, deployable teams, who can assist in MFI efforts.<sup>6</sup> INTERPOL published the first disaster victim identification (DVI) manual in 1984 which specifies policies and procedures on proper mitigation of DVI processes.<sup>6</sup> During past large-scale MFIs when the number of available forensic odontologists has been exhausted, dental hygiene and dental assistant responders have successfully contributed to identification efforts through volunteering, by serving on both ante- and postmortem teams, thereby reducing exorbitant delays in the DVI

process.<sup>7,8</sup> DVI requires a multidisciplinary approach with specialized training so responders can perform duties safely, efficiently, and accurately.<sup>9-11</sup>

Various national and governmental groups such as the American Board of Forensic Odontology (ABFO), Medical Reserve Corp, and Disaster Mortuary Operational Response Teams (D-MORT) have enlisted the help of dental hygienists and dental assistants for disaster victim identification during MFIs.<sup>2,10,12</sup> Formal dental hygiene educational curriculum consisting of oral radiology, oral anatomy and histology, as well as clinical practice<sup>13-14</sup> are recognized as being closely aligned with forensic odontology educational curriculum.<sup>15</sup> Additionally, similar to dental hygiene, educational requirements of dental assistant programs also align with forensic odontology curriculum, including, principles of dental charting documentation, maintaining accurate patient treatment documentation, dental morphology, and dental radiology,<sup>12,16</sup> all of which are skills beneficial to the DVI process.<sup>14</sup>

Unfortunately, forensic odontology and disaster preparedness are rarely included in dental hygiene or dental assisting curriculums possibly due to a lack of accreditation standards related to forensics and emergency preparedness.<sup>17-21</sup> However, a study done by Newcomb et al., suggests that a multimedia approach can be successful for MFI training and DVI tasks.<sup>21</sup> It has been recommended that forensic odontology curriculum and DVI competencies be developed for allied dental professionals.<sup>22</sup>

### **Statement of the Problem**

Current literature lacks research on the effects of DVI learning interventions on cognitive and affective learning outcomes for allied dental professionals. This study seeks to answer the following research questions:

- Will there be an increase in perceived DVI competency for dental assistant and dental hygiene students following a multimedia learning experience?
- Will there be an increase in actual skill assessment of dental assistant and dental hygiene students following a multimedia learning experience?
- When presented with a simulated case, will there be a difference in skill assessment between dental hygiene and dental assistant students when asked to perform DVI activities?
- Following a multimedia learning experience, will dental hygiene and dental assistant students express an increase in their desire to volunteer for DVI activities during a MFI?

### **Significance of the Problem**

Dental hygienists and dental assistants have been identified by authoritative bodies such as the ABFO, United States Government, NAME, American Society of Forensic Odontology (ASFO) as possessing useful skills in DVI tasks based on their education.<sup>2,5,12</sup> In the literature, allied dental students' participation with DVI work during MFIs is recognized and valued.<sup>2, 9-12,15</sup> However, there is a lack of literature which addresses forensic-based education needed to prepare dental hygiene and dental assistant graduates, and the transferability of specific skills useful to DVI. This study investigated allied dental students' perceived possession of DVI skills prior to participating in the research, the ability to perform DVI matching skills following a multimedia learning experience, and perceived confidence among participants for future DVI volunteerism. Additionally, this study will determine if there is a difference in simulated DVI performance between dental hygiene students compared to dental assistant students. Research of effective pedagogical approaches to create DVI skill competency could inform allied dental programs of options for incorporation into formal curriculum. Graduating allied dental professionals prepare

to contribute to DVI relief efforts could strengthen local and national emergency management efforts.<sup>21,23</sup>

### **Definition of Terms**

Mass Fatality Incident (MFI): The loss of human life that coincides with a disaster which results in various quantities of human remains that exceeds the local response teams' ability to locate, identify, document, and finalize remains.<sup>24</sup>

Disaster Victim Identification (DVI): The formal process of identifying human remains for legal confirmation, typically occurring due to a disaster.<sup>2</sup> A forensic odontologist may be called upon to provide comparative dental analysis that is useful in the victim identification process.<sup>2</sup>

Forensic Odontology: Branch of forensic science that utilizes technical skills for collecting, examining, and evaluating dental evidence which has the potential to be utilized by law enforcement. This is primarily used in the identification process of deceased victims.<sup>25</sup>

Forensic Odontologist: Recognized professional who practices in the field of forensic odontology and possesses certification based on the standards of the governing board, American Board of Forensic Odontology.<sup>2</sup> These experts are board certified dentists who complete trainings and additional certifications to become specialized in the field of forensic odontology. They handle a range of medicolegal tasks, but primarily assist with identification of human remains.<sup>25</sup>

Antemortem (AM) data: Material collected on a person prior to their death that could be used for identification. The AM data can consist of medical and dental records established prior to their death. Items of an AM dental record include: intraoral and extraoral photographs, diagnostic models, detailed written records with identifiers, and recent diagnostic quality dental radiographs.<sup>9</sup>

Postmortem (PM) data: Material collected from a deceased body for the use of personal identification. PM dental record items may include: dental occlusion, present or missing dentition, characteristics and materials of restorations, dental radiographs, dental arch shape, presence of dental appliances, soft/hard tissue descriptors, and any other findings that could be of interest to assist with positive identification in comparison against AM record.<sup>9</sup>

Biomaterials: Natural or man-made surfaces, matter, or constructs that interact with biological systems. Many medical devices are made of biomaterials using composite, ceramics, polymers, or metallic components. Examples include hip replacements, heart valves, and several materials used within dentistry. In the dental setting, biomaterials may be referred also to “dental materials.”<sup>26</sup>

### **Assumptions**

This study is based on the following beliefs:

1. All participants are undergraduate senior dental hygiene and senior dental assistant students at accredited dental hygiene and dental assistant programs.
2. All participants completed the learning experience and answered all assessment questions to the best of their ability.
3. All participants completed the learning experience without collaboration or discussion of activities with other students.
4. The participants were able to comprehend the vocabulary used in the learning experience and assessments.
5. Prior to this research, the dental hygiene students did not receive formal education in the topic of forensic odontology however, the dental assistant students had 3 hours of formal education on forensic odontology and DVI.

## **Limitations**

The internal and external validity of this study might be affected by:

1. The sample population consisted of a convenience sample of senior dental hygiene students from Old Dominion University in Norfolk, Virginia and senior dental assistant students from Metropolitan Community College in Kansas City, Missouri. Therefore, the sample population might not be representative of other dental hygienists and dental assistants and the results and conclusions cannot be generalized to other populations of dental hygienists and dental assistants.
2. It is possible that the survey questions or learning experience provided was misinterpreted by the participants.
3. The Qualtrics survey platform used for data collection limited participants' ability to magnify images.

## **Hypotheses**

The following hypotheses were tested at the 0.05 level of significance:

1. Senior level dental hygiene and dental assistant students will be able to accurately match at least 4 out of 5 AM and PM dental radiographic sets.
2. There will be an increase of DVI match performance for dental hygiene students compared to dental assistant students.
3. Participants will indicate an increase in perceived DVI knowledge upon completion of the learning experience.
4. The participants will have an increased perception of the importance for their respective profession to volunteer in DVI after completing the learning experience.



## **Chapter II**

### **REVIEW OF LITERATURE**

To provide a theoretical framework for this study, recent and relevant literature is included regarding the skills and formal education dental hygienists and dental assistants possess to assist with DVI during MFIs.

#### **History of Allied Dental Professional Involvement with DVI**

Disaster victim identification (DVI) is a social justice issue often compounded by mass fatality incidents (MFIs). Naturally occurring meteorologic and geological disasters, as well as man-made disasters produce MFIs of great challenges due to the enormity of damage caused to architectural and travel infrastructures, utility services, and loss of life which may supersede the number of those available to support recovery efforts. In such cases, response and mitigation requires tremendous effort from a variety of skilled professionals. Section VI of the 2020 ABFO Diplomates Reference Manual lists dental hygienists and dental assistants as auxiliary personnel with required “special skills” for DVI team development during MFIs.<sup>2</sup> In the past when the available forensic odontologist workforce was exceeded, allied dental professionals were recruited to support DVI efforts.<sup>7,8,10,15,27</sup> Dental hygienists assisted DVI teams with the 1978 collision of a Pacific Southwest Airline 727 jet and a Cessna 172 aircraft in San Diego, California,<sup>28</sup> the 1980 MGM Grand Hotel Fire,<sup>14</sup> the 2001 World Trade Center attack in New York City,<sup>7</sup> and the 2011 F5 tornado in Joplin, Missouri.<sup>29</sup> Additionally, dental assistants that served in the US Air Force volunteered with DVI tasks for fallen reserve members and government officials.<sup>27</sup> Combined, these tragedies included over 3,100 victims and 400 volunteer dental auxiliary team members including dental hygienists and dental assistants that supported DVI tasks.<sup>7,14,28,29</sup> According to literature published on DVI, allied dental professionals

such as dental hygienists and dental assistants are ideal for supporting local and national emergency teams to increase the efficiency and success of DVI efforts due to their dental related expertise.<sup>21,23,30</sup>

Additionally, the Pandemic and All-Hazards Preparedness Reauthorization Act of 2013 recognizes dental professionals and dental facilities as necessary for responding during a MFI.<sup>31</sup> Dental hygienists and dental assistants fill this response need as members of local and national emergency organizations that assist with identifying, recruiting, organizing, and training professional volunteers prior to MFIs including: the Emergency System for Advance Registration of Volunteer Health Professionals (ESAR-VHP), Disaster Mortuary Operational Response Teams (DMORTs), Medical Reserve Corps (MRC), American Red Cross, and the Community Emergency Response Teams (CERT).<sup>32-36</sup> Such organizations have become the authority for healthcare professional volunteer management and enlist allied dental professionals for appropriate deployment in accordance with individual expertise for DVI events.<sup>21,23,30</sup> When volunteers assisting DVI tasks have formal dental-related education, it benefits DVI teams when there is a shortage of forensic odontologists, as they outperform volunteers without dental related education.<sup>7, 37,38</sup> Currently, there are over 220,000 dental hygienists across America with 7,300 annual graduates<sup>39</sup> and over 330,000 dental assistants with 4,003 that graduated from an accredited program<sup>13,40</sup> making these professionals a widespread and plentiful resource for potential volunteers with dental expertise. During MFIs with a shortage of manpower, it can be a challenge to adequately manage all aspects of DVI in a timely manner while ensuring scientific methodology necessary for DVI medicolegal integrity. Therefore, dental hygienists and dental assistants can serve a critical need as supplemental staffing due to their dental knowledge and skills.

## **Formal Curriculum for the Allied Dental Professional**

Dental hygienists are defined by the American Dental Hygienists' Association (ADHA) as oral health professionals graduated from an accredited dental hygiene program and licensed to provide services including assessment, administrative roles, and diagnostics related to oral health.<sup>41</sup> Furthermore, the 2018 Standard Occupational Classification (SOC) states dental hygienists are classed categorically with dentists and recognized as “healthcare diagnosing or treating practitioners” competent to assess patient oral health and maintain medical records.<sup>42</sup> Dental hygienists are required to complete at minimum of a two-year academic program at the associate or baccalaureate degree level with an average of 2,932 instructional clock hours, with 659 of those hours dedicated to clinical dental hygiene instruction.<sup>43</sup> At the beginning of a dental hygiene program, 6 hours per week are dedicated to clinical instruction and by the senior year, 12-16 hours are completed each week.<sup>13</sup> The Commission on Dental Accreditation (CODA) develops and implements standards that promote quality and continuous improvement of dental education programs including dental hygiene and dental assistant. Since a dental hygienist must graduate from an accredited program to obtain a dental hygiene license, the curriculum at these institutions must follow CODA standards with demonstrated cognitive, psychomotor, and affective skill competencies including content which is inherently common to DVI.<sup>2,41,44-45</sup>

The American Dental Assistants Association (ADAA) defines dental assistants as “highly technical skilled workers responsible for working under the supervision of dentists with a wide range of tasks in the dental office, ranging from patient care to administrative duties to laboratory functions.”<sup>46</sup> Dental assistants can range in the types of education they receive, certifications and registrations they attain, as well as the functions they can do based on the state they live in. Dental assistants can receive their education from either one of the 240 CODA accredited

institutions in the United States or can receive on the job training without any previous education requirements.<sup>46</sup> Additionally, dental assistants who complete a CODA accredited program or have on the job training with two years or 3,500 hours of full time work experience are eligible to take the certified dental assistant (CDA) examination that is offered by the Dental Assisting National Board (DANB).<sup>46</sup> Accredited dental assisting programs must have a minimum of 900 instructional hours with at least 300 hours being clinical based.<sup>16</sup> Included within the dental assisting curriculum is: anatomy, radiology, dental materials, and pathology which are necessary for DVI.<sup>16,44,45</sup> Dental assistants can utilize their skills and knowledge interprofessionally to assist a DVI team similar to that of a dental hygienist; however, dental hygienists have a larger scope of practice in abilities they can perform.<sup>44</sup>

The American Dental Education Association (ADEA) provides a 246-page curricular guidelines Compendium regarding dental hygiene and dental assistant formal education with five major curricular topics common to the ABFO's Model of Curricular Topics for Forensic Odontology including: anatomy, histo-embryology, dental radiology, pathology, and dental materials.<sup>44-45</sup> The Compendium states the cognitive knowledge within these interrelated major topics should be integrated with opportunities for skill application and critical thinking. Within the dental radiology section of the Compendium, forensic identification is listed as a legal issue that should be included within the curriculum.<sup>44</sup> Integration of forensic identification with the other major curricula topics would increase the ability of a graduate to transfer the knowledge to DVI.<sup>44</sup> For example, allied dental professionals' foundational knowledge of oral anatomy and histo-embryology is stated in the Compendium to be applicable to radiology, periodontology, pathology, and dental materials.<sup>44</sup> Additionally, having an understanding of dental materials and

dental radiology can assist with AM and PM radiographic comparison and transcribing of data for dental charting.

The first two major curricular topics listed in the Compendium for dental hygiene and dental assisting are anatomy and histo-embryology which includes the cognitive and psychomotor abilities of defining locating, and applying knowledge of dental morphology, occlusion, and oral histology and embryology during intra- and extraoral exams.<sup>44,47</sup> Within these topics, tooth morphology and dentition identification are key concepts taught in allied dental programs.<sup>44</sup> Clinical competence of these cognitive and psychomotor abilities are assessed comprehensively throughout the duration of educational programs and require visual acuity and discrimination between normal and atypical characteristics which are unique to each individual;<sup>44</sup> skills critical for human identification.<sup>47-48</sup>

The third major curricular topic, dental radiology is an integral part of dental hygiene and dental assisting educational programs with concepts learned in both cognitive and psychomotor domains. Specifically, dental radiographic images are a major source of visual evidence for DVI and heavily reliant on learned principles of dental radiology imaging theory and interpretation for quality assurance.<sup>49-51</sup> Exposure of diagnostic dental radiographic images and preliminary interpretation for live patients is most often completed by clinical dental hygienists and assistants and is therefore a major component of didactic and clinical teaching for these educational programs.<sup>44,52</sup> However, the ADEA Compendium of Curriculum Guidelines does state the level of competency for interpretation of radiographs is higher for dental hygienists versus dental assistants.<sup>44</sup> Dental hygienists are expected to be self-directed and self-assured in their ability to apply scientific principles of dental radiology to produce diagnostic radiographs, problem solve

factors affecting image quality and maintaining accurate corresponding records which could serve as AM evidence.<sup>44</sup>

The fourth major topic of oral pathology in dental hygiene and dental assisting curriculum is based on the cognitive ability to collect and interpret evidence gathered from a variety of sources including extra- and intraoral findings corroborated with radiographic interpretations for the purpose of determining a differential diagnosis.<sup>44</sup> Such corroborations include knowledge of how manifestations of pathology may appear radiographically due to developmental disturbances or environmental alterations of the teeth and/or bone including conditions like tori, supernumerary teeth, atypical exfoliation patterns, atypical sizes and shapes of the dentition, cysts, abscess, calcifications, resorption, attrition, abrasion, and erosion.<sup>44,53</sup>

Finally, allied dental professionals are required to have theoretical and laboratory curriculum for the science and technology of biomaterials as it relates to all dental specialties regarding materials and devices and serves as the fifth major topic.<sup>44</sup> Additionally, allied dental program curriculum for dental materials science includes content on physical and chemical properties of various materials and how they behave or change as a result of mechanical stress and thermal exposure<sup>44,54</sup> which are important DVI concepts due to disaster scenarios involving high heat trauma that may impact the identification process.<sup>45,54-56</sup> Further, the intended interrelationship of this topic includes the ability to cognitively evaluate expected post-operative outcomes of restorative work for documentation purposes, analyze radiographic images to identify therapeutic dental materials, and the ability to participate in a variety of interdisciplinary settings,<sup>44</sup> including DVI morgues.<sup>45,54-55</sup>

While ABFO Curricular Guidelines emphasizes the above mentioned five critical core curricular topics of anatomy, histo-embryology, radiology, pathology, and dental materials, there

are other important topics included in dental hygiene and dental assisting curriculum useful for DVI. Periodontology, administration skills such as record management, interprofessionalism, and cultural competency are also part of allied dental curriculum<sup>44</sup> and are important for DVI.<sup>9-10,15,21</sup> For example, knowledge of periodontics can be useful in DVI through integrated knowledge of clinical and radiographic disease-recognition, periodontal charting, complex extraoral and intraoral hard and soft tissues and gathering information from the periodontal assessment.<sup>44</sup> Allied dental professionals also learn administration skills in their curriculum that can be useful in DVI such as record maintenance, management of other personnel, and restocking and maintenance of supplies and equipment.<sup>44</sup> Dental hygiene and dental assisting formal education also includes content on interprofessional collaborations including principles of surgical assistance which may be needed to access intraoral structures of human remains.<sup>10,14-15,21,44</sup> Further, dental hygiene graduates are prepared with cultural competency for diverse populations from other social, religious, and cultural backgrounds which can be vital in DVI cases when certain procedures are prohibited due to cultural or religious opposition.<sup>44,57</sup>

The ABFO Model of Curricular Topics for Forensic Odontology and the Diplomates Manual recognizes dental hygiene and dental assisting formal education as preparing specialized auxiliary DVI team members with cognitive, psychomotor, and affective foundational knowledge and skills applicable to DVI when assisting forensic odontologists.<sup>2,44-45</sup> Roles within the DVI team model where this foundational knowledge can be applied includes antemortem, postmortem, and comparison phases.

### **Roles of the Allied Dental Team Member During MFIs**

Research has documented that dental hygienists and dental assistants have demonstrated success while assisting actual DVI events due to their knowledge and skillsets applicable to roles

of DVI teams.<sup>10,12-13,15-16</sup> Specifically, dental hygienists and dental assistants can serve in administration roles and as active members of the AM, PM, and comparison teams.<sup>22,45</sup>

AM dental record keeping and management is crucial to DVI and is largely dependent on the care and skill of clinically practicing dental hygienists and dental assistants. AM dental record components useful to DVI include: updated and accurate dental and medical histories, dental and periodontal chartings, treatment plans, diagnostic dental radiographic images and photographs, as well as study cast models.<sup>9</sup> Unfortunately, due to a lack of standardization among dental professionals and subjective documentation styles, the AM interpretation process is considered the most time-consuming task facing forensic odontologists.<sup>10</sup> Dental hygienists and dental assistants can assist forensic odontologists with these tedious tasks and thereby allow forensic odontologists to focus more on the comparison process needed for positive identification and making the official declaration of identification.<sup>10</sup> Allied dental professionals are educated about common notations, abbreviations, dentition numbering systems, and dental charting,<sup>44</sup> making them ideal for assisting the forensic odontologist with de-coding collected AM records to increase efficiency.<sup>10,15, 21</sup> Additionally, they have the ability to monitor the location and integrity of AM victim records on-site in a disaster morgue.<sup>10,58</sup> Unfortunately, AM dental records are often inaccurate or contain insufficient detail to support DVI efforts. For example, during the 2004 Asian tsunami, DVI team members found that out of 106 AM dental records received, 54% of the dental radiographs were undiagnostic; some records did not have AM radiographs, and many records were determined to be unusable due to insufficient information.<sup>59</sup> When affective learning outcomes are achieved, clinical dental hygienists and dental assistants can support DVI efforts by advocating for and managing comprehensive and accurate AM dental records that would be useful to DVI teams.<sup>10,21</sup>



The education of allied dental professionals focuses on the care of live patients to support oral health. While much of the educational competencies gained are applicable to forensic odontology, there are also differences which require additional specialized training to correctly perform PM DVI tasks. Allied dental professionals are competent with exposing and interpreting dental radiographic images to identify anatomical landmarks, dental materials, and pathology for live patients; importantly, this serves as AM data.<sup>44</sup> With additional specialized training, dental hygienists and dental assistants can assist the PM team by exposing radiographs, taking photographs, cleaning debris from victim remains, charting observations from examinations, and assisting with surgical procedures so that PM data can be established.<sup>10,15,44</sup> When exposing radiographic images, dental hygienists and dental assistants are taught the foundational techniques such as paralleling and bisecting using traditional digital radiography on a live patient in standard imaging position,<sup>44</sup> but for DVI, these techniques and devices may differ due to atypical positioning. When working with victim remains, PM radiographic images can be difficult to obtain due lack of occlusion and difficulty locating teeth of interest, causing members of the forensic odontology team to use atypical positioning and aids.<sup>60</sup> Allied dental professionals can participate as one of the 3-team members during the cross-checking and quality assurance model.<sup>10,14-15,21</sup> For example, one forensic odontologist can review the remains and have the dental hygienist or dental assistant document findings; a second forensic odontologist will cross-examine and verify the findings.<sup>15</sup> Additional PM tasks include proper storing, labeling, and chain of custody for collected evidence such as surgically removed remains.<sup>15</sup>

Once AM and PM data has been collected, comparison between the data can begin using DVI dental record software such as WinID3 or DVI System International®. These tools digitally organize, sort, and compare numerous victim records with large amounts of AM and PM

data.<sup>10,61</sup> Hygienists and assistants trained on the operational functions of these identification software can organize the data and perform search commands of comparable information among uploaded AM and PM dental records.<sup>10</sup> Then, AM and PM data undergoes comparative dental analysis, so the forensic odontologist can determine a degree of certainty for the identification.

Based on formal curriculum alone, dental hygienists and dental assistants have the ability to be successful in DVI activities and provide assistance during MFIs. In a study by Bradshaw et al., 30 senior dental hygiene students completed a multimedia learning experience on proper collection and documentation of forensic dental evidence and were tasked with dental charting and matching three bitewing radiograph sets to three human skull dentitions.<sup>62</sup> The participants' accuracy scores ranged from 91.23% to 99.06% for dental charting AM and PM data and all participants were able to correctly match the three radiographic sets and skull dentitions with 100% accuracy; there was no statistically significant difference based on whether or not the participants had prior experience in the field of dentistry as a dental assistant.<sup>62</sup> This data shows that dental hygiene formal education alone sufficiently allowed the dental hygiene senior students to be successful in their ability to accurately dental chart and match AM radiographs to PM dentitions.<sup>62</sup> Similar to dental hygienists, dental assistants can also successfully participate in DVI as reported by Hanks et al., when US Air Force dental assistants provided with just-in-time DVI training worked on a multidisciplinary team of oral pathologists, dentists, pathology technicians, and three radiology technicians to assist with identifying deceased armed forces members.<sup>27</sup>

While current dental allied professionals' curriculum is successful in providing foundational knowledge needed for DVI, further specialized training and education is needed.

Zohn et al., suggested that forensic odontology curriculum for dental professionals should include hands-on simulated disaster preparedness experience, as well as opportunities to attempt identification of AM and PM dental evidence to provide positive identifications.<sup>7</sup> Infection control curricula of the formal education for both dental hygienists and dental assistants is specific to private clinical settings in which professionals must have knowledge and skillsets in preventing disease transmission, standard precautions for management of individuals with blood-borne pathogens, as well as an understanding of sterilization and disinfection techniques.<sup>44</sup> However, during an MFI, standard infection control procedures differ due to the environment where the MFI takes place and physiological changes which occur within the corpse including the breakdown of the blood-brain barrier.<sup>63</sup> Therefore, allied dental professionals should have specialized infection control training for morgue settings. When specialized training and knowledge is provided, dental hygienists and dental assistants can become an integral part of the forensic odontology team able to fully support medicolegal requirements in a safe manner.

To date, there is very little research which quantifies specific DVI skills able to be performed by allied dental professionals. Therefore, the purpose of this study, which is the first of its kind, is to fill a gap in the literature by gathering data on senior level dental hygiene and dental assisting students' ability to perform a simulated DVI task of deciding on identification matches when visually comparing AM and PM bitewing radiographs following a multimedia learning experience. This study also gathered information on the participants' self-reported perceived skills, knowledge, and attitudes regarding forensic odontology and DVI. The data collected can help assess the relevance of including dental hygienists and dental assistants for future DVI assistance during an MFI.

### **CHAPTER III**

#### **METHODS AND MATERIALS**

Exempt approval from the Institutional Review Board (IRB) (see Appendix A) was obtained following review of the proposed research protocol for the protection of human participants from Old Dominion University (ODU) and Metropolitan Community College – Penn Valley (MCC-Penn Valley). Participants reviewed and signed the informed consent letter provided to them via email and sent it back to the research investigators (see Appendix B). Respondents were informed of the anonymity within the project and that results would be available upon request. The multimedia learning experience consisted of a PowerPoint presentation with educational text, audio/video recordings, examples of victim cases with radiographs, and it was presented in a virtual synchronous format by one of the researchers (see Appendix C). Prior to the learning experience, participants created a unique identifier to retain anonymity and completed a researcher designed pretest survey of seven 3-point Likert-scale questions which asked participants to indicate their perceived levels of agreement as “slightly”, “moderately”, and “extremely” regarding DVI topics such as understanding of the scope of forensic odontology, who a forensic odontologist is, the application of DVI in MFIs, understanding of how oral radiology and morphology are used in DVI, their confidence to assist with forensic odontology, and the importance of assisting DVI when needed (see Appendix D).

Immediately following the learning experience, participants completed a post-test survey to assess cognitive and affective changes resulting from exposure to the learning experience (see Appendix E). The posttest survey asked the same seven 3-point Likert-scale questions which appeared on the pretest survey, and also contained ten mismatched AM and PM bitewing radiographs derived from individual dental charts. Participants were asked to identify five

matching sets of those radiographs and indicate their degree of certainty for each match using drop down choice boxes. The bitewing radiographs used in the study were obtained from the Old Dominion University School of Dental Hygiene Care Facility, where informed consent was gained from the patients agreeing that record data may be used for teaching purposes or in scientific publications. The radiographs were de-identified by removing patient names, birthdates, and chart numbers by downloading each radiograph as a single image with no identifying information attached. The patient records were randomly selected, and two separate bitewing radiograph sets were derived from differing time periods to simulate one AM radiographic set and one PM radiographic set. Once randomized radiographs were selected, the researchers reviewed each set of radiographs and came to a consensus on which ones to use. Selected radiographs were deemed as qualifying if they included various identifying characteristics such as missing dentition, restorations, mixed dentition, and orthodontic treatment. For example, one simulated AM radiograph contained all third molars, whereas the simulated PM radiograph from the same patient but at a later date, showed the third molars had been extracted. Unique identifiers of remaining dentition still made it possible to match the case matched to make a positive identification. Additionally, four demographic information questions asked participants to indicate their student type (dental hygiene or dental assisting), age, gender, and race. The investigators designed and delivered the pre- and posttest surveys via the online questionnaire software, Qualtrics.

Respondents were informed that participation was voluntary and if they chose to provide an email address, they would be entered into a raffle for one of four \$25 Amazon gift cards. Prior to the participants receiving the multimedia presentation, the posttest survey was pilot-tested with a panel of eight dental hygiene faculty to establish content validity and clarity of the

instructions. The statistical software used was “R” Software and all results are based on  $\alpha=0.05$  significance level.

## CHAPTER IV

### RESULTS AND DISCUSSION

A convenience sample of N=48 senior dental hygiene and senior dental assisting students were recruited for this study. A total of n=27 dental hygiene students and n=14 dental assistant students were enrolled following informed consent, yielding a response rate of 85.4% (n=41). All participants were female (100%) and most (51.2%, n=21) were 18-22 years old. Participants self-identified as White (n=24, 58.5%), Black or African American (n=6, 14.6%), Asian (n=8, 19.5%), Hispanic or Latino (n=1, 2.4%), Native Hawaiian or Other Pacific Islander (n= 1, 2.4%), and Mixed or Other (n=1, 2.4%). Table 1 summarizes demographic descriptive statistics of the study population.

**Hypothesis 1: Senior level dental hygiene and dental assistant students will be able to accurately match at least 4 out of 5 AM and PM dental radiographic sets.**

Responses were made dichotomous, either (1) correct matches or (2) incorrect matches. Of the 41 total participants, 85% (n=35) correctly matched 5 out of 5 sets; and 15% (n=6) correctly matched 3 out of 5 sets. A one-sample binomial proportion test gave the result  $p < 0.0001$  revealing a p-value less than 0.05; hence, the null hypothesis that senior allied dental students would not accurately match at least 4 out of 5 AM and PM dental radiographic sets was rejected. Therefore, results show that participants were significantly able to accurately match at least 4 out of 5 AM and PM dental radiographic sets, as seen in Figure 1.

**Hypothesis 2: There will be an increase of DVI match performance for dental hygiene compared to dental assistant students.**

Participants' performance of matching the AM and PM radiographic sets was compared against student academic discipline: senior dental hygiene and senior dental assistant students. Participants' match performance based on academic discipline was defined into dichotomous categories of: (1) 5 correct matches and (2) less than 5 correct matches. All but one dental hygiene student (n=26, 99.96%) had 5 correct matches, compared to a little over half of the dental assisting students (n=9, 55%) which had five correct matches. A Fisher's exact test was utilized and revealed a p-value of 0.013. Hence, as seen in Figure 2, there was a significant association between matching performance of AM and PM radiographic sets and student academic discipline; therefore, the null hypothesis was rejected. Since there was an increase in match performance among senior dental hygiene students compared to dental assisting students.

**Hypothesis 3: Participants will indicate an increase in perceived DVI knowledge upon completion of the learning experience.**

Participants indicated their perceived knowledge of DVI concepts for Likert scale questions ordered as slightly (low understanding level), moderately, and extremely (high understanding level) on a pretest and posttest (see Table 2). For each question, a contingency table was created, and questions were tested individually with an one-sided greater than type linear trend test. Results revealed a significant increase of perceived knowledge from pretest to posttest (p-value<0.0001) when asked who a forensic odontologist was and their role in DVI. Participants also had a significant increase in perceived knowledge of the application of DVI used in MFIs (p-value of  $7.36 \times 10^{-10} < 0.05$ ) (Table 2). Statistical analysis revealed a significant increase in perceived knowledge about how dental radiology is used in DVI (p-value =  $6.72 \times 10^{-10}$ ).



$^{08} < 0.05$ ). Finally, statistical analysis also revealed a significant increase in knowledge about how dental morphology is applied to DVI (p-value  $3.17 \times 10^{-08}$  is less than 0.05). All questions yielded significant (p-value  $< 0.05$ ) results. Table II breaks down each question based on the number of responses for each understanding level.

**Hypothesis 4: The participants will have an increased perception of the importance for their respective profession to volunteer in DVI after completing the learning experience.**

A linear trend test analyzed students' pretest/posttest perceptions regarding the importance for their respective profession, dental assisting or dental hygiene, to volunteer in DVI and revealed a significant increase after completing the learning experience ( $6.04 \times 10^{-06}$  which is less than 0.05). Figure 3 shows the highest understanding level of both dental hygiene and dental assisting students before and after reviewing the learning experience. Dental hygiene students had a significantly higher level of understanding of the importance for DVI volunteerism following the learning experience compared to the dental assisting students who only increased slightly between the pre and post surveys.

## **Discussion**

Educational competencies of allied dental professional programs are applicable to DVI skills listed in forensic manuals. Additionally, the literature documents allied dental professionals serving as DVI team members for MFIs with no additional credentialing aside from their professional licensure. While forensic odontology research commonly includes odontologists and dentists as participants to assess their DVI skills and competencies, allied dental professionals are excluded. DVI personnel need to be competent with DVI tasks, yet statistically measured skills and attitudes of supplemental personnel that may be enlisted for MFIs is lacking in the literature. According to the 2016 ADEA Compendium of Curriculum

Guidelines, dental hygienists, and dental assistants have the foundational knowledge necessary for DVI in their formal curriculum,<sup>44</sup> which provides a basis to build additional DVI training necessary for allied dental professionals to be successful on a forensic odontology team. Results from this study suggest that dental hygiene and dental assisting students have foundational skills applicable to successful DVI outcomes, and their perceptions and abilities may be enhanced with additional training, even with simple interventions such as a multimedia learning experience. A review of the literature shows agreement that forensics educational opportunities are lacking for allied dental professionals.<sup>17-21</sup> Furthermore, a search of current CODA accreditation standards for allied dental education programs revealed no standards for forensics,<sup>13,16</sup> and recommended ADEA Compendium competencies yielded only one mention of forensic identification on page 171 in the radiology curriculum section.<sup>44</sup> Further research is needed to explore allied dental professionals' DVI outcomes when involved with MFIs, and their perceptions of DVI knowledge and performance skills, and their actual aptitude when tested in research settings.

In general, current DVI educational assessments and training outside of forensic odontology programs lack standardization, and little is known about the transferability of cognitive, psychomotor, and affective skills, especially those that are specific to allied dental professionals.<sup>7,19-20,38,64</sup> However, the literature points out that educational courses and assessments are needed for all dental related professions.<sup>7, 21,62</sup> Documented competencies of dental related professionals would provide insight to the level of knowledge and skill these responders possess and assist team leaders in managing supplemental personnel for efficient placement during MFIs.<sup>7</sup> Results from the present study, revealed that after completion of the learning experience, participants had a significant increase in perceived DVI knowledge. Prior to

completing the experimental intervention, participants had relatively low self-perceived knowledge of DVI topics (17%), after completing the multimedia learning experience, their perception increased to 60%. It should be noted that the multimedia learning experience was not overly sophisticated, and development did not require a significant amount of time or financial investment. This suggests that incorporation of DVI learning experiences can provide foundational DVI knowledge without significant impediment of educational programs which are already rigorous.

Compared to dental educational programs, dental allied educational programs lack curriculum guidelines for forensic odontology and disaster preparedness. Additionally, existing forensic odontology curriculum guidelines in dental schools lack standardization.<sup>3,19-20</sup> Allied dental programs could benefit by adopting and modifying previously established DVI dental curriculum.<sup>10</sup> However, further research similar to this project could allow for curriculum expansion in both dental and allied dental schools.

As seen in previous literature, both dental hygienists and dental assistants are vital resources to the DVI team and possess the necessary skills and education needed to perform DVI tasks.<sup>2,5,7-8,12</sup> Both professions have similar curriculum such as anatomy, histo-embryology, dental radiology, pathology, and dental materials that provide information useful for DVI.<sup>44-45</sup> Dental radiology is one of the most important topics utilized in DVI. Dental radiographs are a crucial part of the AM record due to the objectiveness compared to written records<sup>65</sup> and when utilizing diagnostic quality AM radiographs, the ability to create a positive match or exclusion of identity is greatly increased, especially in the case of recent full mouth series radiographs.<sup>66-67</sup> This is why comparison of AM and PM radiographic sets was utilized in the study to determine the skill level and performance of the participants. 85% of the total participants were able to

correctly match at least four out of five AM and PM dental radiographic sets. This suggests that dental hygiene and dental assisting students possess the skill to accurately match AM and PM radiographs, which is vital to the DVI team for creating a positive match or exclusion of identity of victims. However, the match performance varied among the participants' academic discipline. All but one dental hygiene student (99.96%) was able to correctly match all radiographic sets, compared to only nine of the dental assistant students (55%). While curriculum may be similar, the amount of instructional and clinical hours varies between the disciplines which could explain the performance difference between the two groups of participants. Additionally, on page 161 of the ADEA Compendium of Curricular Guidelines, it states that within dental radiology curriculum "the level of competency in interpretation skills should be higher for dental hygiene students than for dental assisting students" which could explain the difference in match performance of radiographs between student disciplines.<sup>44</sup>

Results from the study also showed that following the multimedia learning experience, 96% of the participants had a moderately or extremely positive affective attitude regarding the importance of volunteerism in DVI within their respective profession. Similarly, a 2014 survey of 334 US dental hygienists showed that 85.6% were interested in DVI volunteerism, and 91.6% indicated they had intentions of become more involved.<sup>22</sup> However, the present study showed that 77% of the dental hygiene students perceived the importance of volunteerism to be extremely important compared to 50% of dental assistant students, which is interesting to note since the dental assistant students received a separate three hour lecture regarding DVI and volunteerism prior to this study. It is unclear why there was a difference in participants' perceived value of DVI volunteerism among the two academic disciplines. However, overall results from this study and the findings by Bradshaw et al., show that willingness exists among

dental hygienists and dental assistants to volunteer and if provided with specialized training, they are likely to increase the success of DVI teams during MFI.<sup>22</sup>

## **CHAPTER V**

### **SUMMARY AND CONCLUSION**

The aim of the present study was to learn more about allied dental students' perceived skill, knowledge, and attitudes regarding DVI and forensic odontology, specifically after completing a multimedia learning experience. This research is the first to collect information from dental hygiene and dental assistant students regarding the specialized topic of DVI and forensic odontology and will help fill gaps in the literature. The following is a list of findings based on the results and interpretations from the statistical analyses of this study's data:

- Dental hygiene and dental assistant students have the foundational education in their curriculum such as anatomy, histo-embryology, dental radiology, pathology, and dental materials that are transferable as DVI skills.
- Both allied dental students possess competent skills to complete match comparison of AM and PM radiographs which can aid with the victim identification process on a DVI team.
- Dental hygiene and dental assistant students expressed a perceived increase in understanding of DVI and forensic odontology and its relation to their respective professions following the completion of a multimedia learning experience.
- Dental hygiene students match performance of AM and PM radiographs was higher compared to dental assistant students.
- Both allied dental students had a higher understanding of the importance of future DVI volunteerism in their respective profession after completion of a multimedia learning experience. However, dental hygiene students had a higher understanding compared to dental assistant students.

Future research is needed to develop and assess best practices of DVI training for allied dental students that should be included in their academic curriculums. Such research published in allied dental journals and forensic journals could better standardize the literature, strengthen the dental hygiene and dental assistant volunteerism response for MFIs, and best assist DVI teams with more prepared allied dental volunteers. Dental hygienists and dental assistants need to be aware of the volunteerism opportunities that DVI can offer and be prepared through their formal education. Specialized and tailored training could lead dental hygienists and dental assistants to serve as strong supportive members to their local, national, and global communities to assist with DVI.

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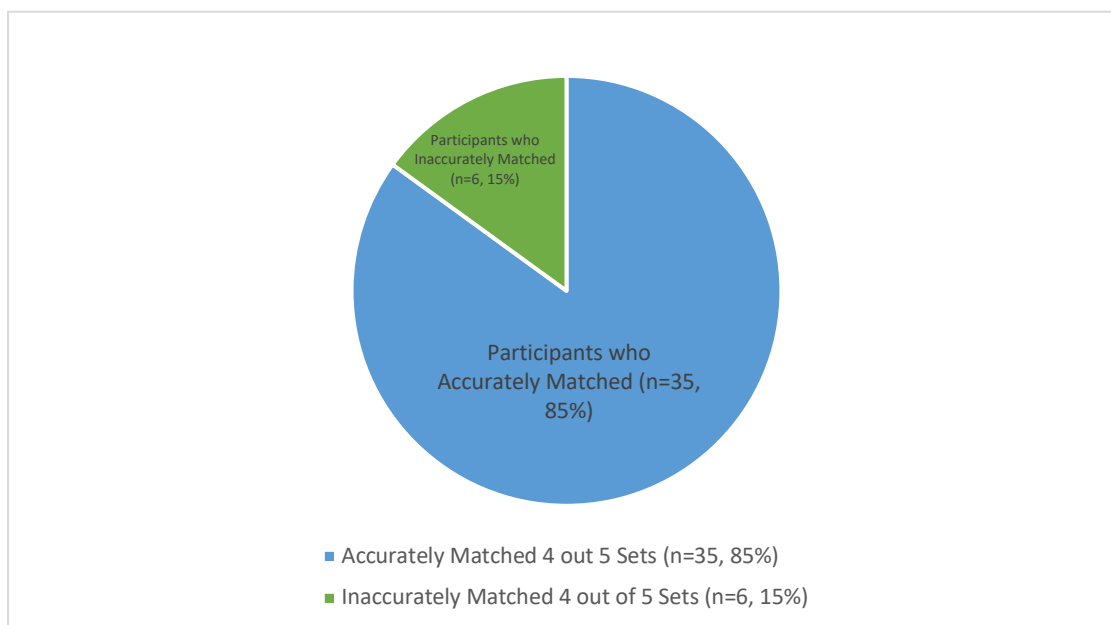
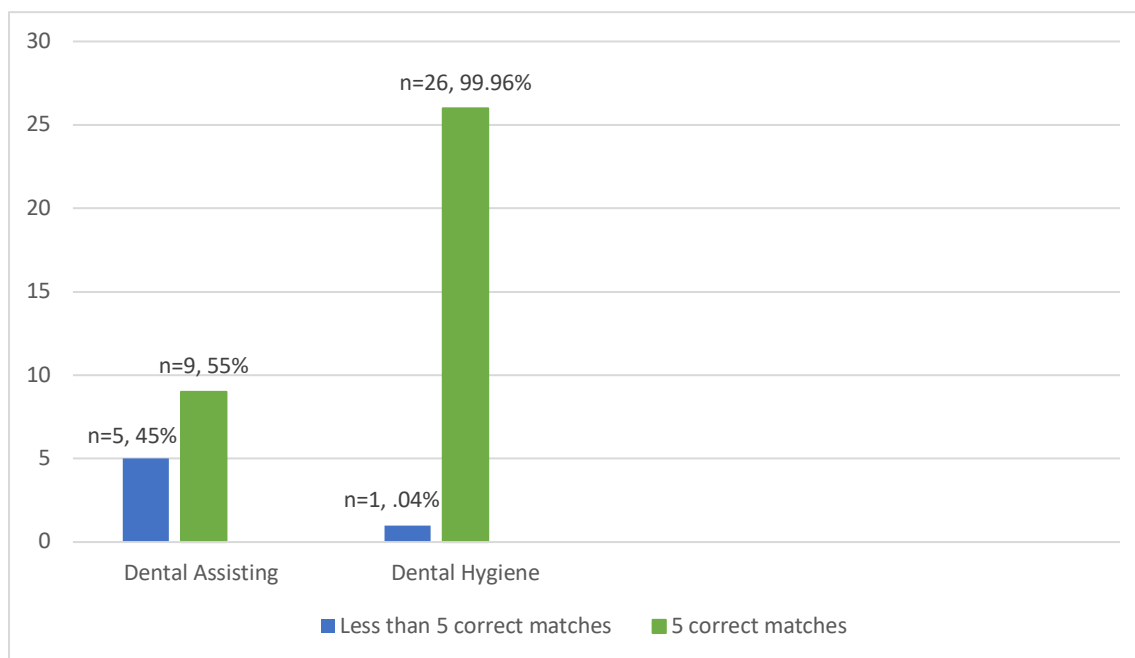
**Table I. Demographic Statistics of the Study Population**

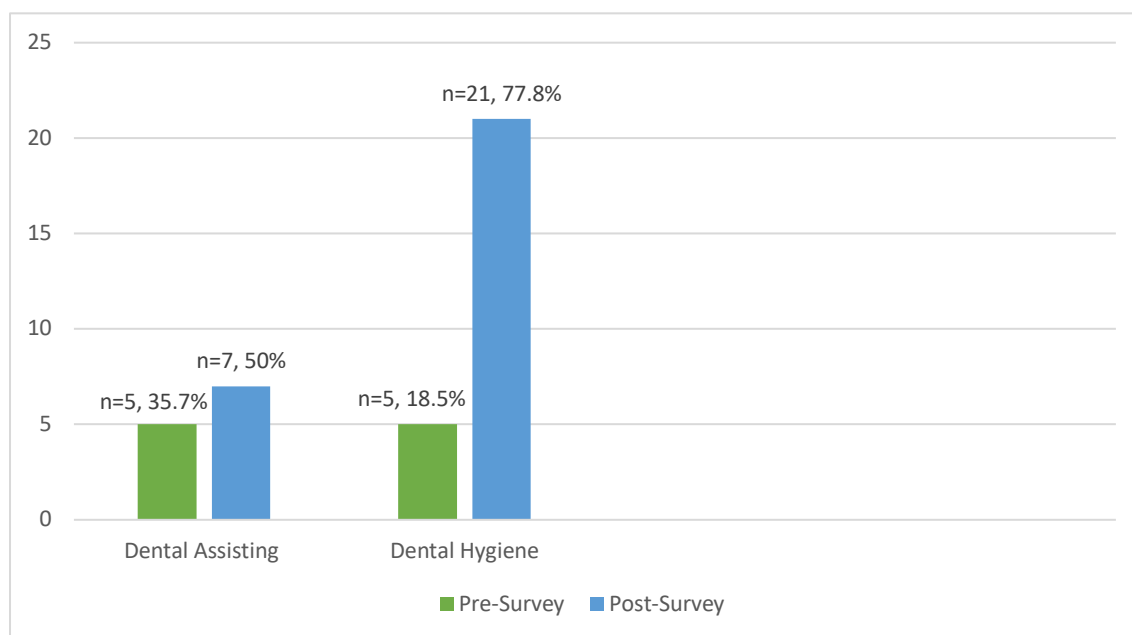
Demographics	n	%
<b>Gender</b>		
Female	41	100%
Male	0	0%
<b>Student Academic Discipline</b>		
Dental Hygiene	27	65.9%
Dental Assisting	14	34.1%
<b>Age</b>		
18-22	21	51.2%
23-27	10	24.4%
28-32	6	14.6%
33-42	1	2.4%
43-47	2	5.0%
48+	1	2.4%
<b>Race/Ethnicity</b>		
White	24	58.5%
American Indian or Alaskan Native	0	0%
Black or African American	6	14.6%
Asian	8	19.5%
Hispanic or Latino	1	2.4%
Native Hawaiian or Other Pacific Islander	1	2.4%
Mixed or Other	1	2.4%

**Table II. Levels of Perceived Knowledge Related to DVI Topics**

Survey	Levels of Perceived DVI Knowledge:		
	Knowledge of Forensic Odontologists and their Roles		
	Slightly	Moderately	Extremely
Pre survey	21(51.2%)	15 (36.6%)	5 (12.2%)
Post survey	1 (2.4%)	17 (41.5%)	23 (56.1%)
	Knowledge of DVI in MFIs		
	Slightly	Moderately	Extremely
Pre survey	28 (68.3%)	10 (24.4%)	3 (7.3%)
Post survey	2 (4.9%)	17 (41.5%)	22 (53.6%)
	Knowledge of Dental Morphology in DVI		
	Slightly	Moderately	Extremely
Pre survey	25 (61%)	9 (22%)	7 (17%)
Post survey	2 (4.9%)	13 (31.7%)	26 (63.4%)
	Knowledge of Dental Radiology in DVI		
	Slightly	Moderately	Extremely
Pre survey	15 (36.6%)	20 (48.4%)	6 (14.6%)
Post survey	1 (2.4%)	12 (29.3%)	28 (68.3%)

Note: All were statistically significant (p-values < 0.05).

**Figure 1. Participants' Combined Accuracy of Matching AM and PM Dental Radiographs****Figure 2: Match Performance of Dental Assisting and Dental Hygiene Students**

**Figure 3: Highest Level of Understanding of Importance for DVI Volunteers**



## APPENDIX A

### IRB APPROVAL



#### OFFICE OF THE VICE PRESIDENT FOR RESEARCH



#### Physical Address

4111 Monarch Way, Suite 203  
Norfolk, Virginia 23508

#### Mailing Address

Office of Research  
1 Old Dominion  
University Norfolk,  
Virginia 23529  
Phone (757) 683-3460  
Fax (757) 683-5902

DATE: March 17, 2021

TO: Brenda Bradshaw, MS

FROM: Old Dominion University Health Sciences Human Subjects Review Committee

PROJECT TITLE: [1693121-4] Disaster victim identification competencies: A comparison of dental hygiene and dental assisting students

REFERENCE #:

SUBMISSION TYPE: Amendment/Modification

ACTION: DETERMINATION OF EXEMPT

STATUS/DECISION DATE:

REVIEW CATEGORY: Exemption category # 2

Thank you for your submission of Amendment/Modification materials for this project. The Old Dominion University Health Sciences Human Subjects Review Committee has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations.

We will retain a copy of this correspondence within our records.

If you have any questions, please contact Harry Zhang at 757-683-6870 or qzhang@odu.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Old Dominion University Health Sciences Human Subjects Review Committee's records.

## APPENDIX B

### INVITATION EMAIL TO STUDENT DENTAL HYGIENISTS AND ASSISTANTS

**Subject:** Invitation for Research Project: Disaster Victim Identification Competencies: A Comparison of Dental Hygiene and Dental Assisting Students

Dear Student,

Hello! My name is Samantha Vest and I am a dental hygiene graduate student at Old Dominion University in Norfolk, VA. I am writing to invite you to participate in my research study –

**Disaster Victim Identification Competencies: A Comparison of Dental Hygiene and Dental Assistant Students**. Dental hygiene students from Old Dominion University (ODU), and dental assisting students from Metropolitan Community College-Penn Valley (MCC-Penn Valley) are being recruited to participate. You are eligible to be a participant because you are either a dental hygiene student from ODU or a dental assisting student from MCC-Penn Valley. I obtained your contact information from the program director of your school. Your identity will remain completely anonymous throughout the study by using a non-identifying combination of letters and numbers that will not be linked to you or any of your personal information.

**Research Study Description:** This research study intends to collect data from dental hygiene and dental assisting students regarding their competency for completing forensic odontology tasks following a short learning module that presents a simulated case study of disaster victims. The learning module utilizing Blackboard® will include a PowerPoint, short audio/video media, photographs, dental radiographs, and pre-/post-assessments along with details of a fictitious airplane crash with 5 deceased human victims. Tasks you would be asked to complete include documenting dental evidence from dental radiographs and using the collected evidence to make identification matches of the disaster victims. The data collected from this research will provide the researchers with information to help determine the willingness and competency of dental hygiene and dental assisting students to assist with disaster victim identifications for mass fatality incidents.

**Research Protocol:** If you choose to participate, you will be allotted one week (**March 22<sup>nd</sup> 2021-March 29<sup>th</sup>, 2021**) to complete the learning course during your own time. If you choose to participate, you should be able to complete the project in one sitting, or you can start it and complete it later after a break if needed. Regardless, you may choose when during the week to participate and do it according to your own schedule. If you choose to participate and complete the project, then you will have the choice to enter a raffle for the chance to win one of four, \$25 Amazon gifts cards.

The option to participate in this research is completely voluntary, and it will not affect your status or grades as a student in your respective academic program. Choosing not to participate will not negatively affect you in any way.

**If you would like to participate in this research project, please email me, Samantha Vest, at svest001@odu.edu on or before March 21<sup>st</sup>, 2021 by 5:00pm with your informed consent**

**signed and dated**. Additionally, if you have any questions for the primary IRB regarding Human Subjects Research please email Danielle Faulkner at [dcfaulkn@odu.edu](mailto:dcfaulkn@odu.edu) or call (757) 683-4636.

This research project has been IRB approved and the project approval number is: **1693121-4**

This research project is being guided and overseen by:

Brenda Bradshaw (Principal Investigator)- [bbradsha@odu.edu](mailto:bbradsha@odu.edu)

Marsha Voelker- [voelkerm7@outlook.com](mailto:voelkerm7@outlook.com)

Ann Bruhn - [abruhn@odu.edu](mailto:abruhn@odu.edu)

Tara Newcomb – [tgarlow@odu.edu](mailto:tgarlow@odu.edu)



Sinjini Sikdar – [ssikdar@odu.edu](mailto:ssikdar@odu.edu)

Thank you for your time and consideration in participating in this research!

Sincerely,  
Samantha Vest, BSDH, RDH  
ODU Graduate Student

## APPENDIX C

### FORENSIC ODONTOLOGY LEARNING EXPERIENCE



**FORENSIC  
ODONTOLOGY  
FOR THE DENTAL  
PROFESSIONAL**

Samantha Vest BSDH, RDH, MS(c)



**CLICK PRE-SURVEY LINK HERE!**

[https://odu.co l.qualtrics.com/jfe/form/SV\\_e2wiBGbmit2XfYq](https://odu.co l.qualtrics.com/jfe/form/SV_e2wiBGbmit2XfYq)



## WHAT IS FORENSIC ODONTOLOGY?

- Official Definition:
  - *“branch of forensic medicine which in the interest of justice deals with the proper handling and examination of dental evidence and with the proper evaluation and presentation of the dental findings”*
- Scope of Practice:
  - Human age estimation
  - Bitemark evaluation
  - Identification of deceased individuals
    - Disaster Victim Identification (DVI)



VIDEO: OVERVIEW OF FORENSIC ODONTOLOGY



## WHO IS A FORENSIC ODONTOLOGIST?

- Official Definition:
  - *Board certified dentists who specialize in forensic odontology according to the standards of the American Board of Forensic Odontology*
- Works with teams of:
  - Medical Examiners
  - Medical Coroners
  - General Dentists
  - Dental Hygienists
  - Dental Assistants



## NATIONAL AND GOVERNING BODIES

- American Board of Forensic Odontology (ABFO)
- American Academy of Forensic Sciences (AAFS)
- U.S. Department of Health and Human Services (DHHS)
  - Disaster Mortuary Operational Response Team (D-MORT)
- National Association of Medical Examiners (NAME)
- National Disaster Medical System (NDMS)
- International Criminal Police Organization (INTERPOL)







## DISASTER VICTIM IDENTIFICATION (DVI)

- Definition of DVI
  - Formal process of identifying human remains for legal confirmation, typically due to a mass fatality incident
- Types of Mass Fatality Incidents (MFIs)
  - Manmade
    - September 11 Attacks in NY (2001)
  - Natural
    - EF-5 Tornado in Joplin, Missouri (2011)
  - Accidental
    - Sinking of British Titanic Ship (1912)
  - Industrial
    - WV Upper Big Branch Mine Disaster (2010)



## DENTAL EVIDENCE

- Antemortem (AM) Data
  - Medical and dental evidence prior to death
- Postmortem (PM) Data
  - Medical and dental evidence after death
- Components of Dental Records
  - Radiographs
  - Intraoral & Extraoral Photographs
  - Diagnostic models
  - Charts (periodontal, restorations, appliances)
  - Detailed written notes
  - Lesion identification



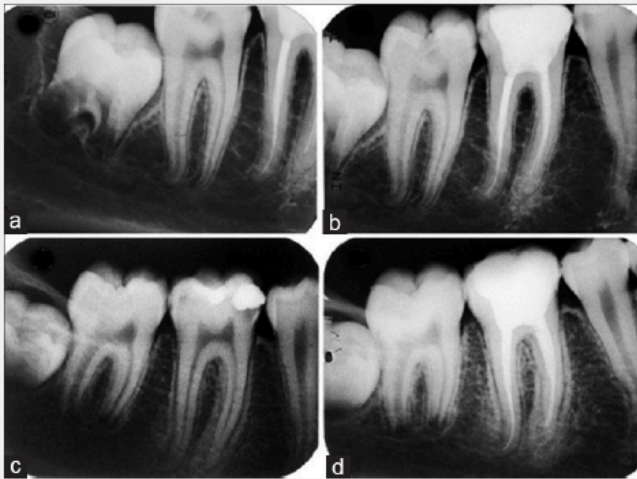


## ROLE OF ALLIED DENTAL PROFESSIONALS

- DVI team duties and responsibilities
- Manage AM & PM dental records
- Surgically assist forensic odontologist
- Expose PM radiographs
- Perform clinical PM examinations
- Assist AM & PM data record comparisons



## HOW CONFIDENT ARE YOU?



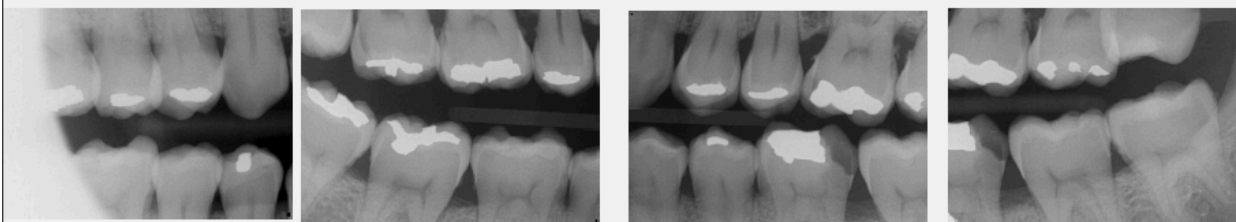
- ABFO Degrees of Certainty:
  - Positive Identification
  - Possible Identification
  - Insufficient
  - Exclusion



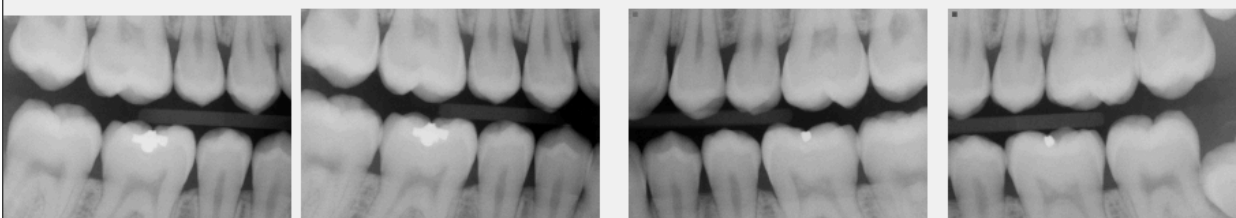


## Example AM & PM Comparison: **Exclusion**

Passenger A: **AM BWX**

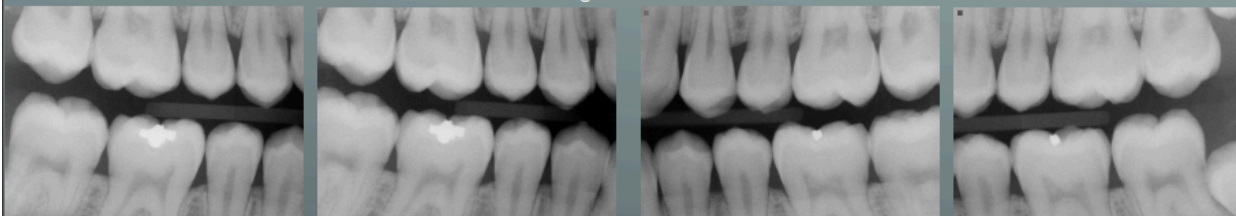


Victim B: **PM BWX**

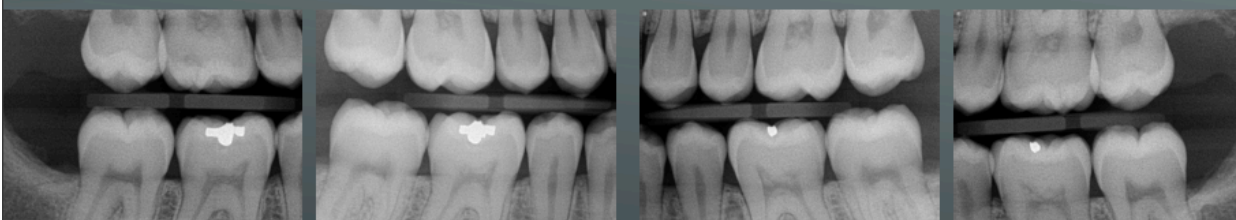


## Example AM & PM Comparison: **Positive Identification**

Passenger A: **AM BWX**



Victim B: **PM BWX**





Below are 5 antemortem (AM) BWX and 5 postmortem (PM) BWX. Click on each to enlarge. Decide which AM and which PM images match, then drag the matches to a box on the right to indicate a match set. Each match set will have only one AM and only one PM BWX.

Each PM BWX will show different restorations and/or missing teeth compared to their corresponding AM BWX. You will evaluate and compare AM and PM dental radiographs to make 5 match sets based on unique features of the dentition.

#### Items

PM



AM



#### Match Set #1

#### Match Set #2



PLEASE CLICK BELOW TO START POST-SURVEY!!

[https://odu.co.l.qualtrics.com/jfe/form/SV\\_4NOUvs2kr3lWAeO](https://odu.co.l.qualtrics.com/jfe/form/SV_4NOUvs2kr3lWAeO)

## REFERENCES

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- Commission on Dental Accreditation (CODA). [Internet]. 2020. Accreditation standards for dental assisting educational programs. Available from [https://www.ada.org/~media/CODA/Files/dental\\_assisting\\_standards.pdf?la=en](https://www.ada.org/~media/CODA/Files/dental_assisting_standards.pdf?la=en)
- Newcomb T, Bruhn A, Giles B. Mass fatality incidents and the role of the dental hygienist: Are we prepared? J Dent Hyg. 2015 Oct; 89(3):143-151. Bradshaw BT, Bruhn AP, Newcomb TL, Giles BD, Simms K. Disaster preparedness and response: A survey of U.S. dental hygienists. J Dent Hyg. 2016 Oct; 90(5):313-322.

## APPENDIX D

### QUALTRICS PRE SURVEY



For the surveys to remain anonymous, but also for your pre- and post-surveys to be matched, please create a unique identifier using the instructions below:

Step 1 - The first initial of your mother's first name (example: Jane = **J**)

Step 2 - The day and month of your mother's birthday (example: August 12 = **08-12**)

Therefore, the example unique identifier would be: **J-08-12**

Specify your level of agreement with the following statements as they pertain to disaster victim identification and its relation to the field of dental hygiene or dental assisting.

Key Terms Defined:

<b>Slightly</b>	means <u>very little</u> or <u>small amount</u> .
<b>Moderately</b>	means an <u>average amount</u> .
<b>Extremely</b>	means to a <u>great degree</u> or a <u>large amount</u> .

I understand the scope of forensic odontology.

- ☐ Slightly  
☐ Moderately  
☐ Extremely

I understand who forensic odontologists are and their role with disaster victim identification (DVI).

- ☐ Slightly  
☐ Moderately  
☐ Extremely

---

I understand the application of DVI used in mass fatality incidents.

- ☐ Slightly
  - ☐ Moderately
  - ☐ Extremely
- 

I understand how dental radiology is used in DVI.

- ☐ Slightly
  - ☐ Moderately
  - ☐ Extremely
- 

I understand how dental morphology is used in DVI.

- ☐ Slightly
  - ☐ Moderately
  - ☐ Extremely
-

---

Based on the curriculum provided to me during my time in the dental hygiene or dental assisting program, I am confident my skills could assist forensic odontologists with DVI.

- ☐ Slightly
  - ☐ Moderately
  - ☐ Extremely
- 

As a future dental hygienist or dental assistant, I understand my importance to assist with forensic odontologists during DVI.

- ☐ Slightly
  - ☐ Moderately
  - ☐ Extremely
- 

What type of student are you?

- ☐ Dental Assisting
  - ☐ Dental Hygiene
- 

Which age category do you belong to?

- ☐ 18-22 years old
  - ☐ 23-27 years old
  - ☐ 28-32 years old
  - ☐ 33-42 years old
  - ☐ 43-47 years old
  - ☐ 48+ years old
- 

What is your gender?

- ☐ Female
  - ☐ Male
  - ☐ Prefer not to say
-

---

What is your race?

- ☐ White
- ☐ American Indian or Alaskan Native
- ☐ Black or African American
- ☐ Asian
- ☐ Hispanic or Latino
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ Mixed or Other

---

**Please return to the PowerPoint to complete the learning module and access the post-survey. Thank you!**



**APPENDIX E**  
**QUALTRICS POST SURVEY**



For the surveys to remain anonymous, but also for your pre- and post-surveys to be matched, please create a unique identifier using the instructions below:

Step 1 - The first initial of your mother's first name (example: Jane = **J**)

Step 2 - The day and month of your mother's birthday (example: August 12 = **08-12**)

Therefore, the example unique identifier would be: **J-08-12**

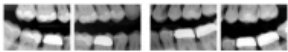
Below are 5 antemortem (AM) BWX and 5 postmortem (PM) BWX. Click on each to enlarge. Decide which AM and which PM images match, then drag the matches to a box on the right to indicate a match set. Each match set will have only one AM and only one PM BWX.

Each PM BWX will show different restorations and/or missing teeth compared to their corresponding AM BWX. You will evaluate and compare AM and PM dental radiographs to make 5 match sets based on unique features of the dentition. You may find it helpful to note key identifiers on paper as you look at the images to assist you with making decisions about matches.



**Items**

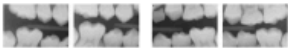
AM



AM



AM



AM



AM



PM



PM



PM



**Match Set #1**

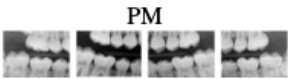
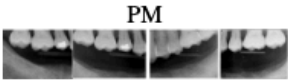
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**Match Set #2**

--

**Match Set #3**

--



**Match Set #4**

**Match Set #5**

---

Indicate your degree of certainty for **Match #1**.

---

Indicate your degree of certainty for **Match #2**.

---

Indicate your degree of certainty for **Match #3**.

---

Indicate your degree of certainty for **Match #4**.

---

Indicate your degree of certainty for **Match #5**.

---

---

Specify your level of agreement with the following statements.

Key Terms Defined:

<b>Slightly</b>	means <u>very little</u> or <u>small amount</u> .
<b>Moderately</b>	means an <u>average amount</u> .
<b>Extremely</b>	means to a <u>great degree</u> or a <u>large amount</u> .

---

I understand the scope of forensic odontology.

- ☐ Slightly  
☐ Moderately  
☐ Extremely

---

I understand who forensic odontologists are and their role with disaster victim identification (DVI).

- ☐ Slightly  
☐ Moderately  
☐ Extremely
-

---

I understand the application of DVI used in mass fatality incidents.

- ☐ Slightly
  - ☐ Moderately
  - ☐ Extremely
- 

I understand how dental radiology is used in DVI.

- ☐ Slightly
  - ☐ Moderately
  - ☐ Extremely
- 

I understand how dental morphology is used in DVI.

- ☐ Slightly
  - ☐ Moderately
  - ☐ Extremely
-

---

Based on the curriculum provided to me during my time in the dental hygiene or dental assisting program, I am confident my skills could assist forensic odontologists with DVI.

- ☐ Slightly
  - ☐ Moderately
  - ☐ Extremely
- 

I understand the importance of assisting forensic odontologists during DVI as a future dental hygienist or dental assistant.

- ☐ Slightly
  - ☐ Moderately
  - ☐ Extremely
- 

Have you been taught forensic odontology curriculum in any capacity prior to this project in your program?

- ☐ Yes
  - ☐ No
  - ☐ N/A
-

---

If you answered yes to the previous question, do you think it helped in your confidence in the ability to make correct matches in this project?

- ☐ Yes
  - ☐ No
  - ☐ N/A
- 

What type of student are you?

- ☐ Dental Assisting
  - ☐ Dental Hygiene
- 

To which age category do you belong?

- ☐ 18-22 years old
  - ☐ 23-27 years old
  - ☐ 28-32 years old
  - ☐ 33-42 years old
  - ☐ 43-47 years old
  - ☐ 48+ years old
-

---

What is your gender?

- ☐ Female
- ☐ Male
- ☐ Prefer not to say
- 

What is your race?

- ☐ White
- ☐ American Indian or Alaskan Native
- ☐ Black or African American
- ☐ Asian
- ☐ Hispanic or Latino
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ Mixed or Other
- 

If you wish to enter the drawing for a chance to win one of four \$25 Amazon Gift cards, please type your email address in the box provided below. If you win, you will be contacted by email. Your participation in the research will not be connected to your email. Thank you for your participation.



## VITA

### SAMANTHA CLARA VEST

Old Dominion University School of Dental Hygiene  
4608 Hampton Blvd. Norfolk, VA 23529

#### EDUCATION:

May 2022	Master of Science in Dental Hygiene Old Dominion University
May 2019	Bachelor of Science in Dental Hygiene Old Dominion University

#### PROFESSIONAL EXPERIENCE:

February 2022–Present	Part-time Dental Hygienist Larchmont Dental Norfolk, VA
May 2021–Present	Adjunct Clinical Faculty School of Dental Hygiene Old Dominion University, Norfolk, VA
November 2019–December 2021	Full-time Dental Hygienist Dr. J Wesley Anderson, DDS Virginia Beach, VA
August 2020–May 2021	Graduate Teaching Assistant School of Dental Hygiene Old Dominion University, Norfolk, VA

#### MEMBERSHIP IN PROFESSIONAL AND HONORARY SOCIETIES:

2021–Present	American Dental Education Association
2021–Present	Alpha Eta National Honor Society
2017–Present	American Dental Hygienists' Association

#### SCHOLARSHIPS:

2019–2021	The DPS, Inc. Graduate Dental Hygiene Scholarship
2019	ADHA Alice Hinchcliffe Williams Graduate Scholarship