

**General Dentists' Perceptions of the Professional Role of the Dental Hygienist within the Private Practice Setting**

**By**

**Samantha K. Mishler**

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**Thesis Committee:**

Associate Professor Janet S. Kinney, Chair  
Professor Marita R. Inglehart  
Assistant Professor Martha J. McComas  
Professor Carol Anne Murdoch-Kinch

## Dedication

“I dedicate this work to my mother for always pushing me to follow my dreams and to my husband for the daily encouragement to make it all possible”

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## CHAPTER I

### INTRODUCTION

#### **1.1 Problem Statement**

Optimal oral health care is attained when all members of the oral health care team work effectively together.<sup>1</sup> Each team member works within a unique scope of practice that allows them to provide different levels of care appropriate for their educational background.<sup>2</sup> Scope of practice is determined by the state in which a professional's license is obtained.<sup>3</sup> Patients benefit when oral health care providers can utilize their scope of practice and function in an interprofessional manner which encourages teamwork.<sup>1</sup> This type of work environment has many advantages such as improved office efficiency, more cost savings opportunities, and enhanced standards of care.<sup>4,5</sup>

As the public's oral health care needs change, the scope of practice in which oral health care providers can practice adapts to accommodate those changes. It is important to periodically evaluate the utilization of all members of the oral health care team to ensure the changing scope of practice is effective in providing for the public.<sup>2</sup> The complex professional role of the dental hygienist is often misunderstood other healthcare professionals.<sup>6</sup> Furthermore, how the dental hygienist is utilized in the general dental practice is highly variable.

#### **1.2 Goal Statement**

Throughout many states in the U.S., as the scope of dental hygiene practice has expanded, research has not been continued to determine if the actual utilization of the dental hygienists'

capabilities has increased respectively. No current publications based on survey data have determined whether the dental hygienists' scope of practice is utilized to the fullest extent in general dental practice setting or whether general dentists' perceptions of the dental hygienists' professional role have changed. The most recent study about the general dentists' perceptions of the professional role of the dental hygienist was published in 1990.<sup>1</sup> This study found that dental hygienists were not being utilized to their full scope of practice and that dentists and dental hygienists reported different understandings of their professional roles as well as different understandings of the dentists' supervision of the dental hygienists' work.<sup>1</sup> Other than this publication from the year 1990, there have been very few studies published in the U.S. about the dental hygiene scope of practice and/or professional role.<sup>7-9</sup>

The overall goals of this study are (a) to determine how dental hygienists are currently being utilized in the general dental practices and (b) to gain a better understanding of how specific characteristics of the general dentist influence how they utilize dental hygienists in their own practice. The objectives of this study are: 1) to investigate current trends throughout the state of Michigan regarding the utilization of the dental hygienist in the general dental practice 2) assess the effectiveness of current general dental offices' practice models, 3) to make recommendations regarding the education of oral health care providers to better understand the team dynamic within the general dental practice. In addition, results from this investigation have the potential to inform the creation of new educational opportunities to improve patient care in general dental practice, and can provide critical information to the discussion surrounding evolution of the dental hygiene profession.

### **1.3 Specific Aims**

Specific Aim 1: To determine how general dentists currently utilize dental hygienists within the general dental practice setting. Hypothesis 1: Dental hygienists are being underutilized and not practicing to the full extent of their legal scope of practice.

Specific Aim 2: To determine which characteristics of general dentists and which practice characteristics are associated with the utilization of dental hygienists. Hypothesis 2: The utilization of dental hygienists increases as the dental practice experience of the general dentist's increases, the proportion of patients from a lower income bracket increases, and as the proportion of patients using government assistance increases. Dentists working with patients of a lower income bracket and with higher numbers of patients that use government assistance are more likely to delegate additional tasks to their dental hygienists, thus increasing the utilization of the dental hygienist.

#### **1.4 Significance**

The most recent survey about the utilization of the dental hygienist was conducted in the 1990's in the state of Michigan.<sup>1</sup> In the past twenty-five years the oral health needs of the public have changed statewide and across the country.<sup>10</sup> In 2002 in the state of Michigan, the administration of local anesthesia was added to the dental hygiene scope of practice.<sup>11</sup> In 2004 the administration of nitrous oxide sedation was also added to the scope of practice as well.<sup>11</sup> The dental hygiene profession fought much opposition from dentists while advocating for changes to its scope of practice.<sup>7</sup> While it is hypothesized that since laws were changed, dentists who originally opposed the legislation have adapted, to utilize these skills of the dental hygienist no research has explored how the dental hygienist is currently being utilized, and if there is support not only in concept, but also in the actual workforce for the expansion of their scope of practice. In an attempt to reach underserved populations the Public Act 161 bill was approved by Michigan legislators and went into effect in 2005.<sup>12</sup> The purpose of this legislation was to expand the access to preventive care for certain vulnerable populations, such as nursing home residents, by allowing some dental hygienists to practice in these settings with indirect supervision by a dentist. This was another important change to the dental hygienists' scope of practice in the state of Michigan. While this survey does not study the utilization of the dental hygienist in this context it is an example of adapting the utilization of dental hygienists to meet the ever-changing needs of the public.

In Michigan, many patient populations face barriers to accessing dental care. Some populations face financial barriers like costs of care, lack of transportation, and lost wages when care cannot be accessed outside of work hours.<sup>13,14</sup> Other barriers in Michigan include a shortage of providers for specific patient groups such as patients covered by Medicaid, or a lack of providers overall such as in rural areas.<sup>13</sup> Finding transportation to reach providers can also be an issue for many patients.<sup>14</sup> By developing sustainable practice guidelines, existing general dental practices can reach a greater population and help to eliminate some barriers that underserved populations face.<sup>13</sup> Trends identified in this current study can identify gaps, and their potential solutions, and therefore contribute to the development of such models.

This survey will provide information important for evaluating the future of the dental hygiene profession in Michigan and the expanding role of dental hygienists in general dental offices where a majority of dental patients are treated. Results from this study can also be used to develop recommendations for dental education to improve better intraprofessional teamwork which should ultimately result in improved patient care.

## **1.5 Thesis Overview**

Chapter II, Review of the Literature, begins with an introduction to the topic by providing an overview of the history of dentistry and the dental hygiene profession. Followed by a description of how dental professionals are educated, is followed by a definition of the scope of practice specific to dental professionals licensed in Michigan. Empirical evidence concerning dentists' understanding of the dental hygienists' scope of practice will be discussed next, followed by a discussion of the oral health care needs of the public and how utilizing dental hygienists to their full scope of practice can be used to meet these needs. Chapter III, Materials and Methods, summarizes the current study design, implementation and analysis. Chapters IV, V and VI summarize through the results, discussion and conclusions.



## CHAPTER II

### REVIEW OF THE LITERATURE

#### 2.1 Introduction

Optimal patient care is achieved when all members of the oral health care team work together.<sup>1</sup> The traditional dental team in the U.S. is composed of the dentist, dental hygienist and a dental assistant. While the profession of dentistry began with an operative perspective, removing the disease to cure the disease, the dental hygiene profession began with a clear focus on prevention.<sup>6,15</sup> Combining the services provided by all members of the oral health care team will allow opportunity to meet all oral health care needs of patients.<sup>3</sup> Each member of the oral health care team comes from different backgrounds, both in educational and work experience, and a unique scope of practice as defined by their title and licensing state. Each branch of the dental profession is regulated by the state in which the license is held. This regulation is known as the provider's scope of practice which clearly defines how each branch of the dental profession can legally practice, and the levels of supervision by a licensed dentist that each task and professional requires.<sup>3</sup> Although U.S. dental schools and dental hygiene programs are held to stringent accreditation standards which regulate educational competencies and standards, the conferred degree is varied.<sup>16,17</sup> Dental schools graduate students with doctoral degrees while dental hygiene programs offer two types of entry-level degrees, associate or baccalaureate of science degree. However, dental assistants may be trained on the job or attend more formal training at a vocational school or community college.<sup>18</sup> A variety of teaching

methodologies are utilized in dental education. Some programs utilize cross training or a team environment education which has the potential to impact relationships as oral health care professionals transfer into general dental practice.<sup>19,20</sup> Other programs do not allow the interaction of different oral health care professionals, which might result in limiting graduates' understanding of one another's professional roles.<sup>19,20</sup>

The scope of practice in which each dental profession works is designed to meet the oral health care needs of the U.S. public.<sup>15</sup> Currently, the oral health care needs of the public are rapidly changing and the U.S. is facing an oral health care crisis.<sup>21</sup> Oral health care professionals must find a way to work together and meet the needs of the public. Research shows that there is a lot of variability in what dentists understand of the dental hygienist's scope of practice, and their perspective is often shaped by their own education and work experiences.<sup>9,22</sup> The dental hygienist is required to work with a dentist's supervision, defined according to the jurisdiction where the hygienist practices.<sup>3</sup> However, dentists are not required by law to work directly with a dental hygienist. Historically the profession of dental hygiene developed out of the dentists' need to have adequate time to provide both preventive and operative care for their patients.<sup>20</sup> The original dental hygiene model reduced the time dentists spent on preventive therapies by providing those procedures themselves, which allowed dentists to provide more operative services for their patients, practicing at the full scope of their training and expertise.<sup>18</sup>

## **2.2 History of Dentistry**

In 1723, Pierre Fauchard, who is known as the Father of Modern Dentistry, wrote a book describing a comprehensive system for the practice of dentistry.<sup>19</sup> It was not until 1890, when Willoughby Miller, an American dentist, sparked an interest in the practice of oral hygiene, promoting both regular tooth brushing and flossing and proposed the microbial basis of dental decay.<sup>19</sup> Further growth and recognition of dentistry as a science-based profession was demonstrated when President

Harry S. Truman formally established the National Institute of Dental Research (NIDR) in 1948.<sup>19</sup> This organization was established to fund and conduct research to provide the knowledge base to advance the dental profession to care for the dental health of the community. NIDR, now known as the National Institute for Dental and Craniofacial Health (NIDCR), and continues to be responsible for the funding of many major research projects including, studies on topics with implications and relationships to oral health : oral and head and neck cancers, the relationship between oral health and diabetes, and the treatment of patients with special healthcare needs.<sup>23</sup> The research funded by NIDR/NIDCR and other organizations has shaped the dental profession and provided a firm foundation for the dental profession today.

Historically dentists practiced in an as a lone dentist (solo practitioner) with or without a chairside assistant. Over time this has changed dramatically, based on research on the needs for dental services, and changing practice philosophies.<sup>15,23</sup> In 2004 approximately 1.8 million practicing dentists worldwide.<sup>24</sup> As of March 2015, U.S. was home to 200,946 professionally active dentists with nearly 8,000 actively practicing in the state of Michigan.<sup>25</sup> While most dentists are general practitioners, significant percentages specialize in fields such as endodontics, oral surgery, orthodontics, and periodontics while the others practice as general dentists. General dentists work in a variety of practice settings. While most general dentists in the U.S. still own their own practice, others work in group practices as both owners and associates, and some work in practices managed by dental corporate managers, communities or in federally qualified health centers..

Modern dentistry in the U.S. no longer follows the traditional operative model and has incorporated a more preventive approach since the 1970's which originated with the foundation of public health dentistry.<sup>26</sup> The model for public health dentistry was based on principles of primary, secondary and tertiary prevention which has influenced and been adopted by general dentistry over time.<sup>26</sup> This has happened slowly and was can be attributed to dental schools and the philosophies which they taught their students.<sup>26</sup> The practice philosophy of the dentist may have an impact on how



or if dental auxiliaries are utilized, and this is also dependent on the preventive, operative and economic goals for the practice.

### **2.3 History of Dental Hygiene**

Dental hygiene has evolved greatly over the past 100 years. In 1910, an Ohio college attempted to begin the first training program for dental nurses to practice under the supervision of a dentist and perform preventive procedures such as dental prophylaxis.<sup>19</sup> The dental nurse profession was initiated to complete oral prophylaxis and oral preventive measures for the dentist so that the dentist could focus their productivity towards restorative and operative procedures. However, this program was canceled shortly after its' start due to strong opposition from Ohio dentists; the dental nurses were never permitted to practice.<sup>19,20</sup> A few years later in 1913, Dr. Alfred C. Fones began the first formal training program for a new oral health care providers in Connecticut and he used the term "dental hygienist" for the professionals he trained.<sup>20</sup> His training program was inspired by a dental assistant named Irene Newman. She often completed preventive treatments under the direct supervision of Dr. Fones prior to the change in Connecticut law making it unlawful for dentists to employ an unlicensed assistant for operative work.<sup>20</sup> In 1917, after completing her training under Dr. Fones, Irene Newman became the first licensed and practicing dental hygienist. Dr. Fones successfully advocated for an amendment to the Connecticut law that allowed dentists to employ assistants for "so-called cleaning of the teeth."<sup>20</sup> Early dental hygienists provided services in the community setting where their primary role was to educate elementary school children about proper oral hygiene.<sup>1</sup> This was the beginning of the dental hygiene profession. Despite opposition by dentists, the dental hygiene progression continued to grow.<sup>7</sup> In 1919, the University of Minnesota established a two-year educational program for dental hygiene.<sup>1</sup> In 1939, the University of Michigan School of Dentistry established the first dental hygiene program granting graduates a baccalaureate degree.<sup>1</sup>

Even with the continued opposition from organized dentistry, research continued to support the dental hygienists' preventive efforts.<sup>7</sup> In 1949 a prominent dentist, by the name of Dr. R.M. Walls, published a paper discussing the use of dental auxiliaries to increase chair time for dentists to perform restorative procedures, as it was determined that the oral health needs of the public were severely undermet.<sup>27</sup> By utilizing dental hygienists to care for the preventive oral hygiene needs of their patients, the dentist had the ability to increase their chair time for providing more restorative procedures.<sup>27</sup> Despite this well known fact hygienists were severely underutilized and only practicing in four percent of dental practices as recent as the late 1940's.<sup>27</sup>

The dental hygiene profession continued to grow and the scope of practice of the dental hygienist evolved to aid in meeting the needs of the public. By 1971 the dental hygiene profession had progressed to a pivotal point. Washington state changed their dental practice act and allowed dental hygienists with proper training and licensure to administer local anesthetic.<sup>1</sup> In recent years, many states in the U.S. have adopted changes to their dental practice acts, to allow dental hygienists to work under different tiers of supervision, to work in independent practices and to provide treatments outside of the preventive realm.<sup>28</sup>

## **2.4 Dental Hygienists as Prevention Specialists**

The dental hygienist has been defined as “a preventive oral health professional that has graduated from an accredited dental hygiene program in an institution of higher education, licensed in dental hygiene and provides educational, clinical, research, administrative, and therapeutic services supporting total health through the promotion of optimal oral health.”<sup>29</sup> Currently, the American Dental Association's Commission on Dental Accreditation (CODA) mandates that dental hygiene education includes extensive training in oral anatomy, head and neck anatomy, microbiology, periodontology, histology, oral pathology, radiography, nutrition, pharmacology, pain control and 659 hours of clinical training.<sup>30</sup> Dental hygiene education programs are stringently monitored by CODA, the accrediting

body for dental education programs. Accreditation standards are designed to “protect the public welfare, to serve as a guide for dental hygiene program development, to serve as a stimulus for the improvement of established programs, and to provide criteria for the evaluation of new and established programs.”<sup>16</sup> In order to be licensed, for most regions dental hygienists must also pass a written national board examination and a regional clinical board exam which also includes a written exam requirement.<sup>2</sup> Dental hygienists licensed to administer local anesthesia and/or nitrous oxide must also pass written and/or clinical board exams in these skills to be credentialed. In addition, each state in the U.S. has the authority to set licensure requirements, such as the completion of continuing education courses, in order for the dental hygienist to maintain an active dental hygiene license.<sup>31</sup>

## **2.5 Dental and Dental Hygiene Education Programs**

Dental schools are also held to stringent accreditation standards by CODA.<sup>17</sup> The education of dentists is broader, with the majority of education centered on restorative and more advanced treatments of dental disease, in addition to preventive care. According to CODA, there are currently 65 accredited dental schools and 335 dental hygiene programs in the United States of America (USA).<sup>8,32</sup> Of the 335 dental hygiene programs 91 of them offer baccalaureate degree programs as entry level training for dental hygienists. Twenty-nine of the 65 dental schools also offers dental hygiene program within their school. Therefore, less than 45% of dental schools offer dental students the opportunity to learn daily alongside dental hygienists in a manner similar to what they will experience in general dental practice. The state of Michigan currently has two dental schools, both of which have a dental hygiene program. Michigan is also home to 11 other dental hygiene programs, not within dental schools, for a total of 13 dental hygiene programs within the state.

In many general dental practices the dental hygienist is responsible for preventive patient care such as providing prophylaxis, sealant application, fluoride treatments, and patient education, and the billable procedures of oral hygiene instruction, nutritional counseling, and tobacco cessation

counseling.<sup>7</sup> The American Dental Hygienists' Association (ADHA) has clearly established the standards for clinical dental hygiene practice.<sup>32</sup> As clearly defined in these standards for care, dental hygienists are also responsible for assessing various patient risks, and then developing a comprehensive "process of care" plan, tailored to the patient's individual needs.<sup>32</sup> Most importantly dental hygienists are able to provide patient-centered and evidence based oral health care.<sup>32</sup> In order to provide the best patient-centered care the dental hygienist must establish a dental hygiene diagnosis. This is done by evaluating all characteristics of the patient including their overall systemic health, their risk factors for oral diseases, current oral habits, and patient's specific needs at the time of their appointment.<sup>32</sup> Synthesizing this information allows hygienists to provide personalized care for their patients, while meeting all of their preventive oral health care needs.

## **2.6 Dental Hygiene Scope of Practice**

The dental hygiene professional role has evolved greatly over time. However, one component of the dental hygiene profession has changed very little. From the very beginning of the dental hygiene profession, hygienists have been required to work under the supervision or assignment of a dentist. Currently, dental hygienists work under varying levels of supervision as determined by their licensing state.<sup>3</sup> These levels of supervision include direct supervision which requires the dentist to be present, general supervision which means the patient must be a patient of record with an established treatment plan, and direct access which is the only level of supervision allowing dental hygienists to treat patients without specific authorization from a dentist.<sup>33-36</sup> In general, the dental hygienists' scope of practice in the U.S. is very complex and varies dependent on the dental hygienists' location of practice.

## **2.7 Professionalism in Dentistry**

Professionalism is defined as "the skill, good judgment, and polite behavior that is expected from a person who is trained to do a job well."<sup>37</sup> Maintaining a professional reputation is important to

building societal trust.<sup>38</sup> As the definition of professionalism includes using good judgment maintaining ethical responsibility is a very important aspect of the concept of professionalism.<sup>38</sup> Another critical component of professionalism is individual professional identity, how professionals see themselves. This important aspect of identity significantly impacts all other components of professionalism.

## **2.8 Dentists' Understanding of the Dental Hygiene Professional Role**

Based on previous research, one can argue that dental and dental hygiene students are not fully aware of each other's scope of practice.<sup>28</sup> This incomplete understanding extends into their practice setting upon graduation. Several surveys have investigated dental students' understanding of the dental hygiene scope of practice, but there have been very few studies that examined the understanding of practicing dentists.<sup>31,39,40</sup> A survey of final year dental students in the United Kingdom found that roughly 60% had experienced co-educational training with dental hygienists.<sup>9</sup> Multiple studies showed that students who have had a co-educational experience were more likely to have a more accurate understanding of the dental hygiene scope of practice.<sup>9,40</sup> Less than half of all dental schools in the US also have dental hygiene programs, therefore, it can be hypothesized that when they graduate, a majority of dental students will not have a comprehensive understanding of the abilities and professional role of the dental hygienist, and will develop work habits based upon this lack of understanding of what the dental hygienist can do. It has been found that the dental hygiene profession is generally misunderstood by many other health professions as well as their fellow dental professionals.<sup>6,22</sup>

## **2.9 Changing Health Care Environment**

The U.S. is currently experiencing an oral health care crisis. According to the 2000 Surgeon General's Report, 14% of adults aged 45-54 show signs of severe periodontal disease and 23% of elderly adults aged 55 and up have severe periodontal disease.<sup>41</sup> Several patient populations are challenged to find access to oral health care services which places them at higher risk for oral

disease including dental caries, periodontal disease, and head and neck cancer. According to the Oral Cancer Foundation, over 43,000 people will be diagnosed with head and neck cancer in the U.S. in 2016 and these cancers will claim the lives of 8,000 U.S. citizens in 2016 as well.<sup>42</sup> Oral cancer screenings can help to detect oral cancer in its early stages to decrease the number of terminal cases. A 2005-2006 survey completed by the Michigan Department of Community Health found that 58% of the third grade students they surveyed had experienced dental disease in the past and 25% had untreated caries at the time of the evaluation.<sup>43</sup> An ADHA position paper on the access to care issues in the U.S. discusses the fact that every dollar spent on preventive dental treatments can help to save up to fifty dollars in restorative costs.<sup>44</sup>

### **2.9a Barriers to Care**

There are several barriers standing between different segments of the population and oral health. One major is a lack of “dental insurance coverage” to help alleviate financial costs placed on individuals. Populations of lower socioeconomic status often do not have access to dental insurance and many government insurance plans, such as Medicaid, do not currently mandate dental coverage for adults.<sup>45</sup> At this time dental coverage for children under the age of 18 is mandated by the U.S. government. However, adult populations are still left mostly uncovered.<sup>45</sup> Finding a provider who accepts Medicaid or other similar programs can also be equally difficult. In the state of Michigan there are 10 counties which do not have community dental clinics at all and there are a total of . In Michigan, some patients, even those with dental insurance ( which does not “cover” all costs of care- even “good” insurance does not) face financial barriers like costs of care, lack of reliable transportation , and lost wages when care cannot be accessed outside of work hours.<sup>43</sup> In Michigan, other barriers include a shortage of providers, for example those who participate with Medicaid, or a lack of any providers in rural areas.<sup>43</sup> Cross-cultural communication conflicts also exist, leaving some populations at higher risk and/or making it more difficult for them to establish a relationship with an oral healthcare professional due to different cultural backgrounds, language differences, or different

cultural beliefs surrounding gender.<sup>43</sup> <sup>10</sup> Vulnerable populations such as the elderly and patients with special needs also face challenges accessing adequate oral health care, for a variety of reasons, including financial, logistical, and a lack of an adequately trained workforce.<sup>10</sup>

## **2.9b Strategies for Meeting the Changing Needs**

Many different strategies have been suggested to help improve the U.S. public's access to oral health care. Utilizing dental hygienists as prevention specialists and has great potential to serve as one of the solutions to this lack of oral health care for certain populations. Currently, 37 states have adopted policies to enable dental hygienists to provide oral health care to underserved populations.<sup>35</sup> Each state has its own regulations for direct access providers, but many states allow dental hygienists to provide care in settings such as schools, nursing homes, and other non-profit organizations.<sup>46</sup> These direct access to care models make dental hygienists more available by relaxing supervision requirements and allowing dental hygienists to provide preventive oral care to underserved populations without a dentist's assignment.

In addition to this direct access to care model, the ADHA has proposed a mid-level provider model which is the dental equivalent of a nurse practitioner or physician assistant. In 2008, the ADHA developed competencies for the Advanced Dental Hygiene Practitioner (ADHP).<sup>47</sup> The proposed model for the ADHP is a dental hygienist with a master's degree who has been educated/prepared to provide treatments outside of the traditional dental hygiene scope of practice. The ADHP would be able to provide simple extractions and restorations, and would be able to diagnose oral disease.<sup>40</sup> This new provider would have a much broader scope of practice than traditional dental hygienists, even if they practice under a direct access model. The states of Minnesota and Alaska have already implemented their own mid-level provider, the dental therapist, underserved areas. Unfortunately, many dentists have been found to misunderstand the role of dental therapists in the clinical setting

and are not familiar with their scope of practice.<sup>22,27,48</sup> Despite resistance, many believe that the U.S. mid-level provider models can dramatically improve access to care .<sup>49,50</sup>

## **2.10 Gaps in DDS/RDH Interprofessional Collaboration**

Before the dental hygiene scope of practice can be expanded or changed, it is important to evaluate the current status of the profession. How is the dental hygienist currently utilized in general dental practice settings? This is a question that has not been asked in the literature for over 25 years. The most recent research completed on this topic within U.S. found that dental hygienists were severely underutilized.<sup>1</sup> It was determined that hygienists were not being utilized to the full scope of practice.<sup>1</sup> They were not providing services such as amalgam carving, placement of temporary restorations and sedative dressings.<sup>1</sup> Studies have shown that despite the recent addition of local anesthesia and nitrous oxide administration to the dental hygiene scope of practice in many states, many hygienists are still not performing these tasks.<sup>39,48,51</sup> Determining the current trends in the utilization of the dental hygienist would identify the areas of excess capacity, which could be leveraged to expand access to care to more patients, not currently receiving care. How the dental hygienist is utilized in a general dental practice is likely to be affected by what the dentist employer understands about the qualifications and scope of practice of their dental hygienist. It is possible, that in the setting of unmet demand for dental services, that increased delegation of appropriate procedures by the dentist to the dental hygienist to utilize their full scope of practice, could increase access to care.

## **2.11 Survey Research**

Surveys are a common research method in many fields.<sup>52</sup> Surveys can be administered in many different ways including interviews, both face-to-face and via telephone, or written or online (web-based) questionnaires..<sup>52</sup> Research has been conducted to determine the most cost effective methods, as well as methods associated with higher quality responses. Cognitive burden placed on



study participants has been shown to have a large effect on response quality as well as perceived legitimacy of the study.<sup>52</sup> Hard copy surveys are associated with higher response rates of oral health professionals; however, written surveys can also result in lower quality answers, and incomplete surveys.<sup>52</sup> Tailoring the questions to the specific audience and providing study descriptions intended to enhance perceived legitimacy of the survey are accommodations that have been shown to increase response quality.<sup>51</sup>

## **2.12 Conclusion**

The dental profession has progressed and changed greatly over the past several hundred years. One of the drivers for change is to meet the needs of the public we serve. As our understanding of the oral health needs of the public changes, we should also review the status of the profession and our ability to meet the needs of the public. This is inherent in the profession's purpose to serve the public good. The dental hygienist is a prevention specialist ready to serve the public. Dental hygienists were the solution to a problem in 1913 and could be a solution to a current problem if their services are used to the full scope. Yet, as previous studies have demonstrated, there is a common thread in finding the professional dental hygienist is underutilized.<sup>1</sup> Oral health disparities and access to care issues are increasing, and could be mitigated by full utilization of all dental professionals. Therefore, there is an urgent need to re-evaluate the role of the dental hygienist in practice, to identify where there is excess capacity and strategies to more fully utilize the dental hygienist to serve the public need.

## CHAPTER III

### MATERIALS AND METHODS

#### **3.1 Ethical Considerations**

This study was determined to be exempt from Institutional Review Board (IRB) oversight by the Institutional Review Board for the Behavioral and Health Sciences at the University of Michigan, Ann Arbor, Michigan (#HUM00098151) on March 4, 2015 (see Appendix A).

#### **3.2 Respondents**

A randomized sample of 900 general dentists, who are members of the Michigan Dental Association (MDA) and listed on the association registry, was surveyed. A randomization code within the Microsoft Excel program was used to randomly select this 900 participants from the original list of 3300 general dentists provided to us by the MDA.

#### **3.3 Study Design**

This was a cross-sectional study of dentists in the State of Michigan in 2015, who were members of the Michigan Dental Association, and completed a quantitative, questionnaire-based survey.

#### **3.4 Study Procedure**

Surveys were mailed with an attached cover letter inviting dentists to participate and explaining the purpose of the study, and that it was approved and found to be exempt from full-board review by the University of Michigan Institutional Review Board for the protection of human subjects (see

Appendix B). Stamped return envelopes and a paper copy of the survey were included in the mailing. (see Appendix C).

The survey was developed using information from a comprehensive literature review and was comprised of 4 sections. Section 1 inquired about general characteristics of the dentist and their practice. Section 2 asked about how the dentist views the professional role of the dental hygienist on the oral health care team. The dentist was asked to select which procedures dental hygienists are capable of performing and then select the tasks their employed hygienists performed in their office. Section 3 asked about the dental hygienist's contributions to various aspects of patient care. Section 4 asked about the general dentist's interactions with their dental hygienists, asking them to rate various statements about their interactions on a scale of 1-strongly disagree to 5-strongly agree. The response rate goal for this survey was 25% and the actual response rate was 32%. Participants were asked to respond to the survey and return completed surveys within one month.

### **3.5 Study Materials**

After the study was reviewed and approved by the University of Michigan IRB as "exempt", the study proposal and survey were presented to and approved by the thesis research committee, in April 2015. Six dentists completed a pilot of the survey to check for validity and flow. Minor modifications were made in revisions to wording and additional questions about periodontal procedures were added to the survey.

Surveys were mailed to all study participants on June 20, 2015. Surveys were mailed to participants via the United States Postal Service (USPS) in 8x11 manila envelopes. Each survey packet included a three-page stapled survey and a stamped and addressed, but otherwise unmarked, return envelope for the completed survey to be returned to the principal investigator. Data was collected from June 20<sup>th</sup> to July 15<sup>th</sup> 2015. The data from the surveys was recorded in a Windows Excel worksheet.

### **3.6 Statistical Analysis**

The worksheet was imported in to SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.) software for statistical analysis. Descriptive statistics including frequency distributions, means and standard deviations were computed. Factor analyses (Extraction Method: Principal component analysis; Rotation Method: Varimax rotation) were used to determine which could be combined in indices. Indices were then computed by averaging the responses the response to the items loading on separate factors. Cronbach alpha inter-item consistency coefficients were used to determine the reliability of the indices. Indices for yes/no survey questions were computed by adding one point for each positive response. Independent sample t-tests were used to determine whether the average responses of male vs. female respondents differed. Pearson correlation coefficients were then computed to determine associations between the respondents' background and their practice characteristics to their survey responses. A p-value of <0.05 was the minimum accepted level of significance for all statistical analyses.

## CHAPTER IV

### RESULTS

#### **4.1 Response rate**

Nine hundred paper surveys were sent to general dentists in the State of Michigan. Six surveys were returned as "undeliverable." Of the remaining 894 surveys delivered, there were 302 completed surveys returned. Two surveys were returned with no questions answered other than short narrative explaining they did not employ a dental hygienist. Eight respondents answered the survey

question about additional professional degrees indicating they held a master's degree in a dental specialty field. These eight respondents' surveys were excluded from the survey since the participants did not meet the inclusion criteria of being a general dentist. After the omission of this data 292 surveys were analyzed. The overall response rate of the survey was 32.4%.

## **4.2 Characteristics of Responding General Dentists**

Descriptive statistics for the responding general dentists can be found in Table 1. A vast majority of the responding general dentists were male: 217 (75%) male and 74 (24%) female respondents. The mean age was  $52 \pm 12.5$  years. Caucasians represented the most prevalent ethnic group with 253 (91%). The next largest ethnic group was Arabic 11 (4%). The remaining ethnicities, African-American, Indian, Hispanic, Asian American and American Indian Alaska Native each had 5 (2%), 4 (1%), 2 (1%), 3 (1%), and 1 (1%), respectively.

When asked where the respondent attended dental school, the University of Michigan was the most frequent response with 165 (57%) reporting they had graduated from this institution. The next most frequent response was the University of Detroit Mercy 87 (30%) and the remaining 25 dental schools were from outside the state of Michigan, with a total of 40 (14%) attendees. The mean dental school graduation year was  $1990 \pm 12.9$ . The most frequent decade to have graduated dental school was the 1980's: 100 (34%). The next most popular decades were 1970-1979 and 2000-2009 with 55 (19%) each.

## **4.3 Characteristics of the practice**

Descriptive statistics for the characteristics of the general dental practice in which the respondents currently work can be found in Table 2. All responding general dentists 292 (100%) lived and practiced in the State of Michigan. When asked to describe the location of their general dental practice, a majority of respondents reported working in either a small town, 95 (32%) or moderate-sized city, 84 (29%). The next most common response was a suburban setting, 66 (23%). Thirty-two

(11%) dentists reported practicing in a rural area. Dentists reporting practice in large cities was the least common response with 14 (5%) respondents.

Dentists were asked about the clinical setting in which they treat patients. They were asked to select all categories that apply including solo, group, associate, partnership, owner, academic setting, community dental center, and corporate practice. The majority of dentists reported providing care in solo dental practices 87 (30%). The next most common response was the selection of both solo practice and owner, with 76 (26%) of those dentists reported being owners of their solo practice. The next most common setting was a partnership with 43 (15%) respondents, followed by a group practice with 29 (10%). The next most common response was associate with 28 (10%) respondents. There were also 10 (3%) respondents who selected owner and group practice. Corporate dental offices were represented by 9 (3%) respondents. The least common responses were community dental center with 7 (2%) respondents and the academic setting with 3 (1%) respondents.

Dentists were asked to report the number and type of different team members employed by the practice. When asked about the number of dental hygienists employed the mean was  $3 \pm 2.8$ ; range 0-40. The mean number of dental assistants employed was  $3 \pm 2.2$  with a range of 0-15. When asked to report the number of "other" team members employed by the practice, the mean response was  $3 \pm 1.9$ , with arrange of 0-11.

The mean number of hours worked reported by respondents was  $31.27 \pm 7.728$ , with a range of 3-60 hours per week. When asked about the number of patients treated in an average week, responses ranged from 4-300 with a mean response of  $61 \pm 46.1$ .

#### **4.4 Characteristics of the Patient Population**

Descriptive statistics for the characteristics of the patients treated in the general dental practice in which the respondents currently work can be found in Table 2. The most common source of primary payment for dental services reported was dental insurance: 166 (58%). The next most

common payment type was a combination of insurance and self-pay, 68 (23%), or self-pay, also referred to as fee for service, 49 (17%). Medicaid was the primary payment source reported by 5 (2%) respondents. When asked to describe the percentage of the patient population treated that are children, the mean response was  $20 \pm 12.8$  with a range of 1 to 100. Dentists were also asked to report the socioeconomic status of the practice's patient base, by reporting the percentage of patients who were in the upper, middle and lower class categories. The mean percentage of patients in the upper class was  $15 \pm 16.3$ , range of 0-99. The mean response for the percentage of patients who are middle class was  $63 \pm 20.7$ , range 0-100 and the mean percentage of lower class patients reported was  $25 \pm 22.0$  and range of 0-100.

#### **4.5 Responses to Questions about Services of the Dental Hygienist.**

Descriptive statistics for the services that a dental hygienist is capable of providing can be found in Table 3 and descriptive statistics for the services that their employed dental hygienist currently provides can be found in Table 4. The survey included a table of services and asked which services dentists felt a dental hygienist could provide, as well as which services their employed hygienists currently provided in their practice. The services were grouped into categories for the purpose of statistical analysis: preventive/non-surgical, diagnostic, patient behavior modification, pain management, supplemental therapies and other services. For each category a sum score was created by adding one point for each "yes" answer.

The preventive/non-surgical category included dental prophylaxis, scaling/root planing, periodontal maintenance, application of fluoride and placing of dental sealants. The mean sum score for the preventive/non-surgical category of services that the dental hygienist can provide was  $4.91 \pm 0.390$  with a range of 0-5. The mean sum score for preventive services that their employed hygienist is currently providing was  $4.63 \pm 0.565$  with a range of 0-5. This category showed the smallest

difference between the services that a hygienist can provide and the services the employed dental hygienist is actually providing.

The diagnostic category included tasks such as taking a medical/dental history, recording patient vital signs, completing intra and extra oral exams and oral cancer screenings, exposure of radiographs, interpreting radiographs and completing caries risk assessment. The mean sum score for the diagnostic category of services that the dental hygienist can provide was  $2.74 \pm 1.042$  with a range of 4-8. The mean sum score for diagnostic services that their employed dental hygienist is currently providing was  $6.55 \pm 1.371$  with a range of 2-8.

The patient behavior modification category consisted, patient education, tobacco cessation counseling, and nutritional counseling. The mean sum score for the patient behavior modification category for services that the dental hygienist can provide was  $2.74 \pm 0.603$  with a range of 0-2. The mean positive response for services that their employed dental hygienist is currently providing was  $2.29 \pm 0.827$  with a range of 0-3.

The pain management category was analyzed as two different categories. The first pain management category included only the administration of nitrous oxide and local anesthesia. The mean sum score for this pain management category for services that the dental hygienist can provide was  $1.73 \pm 0.532$  with a range of 0-2. The mean sum score for the pain management category for services that the dental hygienist is currently providing was  $1.29 \pm 0.759$  with a range of 0-2. The second pain management category included the administration of nitrous oxide and local anesthesia as well as applying desensitizing agents. The mean sum score for this pain management category for services that the dental hygienist can provide was  $2.7 \pm 0.582$  with a range of 0-3. The mean sum score for this broader pain management category of services that the dental hygienist is currently providing was  $2.16 \pm 0.867$  with a range of 0-3.



The supplemental therapies category included taking alginate impressions, pouring cast models, carving amalgam, restoration adjustment and removal of overhangs. The mean sum score for the supplemental therapies category for services that the dental hygienist can provide was  $2.61 \pm 1.318$  with a range of 0-5. The mean sum score for supplemental therapies that the dental hygienist is currently providing was  $1.19 \pm 1.131$  with a range of 0-3. This category contained the largest difference between what dentists reported what a hygienist **can do** and the services hygienists **are currently doing** in general dental practice.

The other services category included tooth whitening, supportive orthodontic treatments and suture removal. The mean sum score for other services that the dental hygienist can provide was  $2.00 \pm 1.214$  with a range of 0-4. The mean sum score for services that the dental hygienist does provide was  $0.75 \pm 0.854$  with a range of 0-3.

#### **4.6 Responses about the Contributions of the Dental Hygienist**

Descriptive statistics for responses about the contribution of the dental hygienist can be found in Table 5. Dentists were asked several questions about the importance of the contribution of the dental hygienist to the dentist's diagnosis. Overall, the results were positive indicating a high importance of the dental hygienist to the dentists' diagnosis on a Likert scale of 1= non-essential to 5= imperative. Responses in this section of the survey were found to have a Cronbach alpha score of .876 with a mean of  $4.07 \pm 0.722$  and a range from 1.29-5.00.

When asked about the dental hygienists' contribution to the diagnosis of periodontal disease the mean response was  $4.81 \pm 0.522$ . The mean importance of dental hygiene input for the diagnosis of clinical caries was  $4.08 \pm 0.951$ . The mean importance of the dental hygienist to the diagnosis of radiographic findings was  $3.86 \pm 1.031$ . The mean response for the diagnosis of oral cancer was  $4.11 \pm 1.022$ . The mean response for questions about the diagnosis of temporomandibular joint dysfunction and mucositis were  $3.48 \pm 1.118$  and  $3.70 \pm 1.138$  respectively. Respondents were also

asked about the importance of the dental hygienist in the explanation of treatment processes and outcomes to patients and the mean response was  $4.56 \pm .689$ .

#### **4.7 Responses about the Dentists' Perceptions of the Dental Hygienist**

Descriptive statistics for the responses about the general dentist's perception of the professional role of the dental hygienist can be found in Table 6. For statistical analysis these questions about were analyzed to determine the factors on which the questions load. The questions were then divided into three categories which were analyzed separately: personal skills, dental hygiene contributions to the practice and items which loaded on no factors. Answers for these questions were reported on a Likert scale 1= strongly disagree to 5= strongly agree.

The items that loaded on factor one "personal skills of the dental hygienist" include questions about how well the dental hygienist is integrated into practice, how well the hygienist works in a team environment, if their dental hygienist requires supervision to complete daily tasks, how well the dental hygienist manages patient behavior change, how well the dental hygienist establishes patient rapport, how well the dental hygienist manages conflict, their dental hygienist has a specialized skillset and is their dental hygienist is a lifelong learner. This factor was found to have a Cronbach alpha score of 0.874 with a mean of  $4.05 \pm 0.732$  and a range of 1.80-5.00

Items loading on factor two "contributions of the dental hygienist to the practice" included question prompts such as "my dental hygienist benefits to the business aspect of my practice", "my hygienist is responsible for determining patient recalls", "my dental hygienist is capable of determining appropriated individualized treatment" and "my dental hygienist is confident in all aspects of patient care". This factor group had a Cronbach alpha score of 0.747. The mean response was  $4.45 \pm 0.519$  and the range was 1.44-5.

The remaining three questions did not correlate enough to analyze together and were therefore analyzed separately. When asked about the dentist's comfort speaking with their dental

hygienist when patient care is involved, they responded with a mean of  $4.75 \pm 0.562$  and a range of 1-5. The mean response to the prompt “my dental hygienist manages their time well” was  $4.12 \pm 0.883$  with a range of 1-5. When asked if their dental hygienist has effective patient communication skills the mean response was  $4.46 \pm 0.686$  with a range of 1-5.

#### **4.8 Association between Gender of the General Dentist and Responses to Survey Questions**

An independent sample t-test was conducted to determine if there was a statistically significant relationship between the gender of responding general dentists and survey responses. Results are presented in Table 7. A statistically significant relationship was determined to exist with a p-value  $>0.05$ .

Significant relationships were found between gender and eight categories of responses: Female dentists were generally younger than male dentists and consequently they reported more recent graduation years. Female dentists reported a higher percentage of pediatric patients treated in their practice. Female dentists were more likely to report that dental hygienists are capable of providing pain management services than male dentists, and were more likely than their male colleagues to report their hygienists complete pain management and patient behavior change services.

#### **4.9 Correlation between Characteristics of the General Dentist and Responses to Survey Questions**

Pearson correlation coefficients were calculated estimate the association between various characteristics of the general dentist and their responses to survey questions. Results are in Table 8. Characteristics were determined to have statistical significance with a p-value of  $>0.05$ . Age was significantly correlated to responses a about pain management services, supplemental therapies and other services a dental hygienist is capable of providing, diagnostic services and other services a dental hygienist does provide, and the contribution of the dental hygienist to the practice. Each of

these categories, with the exception of pain management services the hygienist is capable of providing, were positively correlated to increasing age of the dentist. One exception: t older dentists were less likely to respond that a dental hygienist is capable of providing pain management services.

Graduation year was similarly correlated to these responses: a lower graduation year was associated with similar responses as older age. The only difference between the age and graduation year results was the responses about diagnostic services and other services provided. This category was not found to be significantly correlated to the graduation year of the dentist.

A significant negative correlation was found between the number of dental hygienists employed and the responses about pain management services dental hygienists are capable of providing, and the pain management services and other services the dental hygienist currently provides. The number of hygienists employed and the supplemental therapies provided by the hygienist in general dental practice were negatively correlated. The greater the number of dental hygienists employed in the practice, the less likely the hygienist was performing these services, and the less likely the dentist reported they were capable of performing these services.

Pain management and supplemental therapies provided by the dental hygienist were significantly correlated with the number of dental assistants employed as well. The greater the number of dental assistants employed was associated with a greater likelihood the dentist reported that the dental hygienists are capable of providing pain management services. It was also found that with more dental assistants employed dental hygienists are more likely to provide pain management services for patients and less likely to provide supplemental therapies.

#### **4.10 Correlation between the General Dentist Perception of the Dental Hygienists' Professional Role and Responses to Survey Questions**

Correlation analysis was also performed to study the association between the general dentists' responses to the questions about the professional role of the dental hygienist and their responses to

questions about the capabilities and their utilization of their dental hygienist. Results are in Table 9. Significant associations were found through the analysis of the three indices utilized in the earlier analysis: sum scores of “Importance of the Dental Hygienist to Patient Care,” “Contributions of the Dental Hygienist to the Practice” and “Personal Skills of the Dental Hygienist”.

The first index sum score of “Importance of the Dental Hygienist to Patient Care,” was found to be significantly associated with the general dentists’ reported opinion about the number of diagnostic, technical support, and other services the dental hygienist is capable of as well as the number of those same services their dental hygienist provides. For the second index, “sum score of “Contributions of the Dental Hygienist to the Practice,” positive correlations were found between the number of diagnostic, supplemental therapies and other services that the dental hygienist was reported to be capable of providing as well as the number of preventive non-surgical, diagnostic, supplemental therapies and other services the dental hygienist does provide in their practice. The third index, sum score of “Personal Skills of the Dental Hygienist,” was found to be significantly associated with the dentists’ responses about the number of supplemental therapies and other services the dental hygienist is capable of providing as well as the number of diagnostic, patient behavior modification and supplemental therapies their hygienists are providing in their general dental practice.

## CHAPTER V

### DISCUSSION

#### **5.1 Background for Discussion**

The goals of the study were to determine how dental hygienists are utilized in the general dental practice setting and understand how specific characteristics of general dentists influence how they utilize dental hygienists in their practice.

#### **5.2 Discussion related to Specific Aim 1**

Specific Aim 1 of this study was to determine how general dentists currently utilize their dental hygienists within the general dental practice setting. It was hypothesized that dental hygienists are being underutilized and working to the full scope of practice. It was found that dental hygienists are not practicing their full scope in certain settings. Dental hygienists are not providing pain management procedures, supplemental therapies or the other services category or procedures. These include services such as impression taking, amalgam carving, restoration adjustment, tooth whitening, suture removal and supportive orthodontic treatments. While these are services are included in the dental hygiene scope of practice in the state of Michigan, our study showed that general dentists were not utilizing their dental hygienists for these tasks. On average, they reported using them for two out of the three pain management services, only one of the five supplemental therapies and one of the three other services. The data from this study supported the hypothesis for Specific Aim 1.

These results are consistent with previous reports in the literature study findings. For example, Arkansas dental hygienists were not providing nitrous oxide or local anesthesia on a regular basis despite the addition of these procedures to their scope of practice.<sup>39</sup> It is possible that the dentist does not use a hygienist for supplemental and other services because it does not make good economic sense in their practice; they may be utilizing the hygienist primarily for periodontal therapy. Additionally, some of these tasks overlap with the scope of practice of a dental assistant. Since the average salary of a dental assistant is significantly lower than that of a dental hygienist it would be more economically sound for the dentist to a dental assistant to perform these tasks, as they do not generate significant additional revenues.<sup>53-56</sup> The economy and financial constraints could be determining factors in the utilization of the dental hygienist. Seven respondents to the survey reported that they do not employ a dental hygienist. In response to open ended questions several of these seven dentists reported the economy was the main determining factor as to whether or not a dental hygienist was utilized. One dentist reported “the economic recession of 1980 left me and many fellow dentists with open time. At that point I terminated my hygienist. After 1980 I continued to practice alone and as the economy went through periodic ups and downs felt comfortable with the status quo.” Studies have shown that job loss results in a decreased of utilization of dental services.<sup>57,58</sup> As the economy recedes and unemployment increases, dental utilization decreases. The US is still recovering from the most recent recession in 2008, and dental practices could still be feeling its impact. Economics are likely impacting the utilization of the dental hygienist, and influencing the results of this study.

Another reason dentists may not utilize dental hygienists for their full scope of practice is that the fees associated with preventive treatments are higher than those for the procedures that overlap with the dental assistants' scope of practice.<sup>59</sup> The dental hygienist can therefore produce more revenue for the practice by providing only those services the dental assistant cannot legally perform.

By assigning tasks such as impression taking to the dental assisting staff there will be more chair time available for dental hygienists to produce more revenue for the practice.

### **5.3 Discussion related to Specific Aim 2**

Specific Aim 2 was to determine which attributes of general dentists and which practice characteristics are associated with the utilization of dental hygienists. It was hypothesized that the utilization of dental hygienists will increase as general dentists' private practice experience increases. It was also hypothesized that dentists working with lower income patients and with higher proportion of patients that use government assistance are more likely to delegate a broad range of tasks to their dental hygienists, thus increasing the utilization of the dental hygienist. Gender, age, graduation year, and the number of employees of the general dental practice were all found to be significantly associated with the dentists' responses however there was insufficient data to analyze the relationships of patient's socioeconomic status or primary form of payment on the dentists' utilization of the dental hygienist.

This study showed that gender and age were both significantly correlated to dentists' responses. In general, female dentists were more likely to report that hygienists can and do provide a broader range of services than male dentists in this study. Younger dentists of both genders were also more likely to report that dental hygienist can and do perform a broader range of services than older dentists. This may be partially due to the smaller numbers of older female dentists. The number of female dentists has gradually increased over recent years, during a time during in which the dental hygiene scope of practice was as it is today.<sup>60</sup> Procedures such as local anesthesia and nitrous oxide are relatively recent additions to the dental hygiene scope of practice.<sup>3</sup> It should be noted that only 16% of all study respondents graduated from dental school after the change in law that added the administration of local anesthesia and nitrous oxide sedation to the dental hygiene scope of practice in Michigan. As existing literature suggests education during dental school plays a major role in



dentists' understanding of the dental hygiene scope of practice, older dentists who were trained at a time that these procedures were not within the scope of dental hygiene practice, could be expected to be less likely to have their hygienist perform these procedures.<sup>9,40</sup> Older dentists also tend to work in established practices, which may be less likely to adopt new routines. These older practices also tend to be more likely to employ older hygienists, who may not have received training and certification to administer in local anesthesia or nitrous oxide.

This study also showed that the number of employees in a general dental practice was associated with the responses of general dentists. It was found that as the number of more dental assistants increased, the likelihood that the dental hygienist provided supplemental therapies decreased. As previously discussed, this could be influenced by the revenue-generating capacities of a dental hygienist compared to that of a dental assistant. It is also likely that dentists do not utilize dental hygienists for tasks such as amalgam carving because amalgam restorations are not placed as frequently as they were in the past. Dental offices also generally work as a team, with the dental assistant and dentists working directly together at chairside, more frequently than any other combination of team members. The typical work flow would use the dental assistant, who has assisted the dentist with other steps in a procedure, to make impressions and possible finish restorations. The dental hygienist would be more likely providing care in their own operatory, rather than assisting the dentist with impressions and laboratory work like pouring models. In practices employing more dental hygienists, dentists are more likely to utilize dental hygienists for pain management procedures such as nitrous oxide and local anesthesia. This is likely to be due to work flow and time management. When more dental hygienists are employed in the office, more patients are being treated concurrently, with the dentist performing operative procedures and completing periodic oral exams during the dental hygiene visits, and in between the dentist's scheduled patients. In this larger office setting, efficiency demands that the dental hygienist perform pain management procedures themselves to free the dentist's time to perform operative procedures. If a dental hygienist

is unable to provide pain management services for their patients, a dentist in the practice will be required to provide the services for them. Providing pain management for multiple dental hygiene patients can be time consuming for dentists resulting in increased wait times for patients in the practice.

When asked about their perception of the professional role of the dental hygienist, dentists responded in a generally positive manner. Dentists who place a greater value on their dental hygienists contributions are more likely to utilize the entire scope of practice of the dental hygienist. These respondents are more likely to have positive relationships with their hygienists.<sup>1</sup> It should also be noted that several respondents replied with a neutral response to these same questions about contributions of the hygienist and this could be due to difference between dental hygienists, if there were multiples in a practice. One dentist commented on the differences between hygienists he has employed in the past saying “I’ve had hygienists in the past who could spot caries a mile away. In a years’ time I found maybe 1-2 caries she did not see. Other hygienists I’ve had, clean well, great personality, fit well at the office but just don’t see caries.” This response supports the hypothesis about neutral responses representing the mean of more than one hygienists with different characteristics. In this case cite above, the dentist reports his hygienists have performed at different levels throughout the years and his open comment response explains those differences well.

Dentists were also asked about the services their dental hygienists are currently providing in their general dental practice. In some cases, a ‘no’ response may not reflect the actual situation, as the hygienist may be doing some tasks without the dentist’s knowledge. For example, interpretation of radiographs was a component of the diagnostic services category. Dentists who are unfamiliar with the educational background of dental hygienists may not understand if/how a dental hygienist would utilize radiographs, and may have answered “no”. Dental hygienists use radiographs to verify anatomical findings, overhangs, and bone-loss which is important for the completion of procedures such as dental prophylaxis, periodontal maintenance and periodontal charting. Dentists primarily

utilize radiographs for the diagnosis of disease such as dental caries and periodontal disease. It is possible that the dentist might not realize how their hygienist is using radiographs, and would report “no” because they think it is asking about radiographic diagnosis, and not these other uses of radiographs. If dentists don’t know how their dental hygienists is using radiographs, they may have answered “no” in error.

#### **5.4 Recommendations**

The study findings demonstrates a gap between what the dental hygienist is trained to do and what the dental hygienist is actually doing in some general practices in the state of Michigan. A higher utilization of the dental hygiene scope of practice within the general dentistry setting was associated with female dentists, younger dentists, and practices with fewer employees. In general, the gap between perceived scope of practice and legally defined scope of practice was greater for dentist who had been practicing longer, before the scope was expanded to include pain modification techniques. Reasons that dentist did not fully utilize their hygienist could be partially due to a lack of awareness of their qualifications, and partially due to economics, and a lack of busyness in general dental practices due to decreased dental utilization patterns following the most recent economic recession. As previous studies have shown that experiences during dental school can greatly influence practice behaviors, the findings of this study suggest that dental students should be exposed to dental hygiene curriculum and/or practicing dental hygienists during their training to address their lack of awareness of the dental hygiene scope of practice within the state of Michigan.. This study finding that dentists who were educated prior to the addition of pain management services to the dental hygiene scope of practice were less likely to utilize hygienists for these procedures suggests that further education about the dental hygiene scope of practice would be beneficial to practicing dentists too. Existing research about inter and intraprofessional education also supports this recommendation.<sup>4</sup>

#### **5.5 Benefits of Study Design**

This study design utilized procedures intended to increase response rate supported by Hardigan's study about the response rates of dentists to survey research.<sup>52</sup> To increase the response rate, paper surveys were mailed in eight by eleven inch yellow manila envelopes. Envelopes enclosed a copy of the survey printed back to back and stapled, along with a copy of the cover letter written by the Associate Dean for Academic Affairs at the University of Michigan printed on the school's letter head and a stamped return envelope addressed to the principal investigator. The response rate for this study was 32.4%, which is higher than the average response rate for survey research utilizing dentists as respondents.<sup>52</sup> Utilizing these methods was beneficial for this study. The survey utilized for this study contained a table of questions concerning the scope of practice of the dental hygienist which was adapted from a study published by Prof. Martha McComas, "Dental, Hygiene and Graduate Students' and Faculty Perspectives of Hygienists' Professional Role: Does Hygiene Students' Peer Teaching Matter?".<sup>61</sup>

## **5.6 Limitations**

This study was limited for generalizability, as it included only dentists in the state of Michigan, and therefore may not reflect the situation in other states in the USA. Michigan has two dental schools both of which offer dental hygiene programs. This is somewhat unique and may have influenced the responses of dentists trained at these schools and working in Michigan, compared to dentists trained in dental schools without dental hygiene programs. An overwhelming majority of respondents to this study were graduates of either the University of Michigan or the University of Detroit Mercy. Another limitation of this study is the study population. Participants were randomly sampled from members of the Michigan Dental Association. Membership in professional organizations shows dedication to the profession and embracing professional identity. Since not all practicing dentists in Michigan are members of MDA the results from this study may not reflect the responses of all practicing dentists in the state. These views on the profession may include the professional roles of the other oral healthcare team members. This study demonstrated some

response bias: eighty-four percent of all respondents graduated dental school prior to the addition of the administration of local anesthetic and nitrous oxide sedation to the dental hygiene scope of practice in Michigan. The respondents were also generally from larger more mature practices, which increases the likelihood of working in a team environment that builds stronger working relationships. Responses from this survey may not be reflective of dentists who are more recent graduates of dental school, or work in smaller or less established practices.

## **5.7 Future Research**

Further research is needed in this area. A national study has yet to be completed on this topic and would provide excellent insight into the utilization of dental hygienists nationwide. Any further studies would benefit from questions about why the dental hygienists is or is not utilized for tasks within their scope of practice. It would be useful to survey the dental hygienists in the same practices as the respondent dentists, to try to understand better the actual training and capabilities of those hygienists, which could influence their utilization. These questions would eliminate the need for speculation and also provide further insight into the practice philosophies and practice management principles utilized in general dental practice.

## CHAPTER VI

### CONCLUSIONS

This study was designed to determine whether or not dental hygienists in the state of Michigan are utilizing the breadth of their scope of practice and what characteristics of the general dentist and general dental practice are associated with increased utilization. According to the 2000 Surgeon General's Report, the United States is fighting many disparities limiting oral health care.<sup>41</sup> There are underserved populations who are in need of oral health care.<sup>19</sup> The dental hygiene profession is growing fast with a projected surplus of hygienists in the near future. This excess capacity could provide a solution to part of this problem.<sup>47</sup> The ADHA has proposed a national model for a mid-level provider (the ADHP) and many states are creating midlevel provider models of their own.<sup>47</sup> Before a push for an expanded scope of practice happens it is important to know the current utilization trends of the dental hygienist. This study shows that dentists who were educated after the most recent expansion of the dental hygiene scope of practice in the state of Michigan, were more likely to utilize their dental hygienists for these procedures.

Increased exposure to dental hygienists during dental education has potential to increase the likelihood that dentists will support full utilization of their scope of practice. Interprofessional education within dentistry can be provided to increase collaboration among the oral healthcare team members, and at the same time increase mutual understanding of roles and responsibilities of all members of the oral healthcare team. This will be necessary in order to further expand the role of the dental hygienist, according to the ADHP model.

With further research a better understanding of the potential of the ADHP model can be obtained. A national study would provide the best evidence to influence change in dental education, develop new models of oral healthcare delivery and promote the further evolution the dental professions. Additional research on existing mid-level provider models, their strengths and weaknesses, is also needed. Through continued research the dental hygiene scope of practice and utilization can evolve to meet the needs of the public.

Table 1: Frequencies (percentages) concerning characteristics of the 292 responding general dentists

<b>Characteristics of the General Dentist</b>	<b>Frequency (%)</b>
<b>Gender</b>	
Male	217 (75%)
Female	74 (25%)
<b>Race</b>	
White	253 (91%)
Arabic	11 (4%)
African American	5 (2%)
Indian	4 (1%)
Hispanic	2 (1%)
Asian American	3 (1%)
American Indian Alaska Native	1 (1%)
<b>Dental School</b>	
University of Michigan	165 (57%)
University of Detroit Mercy	87 (30%)
Other	40 (14%)
<b>Age</b>	
Mean (SD)	52.23 (12.50)
Range	26-83
<b>Graduation year</b>	
Mean (SD)	1990 (12.9)
Range	1962-2014



Table 2: Frequencies (percentages) concerning characteristics of the private practice setting of the 292 responding general dentists

<b>Characteristics</b>	<b>Frequency (%)</b>
<b>Community Type</b>	
Small town	95 (32%)
Moderate city	84 (29%)
Suburb of a large city	66 (23%)
Rural	32 (11%)
Large city	14 (5%)
<b>Practice Type</b>	
Solo practice	87 (30%)
Solo and owner of practice	76 (26%)
Partnership	43 (15%)
Group practice	29 (10%)
Associate	28 (10%)
Group and owner of practice	10 (3%)
Corporate	9 (3%)
Community Dental Clinic	7 (2%)
Academic	3 (1%)
Academic setting	4 (1.3%)
<b>Patient Primary Payment Type</b>	
Insurance	166 (58%)
Insurance self-pay split	68 (23%)
Self-Pay	49 (17%)
Medicaid	5 (2%)
<b>Hours Worked</b>	
Mean (SD)	31.27 (7.728)
Range	3-60
<b>Number of Patients Treated per Week</b>	
Mean (SD)	61 (46.4)
Range	0-300
<b>Number of Hygienists Employed</b>	
Mean (SD)	3 (2.8)
Range	0-40
<b>Number of Assistants Employed</b>	
Mean (SD)	3 (2.2)
Range	0-15

Table 2: Continued

<b>Number of Other Staff Employed</b>	
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Mean (SD)	3 (1.9)
Range	0-11
<b>Percentage of child patients</b>	
Mean (SD)	20 (12.8)
Range	1-100
<b>Percent upper class</b>	
Mean (SD)	15 (16.3)
Range	0-99
<b>Percent middle class</b>	
Mean (SD)	63 (20.7)
Range	0-100
<b>Percent lower class</b>	
Mean (SD)	25 (22.0)
Range	0-100

Table 3: Frequencies (percentages) of responses concerning which services dental hygienists CAN provide

Type of services	Yes	No	Unsure
<b>Preventive services</b>			
Dental prophylaxis	280 (100%)	0 (0%)	0 (0%)
Scaling/root planing	281 (100%)	0 (0%)	0 (0%)
Application of fluoride	281 (100%)	0 (0%)	0 (0%)
Periodontal maintenance	279 (99%)	1 (.5%)	1 (.5%)
Placing dental sealants	264 (95%)	12 (4%)	3 (1%)
<i>Preventive services sum score<sup>1</sup></i>	N = 292 Mean = 4.91	SD = .390 Range = 0-5	
<b>Diagnostic services</b>			
Periodontal charting	280 (99%)	1 (1%)	0 (0%)
Taking medical/dental history	278 (99%)	2 (1%)	0 (0%)
Exposure of radiographs	276 (99%)	2 (.5%)	1 (.5%)
Taking patient vitals	272 (97%)	6 (2%)	4 (1%)
Caries risk assessment	263 (90%)	8 (3%)	9 (3%)
Oral cancer screening	248 (88%)	18 (7%)	15 (5%)
Intra oral exam	243 (87%)	26 (9%)	9 (3%)
Interpret radiographs	205 (73%)	58 (21%)	18 (6%)
<i>Diagnostic services sum score<sup>1</sup></i>	N= 281 Mean 7.31	SD= 1.042 Range= 4-8	
<b>Patient behavior modification</b>			
Patient education	280 (99%)	1 (1%)	0 (0%)
Nutritional counseling	280 (99%)	1 (1%)	0 (0%)
Tobacco cessation counseling	249 (87%)	16 (6%)	16 (6%)
<i>Patient behavior modification services sum score<sup>1</sup></i>	N= 280 Mean= 2.74	SD= .603 Range= 1-3	
<b>Pain management</b>			
Applying desensitizing	273 (98%)	4 (1%)	2 (1%)
Administer local anesthesia	261 (93%)	15 (5%)	5 (2%)
Administer nitrous oxide	227 (81%)	35 (13%)	18 (6%)
<i>Pain management services sum score<sup>1</sup></i>	N= 281 Mean= 2.7	SD=.582 Range= 0-3	

Table 3: Continued

<b>Supplemental Therapies 5</b>			
Taking alginate impressions	248 (89%)	24 (9%)	8 (3%)

Pouring cast models	246 (87%)	26 (9%)	10 (4%)
Removal of overhangs	122 (42%)	122 (42%)	37 (13%)
Carving amalgam	63 (23%)	177 (64%)	38 (14%)
Restoration adjustment	60 (21%)	181 (64%)	41 (15%)
<b><i>Supplemental Therapies services sum score<sup>1</sup></i></b>	N = 280 Mean = 2.61	SD = 1.318 Range = 0-5	
<b>Other services</b>			
Tooth whitening	213 (76%)	48 (17%)	20 (7%)
Removal of sutures	182 (65%)	65 (23%)	34 (12%)
Supportive orthodontic treatment	97 (35%)	121 (43%)	61 (22%)
Other			
<b><i>Other services sum score<sup>1</sup></i></b>	N = 282 Mean = 2.00	SD = 1.214 Range = 0-4	

Legend:

1 All some scores were computed by adding up 1 point for each “Yes” response.

Table 4: Frequencies (percentages) of responses concerning which services dental hygienists DO provide in the private practice of responding general dentists

Type of services	Yes	No
<b>Preventive services</b>		
Dental prophylaxis	276 (99%)	1 (1%)
Scaling/root planning	275 (99%)	3 (1%)
Periodontal maintenance	273 (99%)	3 (1%)
Application of fluoride	273 (99%)	3 (1%)
Placing dental sealants	192 (69%)	86 (31%)
<i>Preventive services sum score<sup>1</sup></i>	N = 278 Mean = 4.63	SD = .565 Range = 0-5
<b>Diagnostic services</b>		
Periodontal charting	270 (98%)	7 (2%)
Exposure of radiographs	269 (98%)	7 (2%)
Taking medical/dental history	268 (98%)	6 (2%)
Intra and extra oral exam	223 (81%)	52 (19%)
Oral cancer screening	223 (81%)	54 (19%)
Caries risk assessment	207 (75%)	67 (25%)
Taking patient vitals	186 (68%)	86 (32%)
Interpret radiographs	176 (63%)	102 (37%)
<i>Diagnostic services sum score<sup>1</sup></i>	N = 277 Mean = 6.55	SD = 1.371 Range = 2-8
<b>Patient behavior modification</b>		
Patient education	273 (99%)	3 (1%)
Nutritional counseling	196 (71%)	79 (29%)
Tobacco cessation counseling	168 (61%)	109 (24%)
<i>Patient behavior modification services sum score<sup>1</sup></i>	N = 278 Mean = 2.29	SD = .827 Range = 0-3
<b>Pain management</b>		
Applying desensitizing	242 (87%)	35 (13%)
Administer local anesthesia	194 (70%)	81 (29%)
Administer nitrous oxide	162 (60%)	111 (40%)
<i>Pain Management services sum score<sup>1</sup></i>	N = 278 Mean = 2.16	SD = .867 Range = 0-3

Table 4: Continued

<b>Supplemental Therapies</b>		
Taking alginate impressions	142 (52%)	134 (49%)
Pouring cast models	100 (36%)	175 (64%)
Removal of overhangs	72 (26%)	204 (74%)
Restoration adjustment	13 (5%)	24 (95%)
Carving amalgam	3 (1%)	270 (99%)
<i>Supplemental Therapies sum score<sup>1</sup></i>	N = 278 Mean = 1.19	SD = 1.131 Range = 0-3
<b>Other services</b>		
Tooth whitening	110 (40%)	167 (60%)
Removal of sutures	58 (21%)	215 (79%)
Supportive orthodontic treatment	41 (15%)	231 (85%)
Other		
<i>Other services sum score<sup>1</sup></i>	N = 278 Mean = .75	SD = .854 Range = 0-3

Legend:

1 All sum scores were computed by adding 1 point for each “Yes” response.

Table 5: Frequencies (percentages) of responses about the importance of the dental hygienists' contribution to patient care as reported by the 292 responding general dentists

<b>Tasks:</b>	<b>1<sup>1</sup></b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Mean (SD)</b>
Diagnosis of periodontal disease	0 (0%)	3 (1%)	8 (3%)	31 (11%)	243 (85%)	4.80 (.527)
Explanation of treatment process and outcomes	1 (1%)	2 (1%)	20 (7%)	74 (26%)	187 (66%)	4.56 (.688)
Diagnosis of oral cancer	6 (2%)	12 (4%)	65 (23%)	68 (24%)	134 (47%)	4.09 (1.025)
Diagnosis of clinical caries	2 (1%)	16 (6%)	60 (21%)	89 (31%)	118 (41%)	4.07 (.954)
Diagnosis of radiographic findings	4 (1%)	25 (9%)	78 (27%)	81 (28%)	97 (34%)	3.85 (1.035)
Diagnosis of mucositis	15 (5%)	24 (9%)	79 (28%)	79 (28%)	86 (30%)	3.70 (1.145)
Diagnosis of temporomandibular joint dysfunction	13 (5%)	38 (13%)	101 (36%)	66 (23%)	66 (23%)	3.47 (1.123)
<b>Contribution Index (Cronbach alpha=.876)<sup>2</sup>- Mean (SD) Range</b>	-	-	-	-	--	4.07 (.722) 1.29-5

Legend:

- 1 Answers ranged from 1 = not essential to 5 = imperative.
- 2 The Contribution index was computed by averaging the responses to the 7 single items.

Table 6: Responses about interactions between dental hygienist and general dentist as reported by the 292 responding general dentists

<b>RDH/DDS interaction</b>	<b>1<sup>1</sup></b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Mean (SD)</b>
<b>Items loading on factor 1 “Personal skills of the DH”</b>						
RDH is well integrated into practice	0 (0%)	4 (1%)	10 (3%)	79 (27%)	191 (67%)	4.61 (.628)
RDH works well in team environment	0 (0%)	6 (2%)	15 (5%)	77 (27%)	186 (66%)	4.56 (.693)
RDH requires little supervision	3 (1%)	9 (3%)	12 (4%)	69 (25%)	189 (67%)	4.53 (.810)
Value the recommendations of the RDH	1 (1%)	1 (1%)	7 (2%)	80 (28%)	195 (68%)	4.64 (.588)
RDH can effectively create behavior change in patients	1 (1%)	6 (2%)	36 (13%)	110 (39%)	131 (46%)	4.28 (.792)
RDH establishes good patient rapport	2 (1%)	4 (1%)	0 (0%)	59 (21%)	219 (77%)	4.72 (.609)
RDH manages conflict effectively	4 (1%)	15 (5%)	55 (19%)	126 (45%)	83 (29%)	3.95 (.910)
RDH has specialized skillset	5 (2%)	9 (3%)	35 (12%)	97 (34%)	138 (49%)	4.25 (.915)
RDH is a lifelong learner	3 (1%)	5 (2%)	22 (8%)	94 (33%)	158 (56%)	4.41 (.797)
<i>Contribution Index (Cronbach alpha=.874)<sup>2</sup>- Mean (SD) Range</i>	-	-	-	-	-	4.05 (.732) 1.80-5
<b>Items loading on factor 2 “Contributions of DH to practice”</b>						
RDH benefits business aspect of practice	11 (4%)	10 (4%)	39 (14%)	53 (19%)	161 (59%)	4.25 (1.085)
RDH is responsible for determining appropriate patient recall	17 (6%)	27 (9%)	40 (14%)	75 (27%)	124 (44%)	3.93 (1.225)
RDH is capable of determining appropriate individualized treatment	5 (2%)	26 (9%)	58 (21%)	93 (33%)	99 (35%)	3.91 (1.041)
RDH is confident in all aspects of patient care	3 (1%)	11 (4%)	53 (19%)	110 (39%)	107 (38%)	4.08 (.900)
<i>Contribution Index (Cronbach alpha=.747)<sup>2</sup>- Mean (SD) Range</i>	-	-	-	-	-	4.45 (.519) 1.44-5

Table 6 continued:

<b>Items which load on no factor which were analyzed separately</b>						
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Comfortable speaking with RDH where patient care is involved	1 (1%)	2 (1%)	6 (2%)	48 (17%)	225 (80%)	4.75 (.562)
RDH manages their time well	2 (1%)	13 (5%)	44 (16%)	114 (40%)	111 (39%)	4.12 (.883)
RDH has effective patient communication skills	1 (1%)	4 (1%)	13 (5%)	109 (39%)	154 (55%)	4.46 (.686)

Legend:

- 1 Answers ranged from 1= strongly disagree to 5= strongly agree
- 2 The Contribution Index was computed by averaging the responses to each single item.

Table 7: Comparison of mean (standard deviation) responses for male vs. female respondents'

Question topic	Male	Female	p
Age of general dentist	54 (12.6)	46 (11.1)	<b>.000</b>
Graduation year of general dentist	1987 (12.7)	1997 (11.1)	<b>.000</b>
Number of hygienists employed	3.35 (3.078)	3.02 (1.696)	.388
Number of assistants employed	2.69 (2.147)	3.03 (2.207)	.263
Number of other staff employed	2.57 (1.865)	2.78 (1.827)	.426
Hours worked per week by general dentist	31.59 (7.550)	30.33 (8.266)	.228
Number of patients treated by general dentists	63 (46.3)	53 (46.5)	.142
Percent of patients who are upper class	16 (17.2)	13.46 (13.3)	.222
Percent of patients who are middle class	63 (20.3)	63 (21.8)	.986
Percent of patients who are lower class	25 (21.488)	24 (23.5)	.666
Percent of patients who are children	19 (11.9)	23 (14.9)	<b>.041</b>
Importance of the RDH on Likert scale	4.86 (.593)	4.59 (1.152)	.106
Sum score "preventive/non-surgical DH can do"	4.90 (.433)	4.96 (.205)	.123
Sum score "diagnostic procedures DH can do"	7.26 (1.077)	7.46 (.917)	.126
Sum score "pain management the DH can do"	2.66 (.614)	2.83 (.452)	<b>.017</b>
Sum score "patient behavior change DH can do"	2.72 (.610)	2.81 (.580)	.301
Sum score "technical services DH can do"	2.69 (1.296)	2.36 (1.361)	.071
Sum score "other services DH can do"	2.00 (1.188)	1.99 (1.300)	.909
Sum score "preventive/non-surgical DH does"	4.61 (.508)	4.72 (.714)	.178
Sum score "diagnostic procedures DH does"	6.49 (1.367)	6.71 (1.390)	.253
Sum score "pain management DH does"	2.09 (.882)	2.42 (.781)	<b>.006</b>
Sum score "patient behavior change DH does"	2.23 (.840)	2.46 (.765)	<b>.048</b>
Sum score "technical services DH does"	1.12 (1.107)	1.39 (1.193)	.090
Sum score "Other services DH does"	.72 (.826)	.85 (.942)	.273
Sum score "Importance of DH to patient care"	4.05 (.699)	4.12 (.790)	.487
Sum score "Contributions of DH to practice"	4.03 (.687)	4.11 (.859)	.489
Sum score "Personal skills of the DH"	4.46 (.438)	4.41 (.713)	.569

Legend: Independent sample t-test was used to determine p-values

Table 8: Correlations between dentists’ age, graduation year, number of dental hygienists employed and the number of dental assistants employed and the indices constructed

Indices	Age	Graduation year	Number dental hygienists	Number dental Assistants
Sum score “Preventive/non-surgical DH can do”	-.060	.066	-.009	-.011
Sum score “Diagnostic procedures DH can do”	.057	-.048	.055	.096
Sum score “Patient behavior change DH can do”	-.087	.096	-.083	.021
Sum score “Pain management the DH can do”	<b>-.129*</b>	<b>.118*</b>	<b>-.142*</b>	.096
Sum score “Technical services DH can do”	<b>.118*</b>	<b>-.124*</b>	-.088	-.113
Sum score “Other services DH can do”	<b>.15*</b>	<b>-.13*</b>	-.098	-.060
Sum score “Preventive/non-surgical DH does”	-.048	.051	.010	.003
Sum score “Diagnostic procedures DH does”	<b>.127*</b>	-.098	.058	.069
Sum score “Patient behavior change DH does”	-.053	.081	-.052	.053
Sum score “Pain management DH does”	-.017	.039	.011	<b>.213***</b>
Sum score “Technical services DH does”	.103	-.115	<b>-.125*</b>	<b>-.120*</b>
Sum score “Other services DH does”	<b>.129*</b>	-.084	<b>-.129*</b>	-.144
Sum score “Importance of DH to patient care”	<b>.210***</b>	<b>-.212***</b>	.014	.030
Sum score ”Contributions of DH to practice”	-.021	.015	-.015	-.045
Sum score “Personal skills of the DH”	.095	-.077	.047	.014

Legend: Person correlation coefficient were utilized to determine an association between survey responses

Note: \*p = <05; \*\* p = <.01; \*\*\* p = <.001

Table 9: Correlations between dentists' responses to their perception of the professional role of the dental hygienist and the indices constructed

Indices	Sum score "Importance of DH to patient care"	Sum score "Contributions of DH to practice"	Sum score "Personal skills of the DH"
Sum score "Importance of DH to patient care"	1	.385**	.346**
Sum score "Contributions of DH to practice"	.385**	1	.682**
Sum score "Personal skills of the DH"	.346**	.682**	1
Sum score "Preventive/non-surgical DH can do"	.017	.034	-.052
Sum score "Diagnostic procedures DH can do"	<b>.296**</b>	<b>.155*</b>	.111
Sum score "Patient behavior change DH can do"	.045	.085	.079
Sum score "Pain management the DH can do"	-.004	.084	.003
Sum score "Technical services DH can do"	<b>.203**</b>	<b>.183**</b>	<b>.208**</b>
Sum score "Other services DH can do"	<b>.201**</b>	<b>.180**</b>	<b>.170**</b>
Sum score "Preventive/non-surgical DH does"	.078	<b>.229**</b>	.108
Sum score "Diagnostic procedures DH does"	<b>.352**</b>	<b>.240**</b>	<b>.246**</b>
Sum score "Patient behavior change DH does"	.085	.102	<b>.131*</b>
Sum score "Pain management DH does"	.108	.087	.114
Sum score "Technical services DH does"	<b>.243**</b>	<b>.181**</b>	<b>.210**</b>
Sum score "Other services DH does"	<b>.171**</b>	<b>.142*</b>	.070

Legend: Person correlation coefficient were calculated to determine an association between survey responses

Note: \*p = <0.05; \*\* p = <.01; \*\*\* p = <.001

## Appendix A

**Subject:** Notice of Exemption for [HUM00098151]

### **SUBMISSION INFORMATION:**

Title: General dentists' perceptions of the role of dental hygienists in general and in their own practices

Full Study Title (if applicable):

Study eResearch ID: [HUM00098151](#)

Date of this Notification from IRB: 3/4/2015

Date of IRB Exempt Determination: 3/4/2015

UM Federalwide Assurance: FWA00004969 (For the current FWA expiration date, please visit the [UM HRPP Webpage](#))

OHRP IRB Registration Number(s): IRB00000246

### **IRB EXEMPTION STATUS:**

The IRB HSBS has reviewed the study referenced above and determined that, as currently described, it is exempt from ongoing IRB review, per the following federal exemption category:

#### **EXEMPTION #2 of the 45 CFR 46.101.(b):**

Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Note that the study is considered exempt as long as any changes to the use of human subjects (including their data) remain within the scope of the exemption category above. Any proposed changes that may exceed the scope of this category, or the approval conditions of any other non-IRB reviewing committees, must be submitted as an amendment through eResearch.

Although an exemption determination eliminates the need for ongoing IRB review and approval, you still have an obligation to understand and abide by generally accepted principles of responsible and ethical conduct of research. Examples of these principles can be found in the Belmont Report as well as in guidance from professional societies and scientific organizations.

### **SUBMITTING AMENDMENTS VIA eRESEARCH:**

You can access the online forms for amendments in the eResearch workspace for this exempt study, referenced above.

### **ACCESSING EXEMPT STUDIES IN eRESEARCH:**

Click the "Exempt and Not Regulated" tab in your eResearch home workspace to access this exempt study.



**Thad Polk**  
Chair, IRB HSBS

## Appendix B

June 1, 2015

Dear Doctor,

I am pleased to invite you to participate in a study of general dentists practicing in the state of Michigan, being conducted by Samantha Mishler RDH, BSDH, a graduate student in the Master of Science Dental Hygiene Program at the University of Michigan School of Dentistry. We are writing to ask for your assistance by participating in a survey we are conducting for her thesis research project entitled, "General dentists' perceptions of the professional role of the dental hygienist in the private practice setting." The purpose of this survey is to determine how the dental hygienist is currently utilized in the private practice setting. In addition, the survey asks questions about your thoughts on what contributions the dental hygienist makes in your practice and how the dental hygienist interacts with you, your practice team and patients. Results gained from this study will help us better understand the role the dental hygienist plays as a dental team member providing optimal patient care to patients and adding to the efficiencies of the practice. It will help us shape the education of dentists and dental hygienists for the future, to better meet the needs of the profession and the public we serve.

This study has been approved and exempt from full board review {IRB# HUM00098151} by the University of Michigan Institutional Review Board for human subjects research. Your participation is completely voluntary. The survey is anonymous. There will be no direct benefit to you for your participation nor consequence for non-participation. The information you provide will be stored in a secure database and analyzed as group data. This survey should take about twenty (20) minutes to complete. Please complete this survey by July 15, 2015.

For your convenience, we have enclosed a self-addressed, stamped envelope for the return of your completed survey.

If you have any questions, please feel free to contact Samantha Mishler at [skmet@umich.edu](mailto:skmet@umich.edu) .

Sincerely,

Carol Anne Murdoch-Kinch, DDS, PhD  
Clinical Professor and Associate Dean for Academic Affairs

Samantha Mishler, RDH, BSDH  
Candidate for Master Degree in Dental Hygiene

Appendix C

**University of Michigan – School of Dentistry  
Survey for ADA members concerning the professional role of dental hygienists**

Thank you for taking the time to fill out this survey about your thoughts concerning the professional role of dental hygienists in general dental practices. All answers are anonymous and the results will only be reported on a group level.

**Let us start with some questions about your background and current clinical situation:**

1. Are you male or female? Male  Female
2. How old are you? I am \_\_\_\_\_ years old.
3. What is your ethnicity / race? \_\_\_\_\_
4. Where did you go to dental school? \_\_\_\_\_  
and when did you complete dental school? I graduated in \_\_\_\_\_.
5. While you were in dental school, was dental axillary utilization (DAU) training provided in a team clinic setting, including dental hygienist with expanded functions?  
Yes  No
6. Please list any additional professional degree(s) you have: Degree(s) \_\_\_\_\_
7. In addition to ADA, to what other professional dental organizations do you belong to?  
AGD  Other (please, specify): \_\_\_\_\_.
8. In which state do you practice? I practice in \_\_\_\_\_.
9. Which type of community best describes the location of your practice?  
Rural (<5,000)  Small Town/City (5,000-24,999)   
Moderate-sized city (25,000-250,000)  Suburb near large city  Large city
10. Which of the following best describes your current practice / employment situation? Please select all that apply  
Solo practice  Group Practice  Associate  Partnership   
Owner  Academic setting  Community Dental Clinic  Corporate Owned   
Other (please, specify): \_\_\_\_\_
11. How many dental hygienists, dental assistants and non-dentist auxiliaries work with you in total?





Nutritional counseling	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unsure <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Taking alginate impressions	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unsure <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Pouring alginate impressions	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unsure <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Carving amalgam	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unsure <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Restoration adjustment	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unsure <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Removal of overhangs	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unsure <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Supportive orthodontic treatment	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unsure <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Removal of sutures	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unsure <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Other treatments	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unsure <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>

If other, please describe the treatment/s your dental hygienist(s) currently provides in your practice.

Additionally, please indicate any treatments you believe dental hygienists are capable of providing:

**The following questions are about the contributions your dental hygienist(s) makes in your office. Again, if you employ more than one dental hygienist please provide an answer based on the average input of your dental hygienists.**

Please rate the importance of your dental hygienist(s) input in **your diagnosis** of the following topics on a scale from 1 = not at all important to 5 = very important?

	Not at all Important			Very Important	
	1	2	3	4	5
Diagnosing periodontal disease	1	2	3	4	5
Diagnosing clinical caries	1	2	3	4	5
Diagnosing radiographic findings	1	2	3	4	5
Diagnosing oral cancer	1	2	3	4	5
Diagnosing temporomandibular joint dysfunction	1	2	3	4	5
Diagnosing Mucositis	1	2	3	4	5
Explaining treatment process and outcomes to patients	1	2	3	4	5

**The final part of this survey will ask you about the interactions between you and your dental hygienist(s). If you employ more than one dental hygienist, please provide answers based on your average dental hygiene interactions.**

How much do you disagree/agree with the following statements on a scale from 1 = disagree strongly to 5 = agree strongly?

	Strongly Disagree			Strongly Agree	
	1	2	3	4	5
- My practice benefits from my collaborations with my dental hygienist(s)	1	2	3	4	5
- My dental hygienist(s) consider how their work contributes to the business aspects of the practice	1	2	3	4	5
- My dental hygienist(s) manage their time well	1	2	3	4	5
- My dental hygienist(s) is/are well integrated in my practice	1	2	3	4	5
- My dental hygienist(s) work well in a team environment	1	2	3	4	5

- My dental hygienist(s) requires little supervision to complete daily tasks	1	2	3	4	5
- My dental hygienist(s) is/are responsible for determining patient recalls	1	2	3	4	5
- My dental hygienist(s) is/are capable of determining appropriate individualized patient treatments	1	2	3	4	5
- My dental hygienist(s) is confident in all aspects of patient care	1	2	3	4	5
- I value the recommendations made by my dental hygienist(s)	1	2	3	4	5
- I am comfortable speaking/interacting with my dental hygienist(s) when patient care is directly involved.	1	2	3	4	5
- My dental hygienist(s) can effectively create behavior change in patients	1	2	3	4	5
- My dental hygienist(s) have effective patient communication skills	1	2	3	4	5
- My dental hygienist(s) establish good patient rapport	1	2	3	4	5
- My dental hygienist(s) manage conflict effectively	1	2	3	4	5
- My dental hygienist(s) have a specialized skillset different from other dental professionals	1	2	3	4	5
- My dental hygienist(s) is/are a lifelong learner(s)	1	2	3	4	5

Please share with us any other thoughts you have about the role of dental hygienists in general and in your practice on the reverse side of this survey.

**Thank you for your time completing this survey. If you have any questions or would like to receive the results of this study, please contact Prof. Janet Kinney ([kinneyj@umich.edu](mailto:kinneyj@umich.edu)).**

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