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A STUDY OF NUTRITION IN ENTRY-LEVEL DENTAL HYGIENE EDUCATION

by

Deborah L. Johnson

A thesis

submitted in partial fulfillment

of the requirements for the degree of

Master of Science in the Department of Dental Hygiene

Idaho State University

December, 2014

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Committee Approval

To the Graduate Faculty:

The members of the committee appointed to examine the thesis of DEBORAH L. JOHNSON find it satisfactory and recommend that it be accepted.

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August 13, 2014

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RE: Your application dated 8/13/2014 regarding study number 4138: The status of nutrition education content in entry-level dental hygiene programs

Dear Ms. Johnson:

I agree that this study qualifies as exempt from review under the following guideline: 1. Research on educational practices in educational settings. This letter is your approval, please, keep this document in a safe place.

Notify the HSC of any adverse events. Serious, unexpected adverse events must be reported in writing within 10 business days.

You are granted permission to conduct your study effective immediately. The study is not subject to renewal.

Please note that any changes to the study as approved must be promptly reported and approved. Some changes may be approved by expedited review; others require full board review. Contact Tom Bailey (208-282-2179; fax 208-282-4723; email: humsubj@isu.edu) if you have any questions or require further information.

Sincerely,

Ralph Baergen, PhD, MPH, CIP
Human Subjects Chair

Acknowledgement

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TABLE OF CONTENTS

List of Figures

List of Tables

Abstract

A Study of Nutrition In Entry-Level Dental Hygiene Education

Purpose: The purpose of this study was to document the extent of nutritional information included in dental hygiene program curricula, identify perceptions and barriers to expanding nutritional content within, and determine the need for a proposed nutrition curriculum model.

Methods: The design of this study was a mixed method approach involving qualitative and quantitative aspects. Fifty-five course syllabi were analyzed for nutrition content. Fourteen nutrition instructors and 10 program directors were interviewed regarding their perceptions of nutrition education.

Results: All aspects of the content analysis revealed nutrition content is diverse. Themes that emerged from the interviews included: current nutrition content; patient contact opportunities, topics missed; content emphasis, key elements that could contribute to patient health, barriers to expanding nutrition content, and opinions of an ideal nutrition content model.

Conclusion: A proposed standard nutrition model is recommended to ensure an expected level of quality of nutrition counseling for dental hygiene students.

SECTION I: Thesis Proposal

Chapter I

Introduction

Nutrition and lifestyle related diseases plague the United States at alarming rates (Lianov & Johnson, 2010; U.S. Burden of Disease Collaborators [USBDC], 2013). Nearly 50 percent of the burden of mortality and disabilities are due to chronic diseases (Akabas, Chouinard & Bernstein, 2012; Centers for Disease Control and Prevention [CDC], 2009; USBDC, 2013). Nutrition and lifestyle account for the origin, treatment, and preventive measure for most intrinsic diseases (CDC, 2009; Jones, Hofmann, & Quinn, 2010). However, nutrition counseling from physicians, dental students, and other healthcare providers is nearly non-existent due to lack of nutrition knowledge (Adams, Kohlmeier, & Zeisel, 2010; Akabas, Chouinard, & Bernstein, 2012; Lianov & Johnson, 2010).

Nutrition is an integral component of general and oral health, and nutritional considerations should be an important facet of an individualized dental hygiene care plan (Akabas, Chouinard, & Bernstein, 2012; Burgess & Meyers, 2012). Fermentable carbohydrates, sugary foods, and processed foods contribute to dental caries as well as to chronic diseases such as diabetes and obesity (Akabas, Chouinard, & Bernstein, 2012; Jones, Hofmann, & Quinn, 2010; Krasse, 2001). The presence of periodontal disease increases the risk for systemic diseases such as diabetes, cardiovascular disease, cerebral vascular incidences, respiratory diseases, osteoporosis, rheumatoid arthritis, and preterm low birth weight infants (Azarpazhooh & Tenenbaum, 2012; Manjunath, Praveen, Chandrashekar, Rani, & Bhalla, 2011; Otomo-Corgel, Pucher, Rethman, & Reynolds, 2012). Inversely, oral conditions may be indicative of systemic diseases, infections, and nutrient deficiencies (Basal, Rastogi, & Vineeth, 2013). Outcomes of patient care and health can be improved with the inclusion of an individualized nutritional care plan into the dental

hygiene care plan (Akabas, Chouinard, & Bernstein, 2012; American Dental Hygienists' Association [ADHA], 2008; Burgess & Meyers, 2012; Jones, Hofmann, & Quinn, 2010). In addition, the Commission on Dental Accreditation (CODA, 2013) requires nutrition to be implemented into dental hygiene curricula to serve as "analysis and synthesis of the interrelationships of the body systems when making decisions regarding oral health services within the context of total body health" (p. 21).

The most current document from the ADHA (2008) includes nutrition merely in the assessment portion of the process of care. Dietary and nutritional counseling is often absent from healthcare considerations, particularly dentistry (Akabas, Chouinard, & Bernstein, 2012; Burgess & Meyers, 2012; Shah, Hunger, Fairchild, & Morgan, 2010). Nutritional advice, when provided, many times is conflicting or minimal at best (Akabas, Chouinard, & Bernstein, 2012; Shah et al., 2010).

A pilot study of an advanced nutrition course was implemented in the 1990s at the University of Texas Health Science Center at San Antonio (UTHSCSA) that proved favorable to the dental and dental hygiene students' confidence in applying nutrition assessments and interventions in clinical practice (Long & Mobley, 1999). Unfortunately, the recommended long-term follow-up study was not implemented (Long & Mobley, 1999), and the program no longer exists.

Questions submitted to the American Dental Education Association (ADEA) and ADHA regarding proposals for nutrition education, trends, and recommendations for dental hygiene curricula were addressed as follows. ADEA referred to the curricular compendium from 2005 and the 2011competency document. The curricular compendium included minimum nutrition knowledge (ADEA 2005), and the ADEA (2011) competency document does not mention

nutrition. The Director of Education confirmed the ADHA does not have any plans to develop nutrition guidelines (P. Steinbach, personal communication, February 10, 2014). The recommended nutrition content and competency requirements should be a segment of every entry-level dental hygiene educational program and included in the foundational knowledge as required by CODA (2013) to achieve the ability to assess the patient's nutritional status in accordance with the ADHA (2008) Standard of Care (P. Steinbach, personal communication, February 10, 2014).

As advocates for optimal health and members of a multidisciplinary team of healthcare providers, dental hygienists should be knowledgeable about nutrition and intervention methods to incorporate nutrition counseling into all aspects of the process of care for patients. Nutritional competencies in dental hygiene curricula are mandated by CODA (2013); however, nutritional concepts are not currently standardized in entry-level dental hygiene curricula. In addition, standards to measure essential nutrition knowledge do not exist.

Statement of the Problem

Though CODA (2013) requires nutrition be incorporated in dental hygiene education to the extent that students have the ability to provide oral health services that include analyzing and synthesizing interrelationships of whole health systems (CODA, 2013), CODA, the ADEA and the ADHA do not specify competencies, standards or recommendations to ensure adequate knowledge of nutrition and the ability to perform nutrition assessments and counseling. Without specific standards, determining whether dental hygiene students are receiving adequate information to incorporate effective nutrition assessments and counseling is impossible to ascertain. A specific nutrition education model may be useful to address the possible lack of

nutrition knowledge and to implement an effective standard. To develop an adequate nutrition model, an analysis of current curriculum content needed to be conducted.

Purpose of the Study

The purpose of this study was to document the extent of nutritional information included in dental hygiene program curricula, identify perceptions and barriers to expanding nutritional content within the curriculum, and determine the need for a proposed nutrition curriculum model.

Professional Significance of the Study

The study of nutrition in dental hygiene education is in alignment with the National Dental Hygiene Research Agenda (NDHRA) and addresses health promotion and disease prevention interventions (ADHA, 2007). The NDHRA's intention of health services research is for the "recognition of dental hygienists as [a] primary care providers" (ADHA, 2007, p. 2). The professional education and development section of the NDHRA that involves the evaluation of education curricula and methods to certify and prepare students to meet the publics' oral health needs could include nutrition knowledge (ADHA, 2007). In addition, the clinical dental hygiene care segment promotes the dental hygiene process of care and emphasizes the identification of patients at-risk for oral and systemic diseases (ADHA, 2007). Incorporating clinical nutrition in dental hygiene education for each phase of the dental hygiene care plan satisfies the minimum standards of CODA (2013) and the assessment standards of the ADHA (2008). Adding clinical nutrition in dental hygiene education may also promote practical nutrition and lifestyle counseling in dental hygiene practice, advocacy for patients oral and whole health, and participation in interdisciplinary collaboration.

Advanced nutrition in dental hygiene education may promote an opportunity for the dental hygiene profession to actively participate in the Healthy People 2020 Partners in Prevention initiative (National Prevention Council, 2011). The Healthy People 2020 strategic directions include empowering individuals to make healthy choices "through health promotion, education, and counseling" (National Prevention Council, 2011, p. 11). In addition, the Healthy People 2020 priorities include addressing chronic diseases such as obesity, tobacco use, and preventive oral care services (National Prevention Council, 2011).

The significance of the nutrition curriculum analysis and nutrition instructor interviews was to identify areas where dental hygiene program curricula could be enhanced and determine the need for a standardized nutrition curricula model. The results of this study provided additional information regarding if a need exists to incorporate nutrition in the diagnosis and implementation phases of the dental hygiene standard of care and to teach dental hygiene students how to implement nutritional counseling into patient care. In addition, this study provided evidence for inclusion of additional nutritional content in dental hygiene curricula in order to more effectively prepare future dental hygienists to incorporate nutritional counseling into the dental hygiene process of care. This establishment may enable dental hygienists to collaborate and integrate patient care with other health care providers to provide quality patient care and promote optimal health.

Research Questions

1. To what extent is nutrition information included in dental hygiene program curriculum?
2. What are the perceptions of faculty who teach nutrition in dental hygiene programs and that of directors of dental hygiene programs that do not have a nutrition course within the

curriculum concerning the adequacy of nutrition content and the need for expanding nutrition subject matter?

3. Is there a need for a standardized nutrition content model for entry-level dental hygiene education programs?

Definitions

For the purposes of this study, definitions of key terms follow.

Conceptual Definitions

Standardized nutrition content model. A model of nutrition that serves as a guide to ensure delivery of quality nutrition services (Academy of Nutrition and Dietetics, 2014).

Standardized. Create conformity by comparing with a standard (Standardize, n.d.)

Barrier. A factor that prevents, impedes, or hinders movement or action (barrier, n.d.)

Operational Definitions

Entry-level dental hygiene program. Associate and baccalaureate degree dental hygiene education programs that prepare graduates for the clinical practice of dental hygiene in private or public dental setting (ADHA, 2013)

Prerequisite. A necessity to perform a function (Prerequisite, n.d.). In other words, a course that is required prior to entering the dental hygiene education program.

Basic nutrition: The fundamental knowledge of nutrition that serves as a foundation for advancement (University of Minnesota, 2013). Basic nutrition includes knowledge of the basic food groups, physiological functions of water, dietary fat, carbohydrates, protein, vitamins, and minerals (CDC, 2012)

Advanced nutrition. Nutrition education courses that incorporate nutrition science, nutrient consumption regulation, nutrition biochemistry, cell cycle, nutrigenomic, and epigenetic

concepts. Students should possess background knowledge in biochemistry and physiology knowledge (Berdanier, Berdanier, & Zempleni, 2008)

Nutritional biochemistry. Biochemical, cellular, molecular genetics and nutritional sciences involvement in health and disease (Harvard School of Public Health, 2014)

Nutritional deficiency. An inadequate amount of nutrients absorbed which may lead to a variety of diseases (Healthline, 2012)

Applied clinical nutrition. The emphasis of nutrition and the nutritional application in disease prevention, management, and therapeutic modalities (Liska, Quinn, Lukaczer, Jones & Lerman, 2004).

Conclusion

The epidemic of chronic diseases in the United States indicates the need for nutrition and lifestyle interventions (National Prevention Council, 2011). Since, Nutrition education standards currently do not exist for entry-level dental hygiene students, the results of this study will provide essential knowledge regarding the need for a standardized nutrition content model.

Chapter II

Review of the Literature

Nutrition is an essential component of oral health and should be incorporated into all aspects of oral health promotion, disease prevention, and treatments (Shah et al., 2010). A multifaceted relationship exists between nutrition and the oral cavity in health and disease (Azarpazhooh & Tenenbaum, 2012; Basal, Rastogi, & Vineeth, 2013; Manjunath, Praveen, Chandrashekar, Rani, & Bhalla, 2011; Otomo-Corgel, Pucher, Rethman, & Reynolds, 2012). The Surgeon General's office has acknowledged that the oral cavity reflects general health, including nutrition deficiencies and systemic diseases (Health and Human Services [HHS], 2000). Acute and chronic diseases of the oral cavity can impact an individual's ability to eat and ultimately to consume adequate nutrition (Azarpazhooh & Tenenbaum, 2012; Bauer et al., 2013; Bawadi et al., 2011; Manjunath, Praveen, Chandrashekar, Rani, & Bhalla, 2011; Otomo-Corgel, Pucher, Rethman, & Reynolds, 2012). Insufficient nutrition can result in developmental problems of the oral cavity, as well as progression of oral diseases such as periodontal disease, caries, oral cancer, and tooth loss (Bawadi, Khader, Haroun, Al-Omari, and Tayyem, 2011; Esaki, Morita, Akhter, Akino, & Honda, 2009; Russell, Psoter, Jean-Charles, Prophte, and Gebrian 2010).

In addition to oral diseases, chronic systemic diseases contribute to deaths and declining quality of life globally and specifically in the United States (Akabas, Chouinard & Bernstein, 2012; Centers for Disease Control and Prevention [CDC], 2009; U.S. Burden of Disease Collaborators [USBDC], 2013). Reported deaths and disabilities due to chronic diseases account for almost half the burden of ill health in the United States (USBDC, 2013). Dietary risk factors and lifestyles are large contributors to the prevalence of chronic diseases (Lianov & Johnson, 2010; USBDC, 2013). The CDC (2009) contended that the risk for one chronic disease often

indicates risks for additional diseases and affirmed, “the same intervention strategies can combat multiple chronic diseases and risk factors” (p. 2).

Nutrition is considered an underlying deficit and treatment for most intrinsic diseases (Jones, Hofmann & Quinn, 2010). To combat oral and systemic diseases, the inclusion of didactic and clinical practice concepts that emphasize the role of nutrition in systemic and oral health is essential for the professional training of all health care providers (Bipartisan Policy Center, 2013; Institute of Medicine, Committee on Oral Health [IOM], 2011; National Prevention Council, 2011) and should include dental hygienists. The Healthy People 2020 initiative addressed a range of national health dilemmas and prevention measures including nutrition (National Prevention Council, 2011). The IOM (2011) and the Bipartisan Policy Center (2013) emphasized the significance of interprofessional competencies in education that included nutrition, diet and lifestyle counseling amongst oral health care professionals.

This literature review explored the importance of nutrition in dental hygiene education focusing specifically on the need to collaborate with other healthcare professionals and the benefit to dental hygiene clients. Although required by CODA (2013), nutrition in dental hygiene education programs lack a standardized curriculum. Therefore, curricula in other health care fields were explored in this study; in particular, the medical field seemed to offer a variety of education models.

The search engines used to obtain background information for this study were PubMed, Google Scholar, and Medscape. Key terms used included nutrition, chronic disease, oral health, health promotion, disease prevention, obesity, and nutritional counseling.

Importance of Nutrition in Dental Hygiene Education

The Healthy People 2020 initiative has requested all disciplines of health care providers to become collaborative partners in the disease prevention initiative (National Prevention Council, 2011). The priorities of Healthy People 2020 specifically include addressing chronic diseases, obesity, tobacco use, and oral diseases (National Prevention Council, 2011). These priorities are within the dental hygiene scope of practice (ADHA, 2008). Because nutrition deficiencies display a variety of oral manifestations (i.e. caries, periodontal disease, cancer, and tooth loss), Hornick (2002) and Touger-Decker (2004) suggested incorporating nutrition assessments and interventions in the dental and dental hygiene patient care plan. Nutrition assessments by all health care professionals benefit patients by recognizing diet and nutrition related oral diseases, providing basic intervention, and acknowledging the need to refer to a registered dietitian when more comprehensive and specialized nutrition care is necessary (Touger-Decker, 2004). Integrating nutrition services into dental hygiene care can address patients' oral prevention and management needs (Hornick, 2002; Touger-Decker, 2004). Advanced clinical nutrition services (assessments, recommendations, and counseling) provided by dental hygienists may also be beneficial to the collaborative efforts of the National Prevention Council (2011) goals of Healthy People 2020. Recommendations from multiple professional groups emphasize the importance of nutrition education for all health care providers.

One such group, the New York Academy of Sciences recognized the importance of nutrition education and subsequently hosted a conference to determine how to best provide nutrition education for all health care professionals (DiMaria-Ghalili et al., 2013). Representatives from more than 15 educational institutions in the United States met for the conference entitled, "Capacity Building in Nutrition Science: Revisiting the Curricula for Medical Professionals" on

June 6, 2013 (DiMaria-Ghalili et al., 2013). Presenters discussed recommendations for the effective delivery of nutrition education to all health care professionals and several speakers emphasized the importance of nutrition education to provide clinical nutrition interventions that improve the health of patients and prevent disease (DiMaria-Ghalili et al., 2013). One speaker, Kohlmeier, suggested nutrition curriculums be incorporated throughout all semesters of the healthcare education programs to build "on basic nutrition (foundational biochemistry and physiology) assessment, dietary treatment of disease, and nutrition intervention" (DiMaria-Ghalili et al., 2013). An additional important aspect of nutrition education is to incorporate opportunities for students to obtain experience in practical clinical nutrition assessments and interventions (DiMaria-Ghalili et al., 2013). Collaboration amongst health care disciplines to provide patient-centered nutrition and lifestyle interventions was recommended (DiMaria-Ghalili et al., 2013).

Nutrition knowledge could portray dental hygienists as an asset to the interdisciplinary collaboration efforts. Akabas from Columbia University recommended competencies in nutrition should focus on testing student's general knowledge versus evaluating students on patient outcomes to determine what changes in nutrition curricula are needed (DiMaria-Ghalili et al., 2013). Currently, the core competencies established by the Association of American Medical Colleges (AAMC) include basic nutrition and knowledge of exercise, patient assessment skills, and behavioral science (DiMaria-Ghalili et al., 2013). Akabas reminded the committee that patient literacy and cultural diversity need to be considered when delivering nutrition information (DiMaria-Ghalili et al., 2013). The conference highlighted the need to support a national nutrition education and research-coordinating center that would oversee and develop nutrition education, research, and training activities for healthcare professionals (Di Maria-

Ghalili et al., 2013). Suggested modifications to the Nutrition Academic Award (a five-year grant to incorporate nutrition in medical curricula), Nutrition Curriculum Guide for Training Physicians, included the development of learning objectives and competencies, promoting "interprofessional, transdisciplinary, and interdisciplinary team approaches and referral systems across the continuum of healthcare professional training" (DiMaria-Ghalili et al., 2013, p. 33).

The importance of dental hygienists participating in an interdisciplinary and collaboratory team approach for optimal patient care was emphasized in a study conducted by Swanson-Jaecks (2009). The purpose of the study was to determine dental hygienists' role and barriers in the use of dental hygienists as participants in interdisciplinary collaboration (Swanson-Jaecks, 2009). A survey of 103 dental hygienists determined that interdisciplinary collaboration is valuable, but limited for dental hygienists (Swanson-Jaecks, 2009). Reported barriers to interdisciplinary collaboration included insufficient time, other professionals not respondent to collaborating with dental hygienists, the need for independent dental hygiene practice, and limited knowledge of diseases (Swanson-Jaecks, 2009) Dental hygienists are well positioned to identify inflamed gingiva and chronic periodontitis as valuable correlating inflammatory indicators of deeper intrinsic issues such as cardiovascular disease and diabetes (Swanson-Jaecks, 2009). The study identified the advantages to both the dental hygienists participating in interdisciplinary education opportunities and relaxing the barriers that inhibit dental hygienists' contributions to an interdisciplinary health care team (Swanson-Jaecks, 2009). The inclusion of dental hygienists in interdisciplinary collaboration is an essential element for delivering effective evidence-based patient care (Swanson-Jaecks, 2009). Swanson-Jaecks' study concluded that interdisciplinary education should be standard for dental hygiene and other health professions. Advanced nutrition

knowledge in dental hygiene education could be an effective method of initiating dental hygienists' participation in interdisciplinary collaboration.

The National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP) endorsed preventive interventions to promote optimal health by interdisciplinary collaboration of all health care providers, public health professionals, educators, and policy makers, which would include licensed dental hygienists (CDC, 2009). The Academy of Nutrition and Dietetics considers nutrition as an essential element of oral health and reinforced attention to oral health when providing nutrition services, education, and research (Touger-Decker & Mobley, 2013). "Collaboration between dietetics practitioners and oral health care professionals is recommended for oral health promotion and disease prevention and intervention" (Touger-Decker & Mobley, 2013, p. 693). Systemic, oral, and nutritional health and disease are interrelated and necessitate interdisciplinary collaboration among all health care providers to provide quality evidence-based, patient-centered care (Touger-Decker & Mobley, 2013). Touger-Decker and Mobley (2013) endorsed adopting interdisciplinary competencies in dental and dietetic education to meet the dynamic changes in patient needs and healthcare. Comprehensive knowledge of "advances in technology, genetics, and genomics" was also endorsed by Touger-Decker and Mobley (2013, p. 697). These advances defined by Sales, Pelegrini, and Goersch (2014) relate how genetics respond to diet (nutrigenetics) and the ability of nutrition to regulate gene expression (nutrigenomics). The Academy of Nutrition and Dietetics (2013) recommended oral health care providers integrate nutrition for managing diseases and promoting health by incorporating screenings, assessments, and patient education and counseling in the patient care plans. Since 1992, the American Dental Association's (ADA) Commission on Dental Accreditation (CODA,

1992; 1998; 2009; 2013) has required the inclusion of nutrition in dental hygiene education, but has never provided a standard for measure.

Nutrition in Dental Hygiene Education

Limited nutrition mandates from CODA have changed over time. Currently, nutritional instruction is required for dental hygiene students with the intention of obtaining minimal knowledge to avoid compromising the patient's health, rather than for the purpose of conducting nutrition counseling (CODA, 2013). Nutrition for the purpose of oral and general health intervention is not mandated by CODA. The importance of addressing nutrition insufficiencies was recognized in 1992 when CODA (1992) required dental hygiene curricula be designed to provide students with biochemistry and nutrition education. In 1998 CODA reduced the minimum standards requiring that the curricula only ensure that dental hygiene students achieve competencies in understanding human biological systems and distinguishing abnormal conditions due to nutritional inadequacies. However, in 1992 and 1998, CODA required students to be competent in providing nutritional counseling, and in 2005 the American Dental Education Association (ADEA) acknowledged nutritional counseling as a fundamental dental hygiene skill. The ADEA endorsed the use of skills in nutrition counseling involving the application of nutritional concepts and principles in the clinical assessment and treatment of patients. In 2008, ADHA promoted nutritional education as part of the dental hygiene process of care for the achievement and maintenance of patients' optimal oral health. In 2009, CODA's Dental Hygiene Standards mandated education competencies must include implementation of nutrition counseling in regard to oral and systemic health within the dental hygiene process of care. This mandate represented a commitment to improving patient's overall health. However, CODA's (2013) most recent position incorporated biomedical science content and included nutrition in

dental hygiene education, but did not mention obtaining nutrition knowledge to the extent of promoting improved health outcomes.

The ADEA has not published any article on nutrition in 15 years, but the most recent article supported the importance of nutrition knowledge and counseling in dental and dental hygiene curricula (Long & Mobley, 1999). Long and Mobley (1999) conveyed that leading dental educators were concerned that nutrition instruction was deficient; therefore, an advanced nutrition course was developed for the dental hygiene program at the University of Texas Health Science Center at San Antonio (UTHSCSA) to enhance students' nutrition knowledge. The advanced nutrition course offered opportunities to conduct thorough nutrition assessments that included biochemical data analyses (Long & Mobley 1999). The goal of the nutrition program was to integrate nutrition in a patient care plan for clinical practice that included assessments, diagnoses, and interventions or referrals (Long & Mobley, 1999). Long and Mobley (1999) documented that the UTHSCSA course directors would provide a follow-up report on the long-term use of the nutrition care plan from the dental hygiene students used in the pilot program. Although the students evaluated the course favorably and were confident they could use the nutrition care plan in clinical practice, a follow-up report was not conducted; the instructors no longer teach at UTHSCSA, and the nutrition program was discontinued (B. M. Hicks, personal communication, January 29, 2014). The existing literature showed no other nutrition curriculum directed specifically at dental hygiene students.

Similarly, a review of the ADEA's website found no current nutrition resources for dental hygienists. However, in 2005, ADEA published a textbook review article indicating a possible renewed attention to nutrition in dental education (Wood, 2005). Although Wood (2005) endorsed the textbook as useful for dental, medical, and dietetic clinicians, educators, and

students, and recommended the book be purchased as a valuable library resource, the textbook review was not directed at dental hygiene education. The last nutrition textbook listed on the ADEA's website was published in 1945; the website lists no textbooks published since. No current minimum standards were found regarding nutrition education in the entry-level dental hygiene education programs on the ADEA's website.

For the purpose of this study, an inquiry was submitted to the ADEA and the ADHA to ascertain information on current dental hygiene nutrition education trends, recommendations, and proposals. The ADEA referred to the 2005 curricular compendium and the 2011 competency document. The ADHA's response confirmed that its organization's only guidelines are contained in the Standard of Care (ADHA, 2008) and the CODA (2013; P. Steinbach, personal communication, February 10, 2014). A conclusion can be made that recommendations, endorsements, and standards are likely lacking for an effective nutrition curriculum in dental hygiene entry-level education. Competencies for nutrition do not exist in dental hygiene education according to the CODA, the ADEA, and the ADHA. Therefore, exploring current models and determining minimum nutrition education standards for dental hygiene education is warranted.

Current Nutrition Education Models

The ADA (2008) described a nutrition process of care as the intention to promote communication, empower researchers to identify nutrition challenges commonly encountered, and provide and evaluate interventions. Incorporating an evidence-based nutrition process of care consists of assessment, diagnosis, intervention, and monitoring/evaluation (ADA, 2008). At each patient appointment, the process of care should be repeated and modified as needed (ADA, 2008). The nutrition assessment consists of a health history review and possible interdisciplinary

consultations, and may include a screening and referral system in which standardized tests/examinations are used to identify intervention methods and/or referrals (ADA, 2008). The nutrition diagnosis is the identification of a current nutrition problem and describes signs, symptoms, and etiologies (ADA, 2008). The nutrition intervention phase is the action plan designed to change a nutrition risk factor, environmental cause, health status or behavior (ADA, 2008) The purpose of the intervention is to remedy the etiology versus addressing only signs and symptoms (ADA, 2008). The purpose of the evaluation phase is to monitor and evaluate progress and expected outcomes of the intervention (ADA, 2008). The evaluation may include additions or modifications of assessments, diagnoses, and interventions as needed (ADA, 2008). Whatever nutrition education model is used, the ADA (2008), nutrition process of care provides a focus to measure outcomes.

In 1992, more than 15 years earlier than the ADA (2008) recommendations, the American Medical Student Association (AMSA) created a Nutrition Curriculum Project (NCP) with the intention to "ensure that adequate nutrition be taught, …provide a framework for [the] integration of nutrition, …and to establish and disseminate essential information for nutritional assessment and management in clinical practice" (AMSA, 1996, p. 971). A 10-member advisory board consisting of medical and nutrition educators, physicians, and representatives of nutrition organizations developed five categories consisting of 92 essential nutrition topics deemed necessary in a nutrition curriculum (AMSA, 1996). The NCP recommended educational institutions incorporate all topics in their curriculum, but did not propose a method. There is no evidence that the NCP had any success. Appendix A contains a list of topics and categories recommended by AMSA (1996) for nutrition competencies in medical education. Interestingly, many of the topics in Appendix A could serve as a guide for CODA's nutrition and nutrition

biochemistry requirements. The nutrition assessment section in Appendix A could be used by dental hygienists in meeting the patient standards of care established by ADHA (2008). Appendix A also illustrates topics related to diet and prevention, nutrition and disease, and nutritional therapy that would fulfill goals of prevention, dental hygiene diagnoses, and interventions mentioned in the Dental Hygiene Standards of Care (ADHA. 2008), the National Dental Hygiene Research Agenda (ADHA, 2007), and Healthy People 2020 Partners in Prevention initiative (National Prevention Council, 2011).

Though attempts have been made to develop nutrition curricula for medical and dental hygiene students, currently there is no evidence of a standardized curriculum for nutrition education in health care. Even in nursing programs, the latest nutrition education content survey in the United States was published in 1987 (DiMaria-Ghalili et al., 2013). Some of the reasons for failure could be attributed to, "limited patient contact time, low reimbursement rates, unrecognized importance in patient care, lack of administrative support, a limited number of medical nutrition educators, already crowded curriculum, and no mandate across all healthcare fields for increased emphasis on nutrition education" (DiMaria-Ghalili et al., 2013, p. 22).

One of the pioneer's recognizing the importance of an effective nutrition curriculum for medical students was Halstead (1998). Halstead (1998) recommended nutrition education begin with a preclinical Introduction to Basic Principles course consisting of dietary nutrient requirements and regulation of intake, absorption, and metabolism as well as the significance of diet and health (Halstead, 1998). The basic principles of nutrition could then be applied to the relationship of diet and obesity, eating disorders, lipid disorders, starvation, and most chronic diseases (Halstead, 1998). Knowledge of physiological topics of assessment and interventions would be learned during patient contact in clinical practice (Halstead, 1998).

A minimum of one year of clinical applications of nutrition counseling following didactic education in basic nutrition was suggested to ensure students' confidence in their ability to provide effective nutrition interventions (Halstead, 1999). Halstead (1999) also contended that clinical nutrition would have to be incorporated throughout the medical education program (including pre-clinical years, elective experiences, fellowships) to be effective (Halstead, 1999). Halstead's recognition of a need for a standardized nutrition education model for medical students can be extended to all allied health care professionals including dental hygienists.

All of the nutrition models found in the literature pertained to medical school curricula. Common trends included an integration of nutrition within medical curriculum, clerkships, and clinical settings. Tufts University and the University of Pennsylvania incorporated the use of standardized patients. Cornell University and the University of North Carolina's nutrition education programs were exclusively online.

A representative from the University of Texas Medical School at Houston discussed the longitudinal integration of nutrition "into the basic science preclinical curriculum, clinical clerkships, and a transition-to-residency workshop" (DiMaria-Ghalili et al., 2013, p. 31). The University of Texas Medical School provides didactic nutrition education from the first year in biochemistry and physiology, and clinical nutrition skills in the clinical medicine course. Clinical case-based, problem-based learning builds on the first year information and teaches students to apply evidence-based nutrition interventions to patients (DiMaria-Ghalili et al., 2013). The third and fourth years at the University of Texas Medical School provides clinical clerkship opportunities (DiMaria-Ghalili et al., 2013). The fourth year also consists of a transition-to-residency workshop that focuses "on motivational interviewing and counseling skills related to diet and lifestyle modification for chronic diseases", and teaches how to write referrals to a

registered dietitian (DiMaria-Ghalili et al., 2013, p. 32). The University of Texas Medical School example of incorporating nutrition in existing didactic and clinical courses serves as an example of how dental hygiene programs can integrate nutrition in the current entry-level education curricula.

The nutrition program at the University of Texas Medical School was based on traditional faculty instruction, while the Boston University School of Medicine developed a student-centered nutrition medicine education model in 2006 (Lenders et al., 2013). The Boston nutrition education model consisted of case-based studies in the didactic setting and practice-base activities in the clinical setting (Lenders et al., 2013). The Nutrition Vertical Integration Group was created for curriculum evaluation, and the Student Nutrition Awareness and Action Council (SNAAC) was formed to "improve medical students' understanding of nutrition and obesity medicine" (Lenders et al., 2013, p.2). An interdisciplinary collaborative education was implemented with medical students and dietetic interns working together to form "nutrition and obesity-related committees" and participating "in activities such as education, specialty rotations, community outreach, and advocacy" (Lenders et al., 2013, p. 2). In several settings, the dietetic intern provided personal nutritional and lifestyle counseling directed at the medical student while incorporating "information regarding nutritional management of various chronic diseases and the role of the registered dietitian on the health care team (Lenders et al., 2013, p. 2). During these student-mentored committees, the medical student shared information regarding medical assessments and pharmacological treatments of chronic diseases (Lenders, et al., 2013). SNAAC was awarded the best student presentation at the John McCahan Medical Campus Education Day and was a featured program of Boston University School of Medicine's Deans Service Learning Initiative and Wellness Initiative in 2010 (Lenders et al., 2013).

Boston University School of Medicine met most of the National Institutes of Health (NIH), Nutrition Academic Award objectives (DiMaria-Ghalili et al., 2013). Perceptions of collaborative initiatives, understanding professional roles and teamwork proved to be a benefit of the nutrition medicine education model (Lenders et al., 2013). Following a pilot module involving approximately 15 volunteer students, the nutrition component became mandatory in 2012 for all students enrolled in the introduction to clinical medicine course. Identified limitations of the model included "lack of funding, clinical placements, faculty guidance, and student leadership opportunities (Lenders et al., 2013, p. 5). Another study identified that student confidence levels at the Boston School of Medicine were low in regard to providing nutritional counseling and dietician referrals (DiMaria-Ghalili et al., 2013). The Boston School of Medicine Nutrition program serves as another example of which some aspects can be integrated in dental hygiene entry-level education programs.

Tufts University School of Medicine (TUSM) also established a student-centered nutrition education curriculum and added a standardized patient (patients trained to assist in students' education) program to provide student feedback, education, assessments, and negotiate on dietary and exercise interventions (Woods, 2006). Woods (2006) reported the use of standardized patients was successful; however, the use of standardized patients is limited due to the expense in training and recruiting. The first two situations exposed the students to cardiovascular disease risk reduction and weight loss (Woods, 2006). The students were to obtain assessment information from a patient profile containing family and social history, preferences and aversions, dietary habits, and attitudes (Woods, 2006). A medical report was also available to the students that included patient information on serum lipids, triacylglycerols, glucose, blood pressure, and other lab reports (Woods, 2006). Six skills were selected from the Arizona Master

Interview Rating Scale for developing students nutrition interviewing skills: “developing rapport, organizing the session effectively, supplying clear information, providing positive reinforcement, getting the patient’s perspective, and checking the patient’s understanding” (Woods, 2006, p. 972S). The Arizona Interview Rating Scale is a method using standardized patients to evaluate students interviewing skills (Stillman, Burpeau-Di Gregorio, Nicholson, Sabers, & Stillman, 1983). Family medicine physicians identified the need for nutrition mentors who could deliver effective evidence-based nutrition counseling (Woods, 2006). Faculty was trained with an emphasis on hypertension, cardiovascular disease, type II diabetes, and weight loss/maintenance (Woods, 2006). The Dietary Approaches to Stop Hypertension (DASH) was the chosen nutrition education model with patient handouts (Woods, 2006). The training was extended to the residents who expressed concerns regarding time restraints inhibiting the ability to provide nutrition interviews (Woods, 2006). Based on the residents’ concerns, nutrition counseling formats were developed for one, three, and five minutes of nutrition counseling (Woods, 2006). TUSM received the Nutrition Academic Award to develop clinical nutrition skills for third and fourth year medical students (Woods, 2006). The barriers to change recognized by Woods (2006) were the current medical care delivery system was not yet preventive-oriented, care tended to be provided only when “things go wrong”, the majority of physicians lacked the ability to provide nutrition and lifestyle counseling, billing for nutrition counseling was not yet efficient, and referrals to dieticians were lacking for several reasons (limited insurance benefits, lack of dietician availability, lack of relationship between physician and dietician, and others). The success of the TUSM nutrition program was not reported, but the use of standardized patients may prove an important consideration when developing a standardized dental hygiene nutrition program.

The University of Pennsylvania School of Medicine eventually incorporated the use of standardized patients after a second award (Hark & Morrison, 2000). Initially, the University of Pennsylvania received a five-year grant in 1991 from the Howard Heinz Endowment to create a nutrition education curriculum for medical students (Hark & Morrison, 2000). The grant was intended for first through third year medical students and funding for the development of course materials for a self-instructional, case-based curriculum (Hark & Morrison, 2000). The integrated method was incorporated into several courses and departments such as medicine, family practice, geriatrics, surgery, obstetrics and gynecology, pediatrics, biostatistics and clinical epidemiology, the Institute on Aging, and the Center for Weight and Eating Disorders (Hark & Morrison, 2000). Appendix B describes the education model objectives the faculty developed (Hark & Morrison, 2000).

The University of Pennsylvania School of Medicine received a three-year grant in 1994 from the National Cancer Institute to enhance the introductory nutrition curriculum with a focus on nutrition and cancer prevention in the four-year medical curriculum (Hark & Morrison, 2000). The nutrition education model was integrated in the medical curriculum and consisted of six interdisciplinary modules.

Nutrition in Module 1 (Core Principles) included case-presentations that mimicked actual patient cases (Hark & Morrison, 2000). Questions were devised as a template and answered in sequence providing a self-instruction format for learning (Hark & Morrison, 2000). Topics in Module 1 included “metabolism of protein, lipids, and carbohydrates; inborn errors of metabolism; one-carbon metabolism; insulin action; and the role of vitamins and minerals in cellular respiration” (Hark & Morrison, 2000, p. 892S).

Module 2 (Integrative Systems and Disease) consisted of case-based nutritional management and entailed a list of diseases including cardiac diseases, gastroenterology, endocrinology, reproduction, pulmonary, renal, and hematology and oncology. Module 3 (Technology and Practice of Medicine) encouraged students to consistently integrate patient "information on dietary intake, vitamin, mineral and herbal remedies, lifestyle, alcohol, and exercise behavior when obtaining patient histories" (Hark & Morrison, 2000, p. 893S). Standardized patients performed competency evaluations and nutrition-related questions asked by the students, which provided student feedback (Hark & Morrison, 2000). Patient nutritional status was considered while performing physical examinations by using anthropometric data, physical findings (i.e. temporal wasting), and laboratory data (Hark & Morrison, 2000).

In Module 4, Core Clinical Clerkships, nutrition assessments were required during students' clinical rotations (Hark & Morrison, 2000). In Module 5 (Electives, Selectives, and Scholarly Pursuit), the students were to use critical thinking skills to integrate didactic and simulated learning in an area of interest (research or community) with a mentor (Hark & Morrison, 2000). Finally, Module 6 (professionalism and Humanism) emphasized professional development and cultural diversity in patient care (Hark & Morrison, 2000). Throughout the four years, the methods of teaching nutrition included lectures, cases, small group sessions, workshops, and self-learning modules. Hark and Morrison (2000) reported that each method of teaching proved to be valuable elements in the curriculum. The nutrition curriculum objectives included knowledge and clinical skills (Hark & Morrison, 2000). Appendix C provides the four topics and core clinical skills competencies for knowledge of nutrition principles.

Students from the University of Pennsylvania Medical School reported general satisfaction (63.8%) with the time exposed to nutrition education (Hark & Morrision, 2000). Evaluations

pending consisted of "identifying compliance with basic standards of care, …ability to provide nutrition counseling, [and]…interviews with patients at risk of cardiovascular disease …if they recall receiving nutritional counseling from their physician" and their opinion of the effectiveness of the counseling (Hark & Morrison, 2000, p. 895S). In conclusion, the University of Pennsylvania felt the nutrition education and prevention program was a success (Hark & Morrison, 2000). The University of Pennsylvania demonstrated a unique nutrition program by incorporating clinical nutrition and problem solving along with medical training. On the other hand, Cornell University and the University of North Carolina provided online nutrition continuing education courses (DiMaria-Ghalili et al., 2013).

Though no research articles are yet published, the University of North Carolina's current Nutrition Education program for Practicing Physicians (NEPP) was designed to improve obstetrics and gynecology physicians' understanding of weight and diet (DiMaria-Ghalili et al., 2013). A survey of obstetrics and gynecology residents regarding NEPP was conducted to determine the "feasibility and effectiveness of an online nutrition curriculum in improving clinical practice skills" (DiMaria-Ghalili et al., 2013, p. 30). The results of the survey discovered a significant increase in nutrition knowledge in calculating basal metabolic rates, assessing patients' readiness to change, and nutritional issues before and after NEPP were instituted (DiMaria-Ghalili et al., 2013). Furthermore, students' confidence levels also improved in all areas of nutrition surveyed, including referrals to a registered dietician (DiMaria-Ghalili et al., 2013). This study indicated that nutrition education can successfully be delivered to practicing professionals and could be implemented with other health care providers.

Cornell University offers opportunities that include high quality content available worldwide (DiMaria-Ghalili et al., 2013). DiMaria-Ghalili et al. (2013) reported online learning

has been successfully delivered efficiently at a low-cost. In turn, the challenges identified included online courses require funds to create and maintain, ongoing technical support, competition from free online courses, and a faceless audience can prove difficult for some (DiMaria-Ghalili et al., 2013). Dental hygiene programs that already incorporate online learning may benefit from an online nutrition education that can be applied in the clinical setting.

Figure 1 shows the comparison of nutrition education models discussed in this literature review. Incorporating a variety of these models may prove successful for nutrition in dental hygiene education with the purpose of improving patient health and fostering interdisciplinary collaboration. The clerkships and clinical setting models provide patient contact for practical application of knowledge obtained in classroom settings consisting of advanced nutrition and nutrition biochemistry. An exclusive online nutrition education or a hybrid curriculum may be beneficial for students earning a baccalaureate, masters in dental hygiene, or a doctorate degree. Furthermore, an online nutrition program may be advantageous for practicing clinical dental hygienists who do not feel competent applying nutrition counseling or collaborating with other healthcare disciplines.

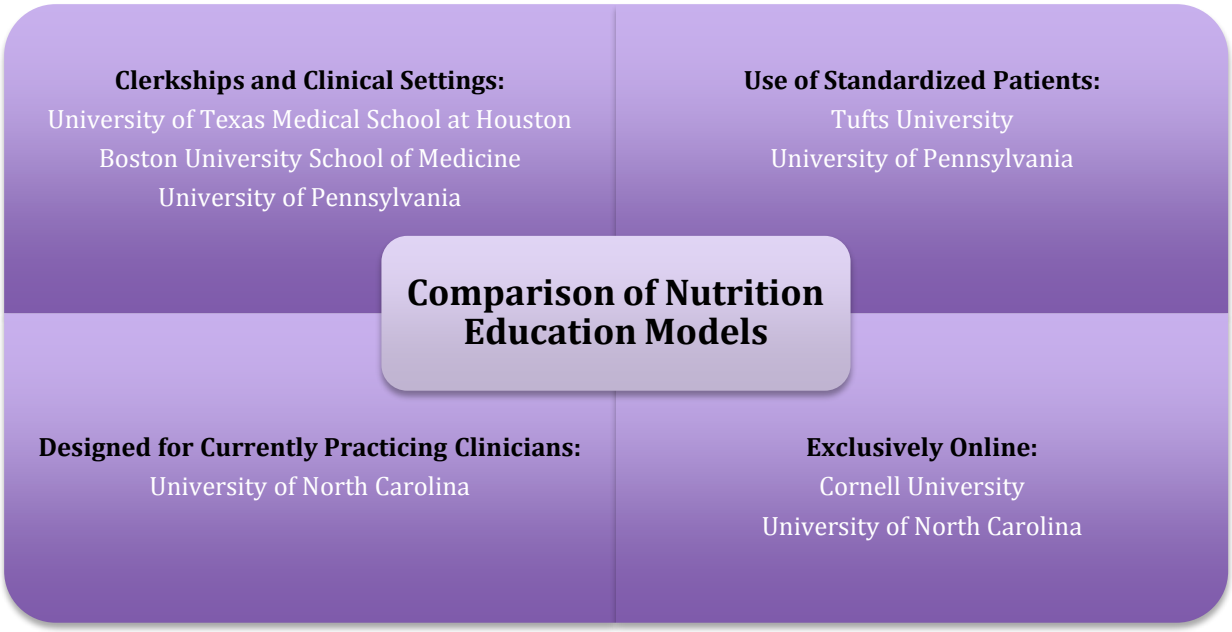

Figure 1: Comparison of Nutrition Education Models

Conclusion

The importance of nutrition in oral and systemic health is well established in the literature. Current literature addressed concerns of oral and systemic health in the United States and globally (CDC, 2009; National Prevention Council, 2011). Sedentary lifestyles and poor diets contribute to oral and general health diseases (Akabas, Chouinard, & Bernstein, 2012; Jones, Hofmann, & Quinn, 2010; Kraase, 2001). With the prevalence of disease and consumption of nutrient deficient food (CDC, 2009; National Prevention Council, 2011), a conclusion can be drawn that a lack of general knowledge and/or motivation exists regarding the benefits that good nutrition has on general health and well-being, in addition to maintaining and/or preventing disease. Dental hygienists should possess a fundamental knowledge of nutrition and communication skills to professionally counsel patients on healthy nutrition practices (Stegeman, Davis, and Boyd, 2010). Including clinical nutrition for therapeutic intervention and prevention will positively influence the whole health of patients while failing to provide nutritional

counseling denies patients optimal care (Liska et al., 2004). The incorporation of advanced clinical nutrition in dental hygiene curriculum may lead to a consensus to adapt nutritional education/counseling in all aspects of the dental hygiene process of care and scope of practice (Touger-Decker, 2004; Kading et al., 2010).

As mentioned previously, nutrition competencies and standards are lacking for entry-level dental hygiene education programs. Therefore, the purpose of this study was to document the extent of nutritional information included in dental hygiene program curricula, identify barriers to expanding nutritional content within the curriculum, and determine the a need for a proposed nutrition curriculum model. The desired outcomes of incorporating nutrition in dental hygiene education programs and general practice were to allow for consideration of patients' oral and whole health simultaneously and to foster interdisciplinary collaborative relationships.

Chapter III

Methodology

The purpose of this study was to document the extent of nutritional information included in dental hygiene program curriculum, identify perceptions and barriers to expanding nutritional content within the curriculum, and determine the need for a proposed nutrition curriculum model for entry-level dental hygiene education. The desired outcomes of incorporating nutrition in dental hygiene education programs and general practice are to allow for consideration of patients' oral and whole health simultaneously and to foster respectful interdisciplinary collaborative relationships.

To what extent is nutrition information included in dental hygiene program curricula, what are the perceptions of faculty who teach nutrition in dental hygiene programs concerning the adequacy of nutrition content and the need for expanding nutrition subject matter, and is there a need for a standardized nutrition content model for entry-level dental hygiene programs are the research questions this study pursued. Analyses of nutrition educational content in dental hygiene entry-level programs accompanied by nutrition instructor interviews were used to obtain the necessary information to determine the need of a nutrition education standard.

Research Design

The design consisted of a mixed methods approach using quantitative and qualitative methods. The key variables considered for this study consisted of the quality of nutrition courses in the entry-level dental hygiene programs, the quantity of student exposure opportunities to nutrition courses and clinical applications, and whether the nutrition curriculum could potentially contribute to health outcomes of patients. Other core variables included opinions and perceptions

of the current quality and quantity of nutrition courses as well as the need for a standardized nutrition curriculum for entry-level dental hygiene programs.

Research Context

For this study, the context referred to entry-level dental hygiene programs. Of the 335 entry-level dental hygiene programs in the United States, an attempt was made to ascertain which ones offered a stand-alone nutrition course.

Research Participants

Sample description. A representative response of the entry-level dental hygiene programs that included a stand-alone nutrition course was desired to conduct a content analysis of nutrition curriculum using course syllabi. Once the number of entry-level dental hygiene programs that offered a stand-alone nutrition course was established, the 11 nutrition instructors were interviewed (three had a dual role of program director and nutrition instructor). In addition, 10 program directors that did not employ a stand-alone nutrition course instructor were interviewed from dental hygiene programs that do not employ a nutrition instructor.

Human subjects' protection. Participants were recruited through a HSC application consent letter emailed to program directors requesting permission to interview nutrition instructors, or the program director if a stand-alone nutrition course does not exist (Appendix D). Contact information was requested when permission was granted to conduct the interviews. Obtaining informed consent ensured the interviewees volunteered and consented to the interview. After an introduction and describing the purpose of the study, each participant was asked specific informed consent questions and offered the option of continuing or terminating the interview. Respect for autonomy was extended to all potential interviewees who refused to participate or who chose to terminate the interview at any time. Appendices E and F highlight the

informed consent questions for the interviews conducted. Participant identity was assigned a code number or name. Subject identifiers were maintained on a removable/disposable hard drive and were not available to anyone other than the researchers. The identifiers were maintained in the event follow up information was needed for data analyses. Once the study was completed, all files were stored in the department of dental hygiene at Idaho State University in a locked file cabinet for seven years.

Data Collection

Instruments. The analysis of institution course syllabi was performed using a self-designed rubric based on the review of the literature (Ternus, Palmer, & Faulk, 2007). The interviews were conducted by telephone using a predetermined list of questions, and recorded on an audio recorder.

Procedures and protocols.

Step 1: A letter was sent via email to the program directors of all 335 entry-level dental hygiene education programs in the United States. The email asked if the program offered a stand-alone nutrition course, or required prerequisites. The email requested the program director share the name of the person who taught nutrition and share the course syllabi if the program offered a stand-alone nutrition course. Appendix D provides the HSC application consent letter.

Step 2: A conceptual analysis of the syllabi focused on the existence and frequency of nutrition content in dental hygiene program. When a dental hygiene program incorporated the clinical application of nutrition, the frequency of patient contact was measured. Finally, if nutrition content existed within a dental hygiene program, did the content allow for the potential improvement of patients' health? Ordinal scales and a specifically worded rubric that identified each level of adequacy measured the quality of the stand-alone nutrition curriculum. A rubric

was created using a modified design based on suggestions from Ternus, Palmer, and Faulk (2007). The nutrition syllabus content analysis rubric appears in Appendix G.

Step 3: Following the analysis of nutrition curriculum, a non-probability qualitative analysis employing interviews of either dental hygiene program nutrition instructors or program directors was conducted. The interviews began with an informed consent document and demographic questions for descriptive statistical purposes. (Appendices D, F, H, & I provide the informed consent and demographic questions respectively). Following the demographic questions the nutrition instructor was interviewed using a list of questions if a stand-alone nutrition course existed within the entry-level dental hygiene program (Appendix J provides questions for nutrition instructors). If a stand-alone nutrition course did not exist, the program director was interviewed (Appendices K & L provide the list of questions used for program directors). In some cases, the program director was the nutrition instructor. A non-probability sample size of six to 12 nutrition instructor participants and six to 12 program directors was desired and based upon voluntary participation. The interviews were conducted using a list of suggested questions based on the literature. The semi-structured interviews were conducted by telephone and audio recorded, and then transcribed immediately following the interview with the intention of resolving ambiguities and refining and/or adding new questions already answered in the first few interviews. The comparison of qualitative analysis, and inductive coding was created after the interviews as suggested by Thomas (2006). Thomas also suggested using a trustworthiness assessment and coding consistency checks. (Figure 2 provides the proposed concept map).

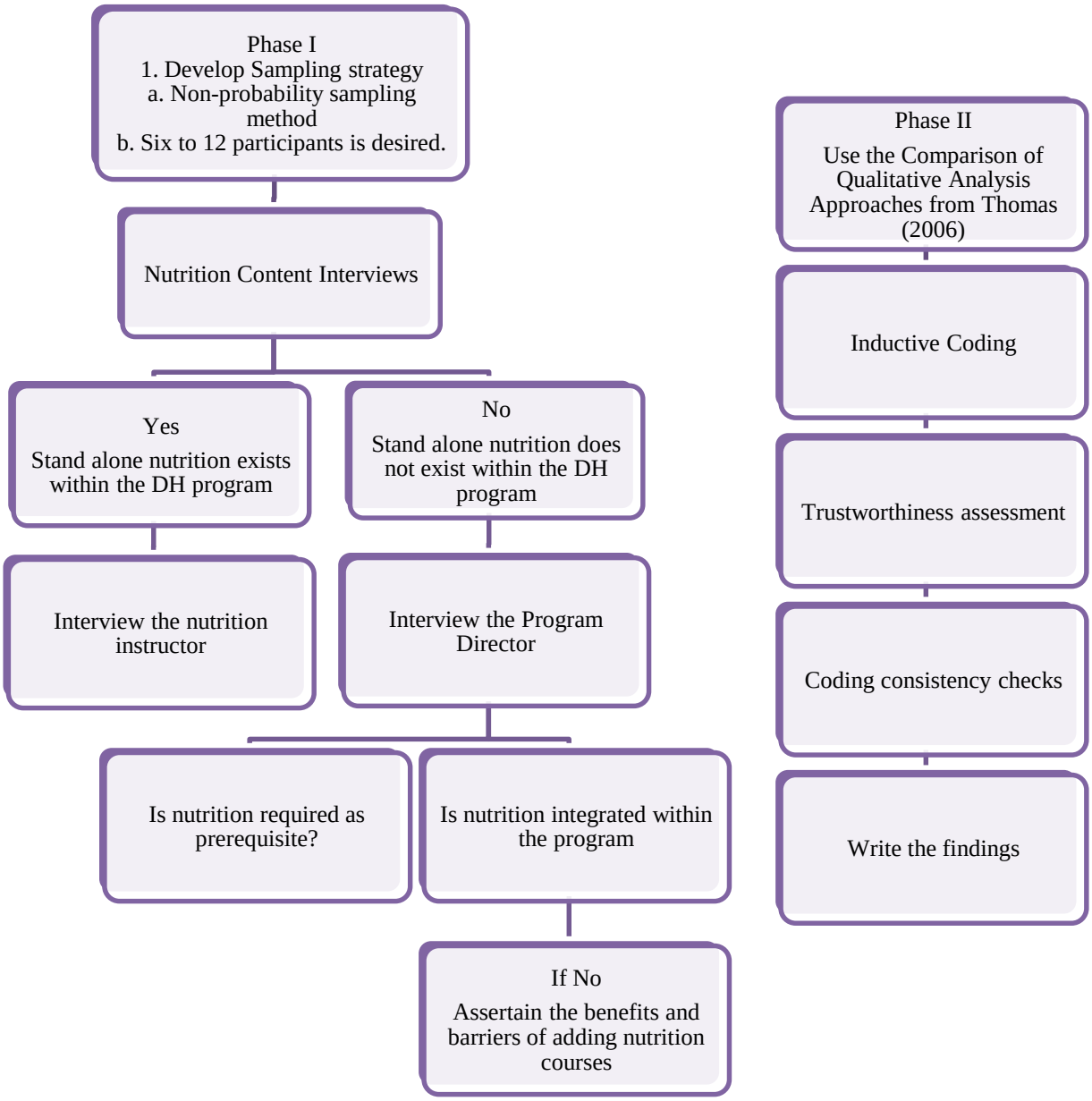

Figure 2: Qualitative Analysis Concept Map

Step 4: Using inductive analyses, the transcriptions were reviewed at least three times for accuracy and to identify and interpret themes, comparisons, and outcomes planned as well as those not planned. Indirect, nonspecific questions were asked to encourage more unstructured and opinionated responses than what direct questions would ascertain. The information was organized, categorized, and coded. An inductive analysis coding process was conducted (see

figure 3). Coding categories contained the setting and context, respondent perspectives, relationships, and themes. Data obtained during the analyses of the education context and interviews were entered on a spreadsheet and quantified in a codebook.

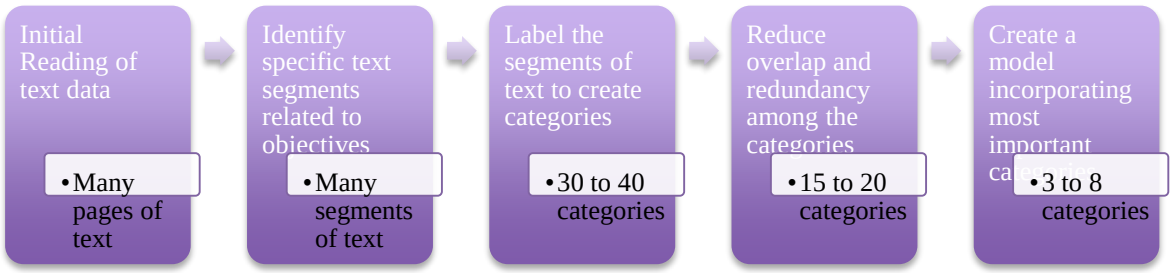

Figure 3: Inductive Analysis Coding Process. Adopted from Thomas (2006)

A coding frame was created and modified when new codes and themes emerge. The categories contained a label, description, text or data, links or relationships with other categories, and possibly the type of model containing the category. Interviews were beneficial in providing individual knowledge and information, values and preferences, and attitudes and beliefs of each nutrition instructor.

Statistical Analysis

Analyses of the nutrition curriculum content were performed using a specifically worded rubric that identified each level of adequacy for the qualitative analysis. Fifty-five syllabi were obtained for the nutrition content analysis.

Inductive analyses along with qualitative analyses where themes and codes emerge were used for the interview data as suggested by Thomas (2006). Inductive analysis considered frequencies, dominances, and themes that emerged from the interviews (raw data) without limitations (Thomas, 2006). The inductive approach allowed for clarifying and condensing lengthy interviews into summaries, identifying similarities and themes within the research questions and findings, and theorizing experiences and processes within the data (Thomas,

2006). When or if new themes or codes emerged, coding frames were developed and/or modified. Additional information obtained during the content analysis and interviews was deleted, skipped or added to the coding scheme. Descriptive statistics were used for the demographic data obtained and included frequencies and percentages.

Limitations

This study used a mixed method design with a predominately qualitative study using a non-probability sample. Therefore, the results could not be generalized and bias may have occurred in sample selections. This study may not reflect all programs that offer a nutrition course, but the study is relevant to entry-level dental hygiene education. Samples of nutrition syllabi were voluntarily obtained resulting in possible bias. Other limitations included non-responses to the emails and some refused to participate.

Conclusion

This study used a mixed method approach to examining nutrition in dental hygiene entry-level curriculum. A content analysis of nutrition curricula was conducted followed by interviews of nutrition instructors and dental hygiene program directors regarding their opinions and perceptions of the current and future status of nutrition education in entry-level dental hygiene programs.

Upon completion of this study, a manuscript was prepared suitable for publication in the Journal of Dental Education. Appendix M provides manuscript guidelines for the Journal of Dental Education. Nutrition education for entry-level dental hygiene programs has not been studied or published in a considerable amount of time. Therefore, a consideration of the current status and future needs of nutrition in dental hygiene education is warranted.

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Appendix A

Essential Topics for Developing Physicians Nutrition Competencies

Biochemistry, Physiology, Pathophysiology

Deficiency of vitamins and minerals
Sources of antioxidant, $B_{12,}$ calcium, complex carbohydrates, fats, fiber, iron, potassium, protein, and sodium
Energy balance
Gastrointestinal tract: an overview of function
Deficiency of calories
Deficiencies of A, C, D, K, B complex
Deficiencies of Zn, Fe
Deficiency of protein
Criteria of an adequate diet
Hormonal control of nutrient metabolism
Lipids (including cholesterol)
Nutrition and immunity
Physiology of hunger and satiety
Water and electrolytes
Trace minerals

Nutrition Assessment

Body Composition
Waist: hip ratio
Diet history taking
Nutrition physical examination
Biochemical evaluation
Anthropometrics
Assessment of vitamin intake and balance
Assessments of mineral intake and balance
Assessments of electrolyte intake and balance
Assessments of antioxidant intake and balance
Assessment of protein, carbohydrate, fat, and fiber intake
Assessment of energy balance
Plotting growth

Diet and Prevention

Pregnancy
Lactation
Growth and development
Geriatrics
Cardiovascular disease
Cancer
Osteoporosis
Obesity
Hypertension
Criteria for an adequate diet
National nutritional programs and goals
Nutritional supplements
Low-sodium diet
Vegetarianism

Nutrition and Disease

Bulimia
Anorexia
Depression
Schizophrenia
Failure to thrive
Nutritional anemias
Diabetes
Cancer
Hypertension
Osteoporosis
Hyperlipidemia and atherosclerosis
Coronary artery and cerebrovascular disease
Reflux disease
Liver disease
Peptic ulcer disease
Water, electrolytes, and acid-base balance
Hospital malnutrition
Surgery, trauma, and infection
Food-borne illness
Drug-nutrient interactions
Primary malnutrition
Diet and wound healing
Allergies
Cystic fibrosis
Rheumatoid disease
Oral cavity
Inborn errors in metabolism
Acquired immunodeficiency syndrome
Tests of digestive function

Nutritional Therapy

Digestive enzyme therapy
The “MD-RD” team
Nutritional supplements
Alcohol abuse
Enteral nutrition support
Parenteral nutrition support
Writing nutrition prescriptions
Writing nutrition referrals
Cultural issues

Appendix B

University of Pennsylvania School of Medicine Education Model Objectives

(Hark & Morrison, 2000)

- Increase student's nutrition knowledge in biochemistry and pathophysiology.
- Understand normal nutritional requirements throughout the life span.
- Understand the association between nutrition and health maintenance and prevention.
- Describe the relation between an appropriate diet and management of specific chronic diseases.
- Conduct a nutrition and diet history.
- Assess patients' nutritional status during the history and physical exam.
- Provide nutrition guidance to hospitalized and ambulatory patients.
- Answer patients' nutrition-related questions.
- Display professionalism when interacting and counseling patients.
- Understand how to utilize and when to refer to registered dietitians.
- Appreciate patients' diverse cultural, ethnic, and dietary habits.
- Help motivate patients to make dietary and lifestyle changes to prevent disease

Appendix C

Four Topics and the Core Competencies For Knowledge of Nutrition Principles

(Hark & Morrison, 2000, p. 895S)

Topics

1. the science of nutrition related to primary and secondary prevention of cardiovascular disease;
2. methods to assess nutritional status and cardiovascular disease risk;
3. behavioral change and treatment strategies; and
4. nutritional issues for special populations defined by age, sex, ethnicity, and socioeconomic status.

Core Clinical Skills Competencies

- Assess and document patients' risk factors for cardiovascular disease.
- Take a nutrition history as a component of a routine medical and social history.
- Assess the concentration of saturated fat and sodium in a patient's diet.
- Screen patients to identify hypercholesterolemia in children and adults.
- Discuss National Cholesterol Education Program or American Heart Association Nutrition Therapy Guidelines with patients.
- Consider a patient's readiness to change behavior and motivate them to the next step.
- Personalize nutrition recommendations for diagnosis, age, ethnicity, and gender.
- Encourage healthy behaviors such as exercise and smoking cessation.
- Monitor patients' progress with nutrition and behavioral interventions.
- Answer patients' questions about nutrition and its role in prevention.
- Evaluate laboratory data to assess patients' progress with nutritional interventions.
- Identify and refer patients who would benefit from a registered dietitian.
- Identify and refer patients who would benefit from a nurse educator.

Appendix D

HSC Application Consent Letter

Date, 2014

Dear Program Director:

I am currently preparing to conduct my thesis research and request your participation to obtain information regarding nutrition education in entry-level dental hygiene education programs. The research questions I am pursuing consist of: 1) To what extent is nutrition information included in dental hygiene program curricula? 2) What are the perceptions of faculty who teach nutrition in dental hygiene programs concerning the adequacy of nutrition content and the need for expanding nutrition subject matter? 3) Is there a need for a standardized nutrition content model for entry-level dental hygiene education programs?

Consent is to be in research is voluntary

Study Title: Nutrition in Dental Hygiene Education

This is a volunteer research study. The research committee members are Deborah Johnson, RDH BSDH, JoAnn Gurenlian, RDH, PhD, and Jacque Freudenthal, RDH, MHE from the Department of Dental Hygiene, Idaho State University.

You are being asked to participate in this study because you are a Dental Hygiene Program Director. Your knowledge, perceptions, and opinions are valuable to dental hygiene education and this study.

What to expect if you choose to participate in this study:

The purpose of this step of the study is to ascertain how many entry-level dental hygiene education programs offer a stand-alone nutrition course. Once those programs that offer a stand-alone nutrition course are identified, interviewing nutrition instructors of those courses is desired. Program directors will be asked to participate in interview when the entry-level program does not employ a nutrition instructor, or the program director is the nutrition instructor.

What are the personal and privacy risks involved as a participant:

If any of the questions make you feel uncomfortable or raise unpleasant memories, you may ask to skip any question. Identifying information will not be made publicly available or published in the research document.

Are there any benefits in participating in this study?

There are no benefits to you. All the data collected will be used for research purposes.

Incentives for Participation:

You will not be paid for completing the survey. Additionally, there are no costs to you.

Rights of the Research Participant:

Participating in this research study is voluntary. There will be no negative consequences for declining to participate or for withdrawing from the study

Who can answer questions about the study:

If you have any questions, concerns or complaints about this study, you may contact Deborah Johnson at johndeb5@isu.edu, Jacque Freudenthal at freujacq@isu.edu, or JoAnn Gurenlian at gurejoan@isu.edu.

The research study has been reviewed and approved by the institutional review board (IRB). You may contact the IRB administrator at 208-282-2179; fax 208-282-4529; email humsubj@isu.edu if you have any questions, concerns, or complaints not resolved by the researcher.

Preliminary Nutrition Survey:

Your consent is implied if you voluntarily answer the following questions:

1. Does your entry-level dental hygiene program offer a stand-alone nutrition course during the program or require nutrition as a prerequisite prior to admittance to the program?

2. If your entry-level dental hygiene program offers a stand-alone nutrition course, would you be so kind as to provide the name and contact information of the nutrition instructor as well as a copy of the nutrition course syllabus (syllabi)?

3. If you are the nutrition instructor, or if your program does not offer a stand-alone nutrition course, would you be willing to participate in a nutrition interview?

4. Please provide the nutrition instructor contact information if a nutrition course exists in the curriculum.

The interview is designed to take approximately 20 minutes to complete. The interview is voluntary and will consist of separate consent questions and may be terminated at anytime prior to completion.

In recognition of your time constraints, your voluntary participation is greatly appreciated and will provide valuable information regarding dental hygiene education.

Sincerely,

Deborah Johnson

RDH, BSDH, MSDH(c)

Johndeb5@isu.edu

530-515-5761

Appendix E

Interview Informed Consent Document

(Program Directors)

My name is Deborah Johnson. I am a graduate student at Idaho State University. The purpose of this call is to follow up on the email I sent you and obtain information regarding nutrition education in entry-level dental hygiene education programs for my thesis study. You have been selected to participate in this research because you are a program director for an entry-level dental hygiene program. Would you be will willing to answer a few questions for me?

1. The purpose of the study is to document the extent of nutritional information included in dental hygiene program curricula, identify perceptions and barriers to expanding nutritional content within the curriculum, and determine if there is a need for a proposed nutrition curriculum model.
2. Procedures: This interview will be recorded and quickly transcribed with the intention of resolving ambiguities and refining and/or adding new questions already answered in the first few interviews. The recordings will be used for research purposes only, will be protected in a locked file cabinet in the Dental Hygiene Department at Idaho State University for seven years, and then destroyed.
3. Potential discomforts or risks: If any of the questions make you feel uncomfortable or raise unpleasant memories, you may ask to skip any question. Identifying information will not be made publicly available or published in the research document
4. Anticipated Benefits: There are no benefits to you. All data collected will be used for research purposes.
5. Incentives for Participation: You will not be paid for completing the survey. Additionally, there are no costs to you.
6. Privacy and Confidentiality: Personal identifying information will not be made public or be included in the research documents.
7. Rights of the Research Participants: Participation in this research project is voluntary. Participation is not a requirement. There will be no negative consequences for declining to participate or for withdrawing from the study.

Your participation in this interview is sincerely appreciated and important to the contribution in obtaining information on the current status of nutrition in dental hygiene curriculum throughout the United States. The interview will be approximately 15 to 20 minutes. You are encouraged to provide answers that are representative and related to your program. Your sincerity and honesty are greatly appreciated and will be valuable for this research study.

If you have any questions or would like to discuss the interview at a later time, you may contact me, Deborah Johnson, at johndeb5@isu.edu or 530-515-5761.

The first few questions are for informed consent to voluntarily participate in this survey. If you answer "NO" to any of these questions the interview will be immediately terminated.

1. Do you understand that participation in this interview is entirely voluntary?
    - ○ Yes
    - ○ No
2. Do you understand your responses to this interview are strictly confidential and your anonymity will be protected? There will be no personal data collected that could identify you.
    - ○ Yes
    - ○ No
3. Do you understand that your individual answers are for research and data analysis only?
    - ○ Yes
    - ○ No
4. Do you understand that you may refuse to answer any of the questions you are not comfortable with, and may revoke your consent and discontinue participation in this interview at any time?
    - ○ Yes
    - ○ No
5. Do you wish to continue and participate in the interview?
    - ○ Yes
    - ○ No
    - ○ No

Appendix F

Interview Informed Consent Document

(Nutrition Instructors)

My name is Deborah Johnson. I am a graduate student at Idaho State University. I received your contact information from ____, the director of the Dental Hygiene program at your institution. The purpose of this call is to obtain information regarding nutrition education in entry-level dental hygiene education programs for my thesis study. You have been selected to participate in this research because you are a nutrition instructor for an entry-level dental hygiene program. Would you be will willing to answer a few questions for me?

8. The purpose of the study is to document the extent of nutritional information included in dental hygiene program curricula, identify perceptions and barriers to expanding nutritional content within the curriculum, and determine if there is a need for a proposed nutrition curriculum model.
9. Procedures: This interview will be recorded and quickly transcribed with the intention of resolving ambiguities and refining and/or adding new questions already answered in the first few interviews. The recordings will be used for research purposes only, will be protected in a locked file cabinet in the Dental Hygiene Department at Idaho State University for seven years, and then destroyed.
10. Potential discomforts or risks: If any of the questions make you feel uncomfortable or raise unpleasant memories, you may ask to skip any question. Identifying information will not be made publicly available or published in the research document
11. Anticipated Benefits: There are no benefits to you. All data collected will be used for research purposes.
12. Incentives for Participation: You will not be paid for completing the survey. Additionally, there are no costs to you.
13. Privacy and Confidentiality: Personal identifying information will not be made public or be included in the research documents.
14. Rights of the Research Participants: Participation in this research project is voluntary. Participation is not a requirement. There will be no negative consequences for declining to participate or for withdrawing from the study.

Your participation in this interview is sincerely appreciated and important to the contribution in obtaining information on the current status of nutrition in dental hygiene curriculum throughout the United States. The interview will be approximately 15 to 20 minutes. You are encouraged to provide answers that are representative and related to your program. Your sincerity and honesty are greatly appreciated and will be valuable for this research study.

If you have any questions or would like to discuss the interview at a later time, you may contact me, Deborah Johnson, at johndeb5@isu.edu or 530-515-5761.

The first five questions are for your informed consent to voluntarily participate in this survey. If you answer "NO" to any of the first five questions the interview will be immediately terminated.

1. Do you understand that participation in this interview is entirely voluntary?
    - ○ Yes
    - ○ No
2. Do you understand your responses to this interview are strictly confidential and your anonymity will be protected? There will be no personal data collected that could identify you.
    - ○ Yes
    - ○ No
3. Do you understand that your individual answers are for research and data analysis only?
    - ○ Yes
    - ○ No
4. Do you understand that you may refuse to answer any of the questions you are not comfortable with, and may revoke your consent and discontinue participation in this interview at any time?
    - ○ Yes
    - ○ No
5. Do you wish to continue and participate in the interview?
    - ○ Yes
    - ○ No

Appendix G

Nutrition Syllabus Content Analysis Rubric

(Adopted and modified from Ternus, Palmer, & Faulk, 2007)

	0	1	2	3	Comment
Nutrition Content	Does not exist	A nutrition course content exists, but content is not clear. Lacks relevant material related to the learning objectives and material is not current (resources used >5 years) Content does not go beyond basic nutrition (protein, fats, and carbohydrates) Content does not incorporate ADA (2008) process of care.	A nutrition course exists with limited clarity Resources are current and information is relevant to learning objectives. Content includes one or two elements of applied nutrition for allied health care provider/advanced nutrition for dental hygiene. Incorporates nutrition assessments, but no other elements of the ADA (2008) process of care.	A nutrition course exists and is presented in a uniform and clear method. Resources are current (< 5 years) and information is relevant to learning objectives. Content encompasses more than three elements of applied or advanced nutrition requirements and nutrient deficiencies and diseases. Incorporates the ADA (2008) process of care consisting of nutrition assessment, diagnosis, intervention, monitoring/evaluation, and consideration of interdisciplinary consultations and provides a focus to measure outcomes.	
Nutrition learning methods and patient contact opportunities	Does not exist	One applied clinical nutrition opportunity exists and no patient contact opportunities	More than two applied clinical nutrition opportunities exists and one patient contact opportunity.	More than two applied clinical nutrition opportunities exists and more than one patient contact opportunity. Learning Modules include patient assessments	

	0	1	2	3	Comment
New Information -Synchronous -Asynchronous	No new information is presented. Ideas stated are not reinforced in either synchronous or asynchronous Settings	Syllabus indicates new information is encouraged synchronous/asynchronous settings	Syllabus allows for limited new information	Instructor adds to the body of knowledge and information presented Latest nutrition information is referenced.	
Web-based Links	No links to web-based information added to the course.	Minimal web links are apparent in the course. Some are irrelevant.	An appropriate number of relevant links add to the learning experience.	An appropriate number of credible and relevant selected links add to the learning experience.	
Course Learning Objectives	Not identified	Identified but not measured. Lower level cognitive and/or affective learning objectives described.	Behavioral learning objectives/goals are measured and identified. Most Learning objectives described at lower level. Not more than two Higher level objectives	Behavioral learning objectives/goals are measured and identified and the number is appropriate for the content and length of time for the course. Higher level objectives described	
Course Assignments, Readings, Activities and/or Projects	Assignments, activities and/or projects within the course are not related to the learning objectives or do not exist. Assignments/projects do not present a purpose.	Assignments, activities and/or projects within the course are related to the learning objectives. Present an unclear purpose.	Assignments, activities and/or projects within the course have a discussion of the purpose of the assignment related to learning objectives.	Assignments, activities and/or projects within the course have a discussion of the purpose of the assignment related to learning objectives and are based on evidence.	
Knowledge	Limited nutrition expertise is evident in presentation of content. No faculty bio available	Inconsistent expertise in nutrition content area is evident in presentation of knowledge according to faculty bio.	Expertise in nutrition content area is evident according to the faculty bio.	Expertise in nutrition content area is evident according to the faculty bio. Faculty presents a number of their research studies in the course.	

Appendix H

Program Director Demographic Information

Questions

6. What is your gender?
    a. Female
    b. Male
7. What is your age? _____
8. What is your level of education?
    ○ AA/AS degree
    ○ BA/BS degree
    ○ MA/MS degree
    ○ PHD degree
    ○ None of the above
9. What are your credentials? (Select all that apply)
    ○ Registered Dental Hygienist
    ○ Dentist
    ○ Educator
    ○ Public Health Professional
    ○ Other
10. How many years have you been the program director of this dental hygiene program?
    a. One year or less
    b. Two to five years
    c. Six to ten years
    d. More than ten years.
11. How many years have you taught nutrition to dental hygiene students? (Skip for program directors not teaching nutrition)
    ○ Less than one year.
    ○ One - Five years
    ○ Six – Ten Years
    ○ More than Ten Years.

12. Do you have the autonomy to ensure the dental hygiene students in your program receive adequate training in providing nutritional counseling to their clients?
    - ○ Complete Autonomy. I make all the decisions.
    - ○ Moderate Autonomy. I make most of the decisions.
    - ○ Some Autonomy. I make some decisions.
    - ○ Very Little Autonomy. My decisions must be approved by someone else.
    - ○ None. Someone else makes the decisions.
13. How familiar are you with the Healthy People 2020 nutrition recommendations?
    a. Not familiar at all (never heard of Healthy People 2020).
    b. Slightly familiar.
    c. Moderately familiar.
    d. Extremely familiar.

Appendix I

Nutrition Instructor Demographic Information

Questions

6. What is your gender?
    c. Female
    d. Male
7. What is your age? _____
8. What is your level of education?
    - ○ AA/AS degree
    - ○ BA/BS degree
    - ○ MA/MS degree
    - ○ PHD degree
    - ○ None of the above
9. What are your credentials? (Select all that apply)
    - ○ Registered Dental Hygienist
    - ○ Dentist
    - ○ Educator
    - ○ Public Health Professional
    - ○ Other
10. How many years have you taught nutrition to dental hygiene students?
    - ○ Less than one year.
    - ○ One - Five years
    - ○ Six – Ten Years
    - ○ More than Ten Years.
11. Do you have the autonomy to ensure the dental hygiene students in your program receive adequate training in providing nutritional counseling to their clients?
    - ○ Complete Autonomy. I make all the decisions.
    - ○ Moderate Autonomy. I make most of the decisions.
    - ○ Some Autonomy. I make some decisions.
    - ○ Very Little Autonomy. My decisions must be approved by someone else.
    - ○ None. Someone else makes the decisions.

12. How familiar are you with the Healthy People 2020 nutrition recommendations?

- ○ Not familiar at all (never heard of Healthy People 2020).
- ○ Slightly familiar.
- ○ Moderately familiar.
- ○ Extremely familiar.

Appendix J

Interview Questions for Nutrition Instructors

13. Please share your opinion and perceptions of the quality and quantity of nutrition courses presented to the dental hygiene students at the institution you teach.
14. Can you describe in your opinion, how much nutrition is needed, and is your program meeting these needs?
15. How many applied clinical nutrition application or patient contact opportunities are the students provided?
16. In your opinion, are there any topics that are being missed?
17. What topics are emphasized in your course(s)?
18. What do you use to measure the competencies of the nutrition course(s)?
19. What are the key elements that prepare your students to contribute to and benefit the patients they serve?
20. To what extent are the recommendations of Healthy People 2020 nutrition incorporated in the students' nutrition education?
21. In your opinion, are there any barriers to expanding the nutrition content within the dental hygiene program curriculum? If so, what are they?
22. In your opinion, what would be an ideal standard nutrition content model for entry-level dental hygiene education programs?

Appendix K

Interview Questions for Program Directors

(Not teaching nutrition)

14. What is your opinion of the role dental hygienists should serve in providing nutrition education counseling?

15. Is there a required prerequisite nutrition course?

16. How is nutrition incorporated throughout the dental hygiene education program?

17. What do you use to measure the competencies of the nutrition course(s)?

18. What would you consider being benefits of adding nutrition to the curriculum?

19. Are there barriers to adding nutrition courses in your program? If so, what are they?

20. In your opinion, what would be an ideal standard for nutrition content model in dental hygiene education programs (if time and credits were of no concern)?

Appendix L

Interview Questions for Program Directors

(Teaching nutrition)

14. What is your opinion of the role dental hygienists should serve in providing nutrition education counseling?
15. Is there a required prerequisite nutrition course prior to taking the course you teach?
16. Please share your opinion and perceptions of the quality and quantity of nutrition courses presented to the dental hygiene students at the institution you teach.
17. How is nutrition incorporated throughout the dental hygiene education program?
18. Can you describe in your opinion, how much nutrition is needed, and is your program meeting these needs?
    a. How many applied clinical nutrition application or patient contact opportunities are the students provided?
19. In your opinion, are there any topics that are being missed?
20. What topics are emphasized in your course(s)?
21. What do you use to measure the competencies of the nutrition course(s)?
22. What are the key elements that prepare your students to contribute to and benefit the patients they serve?
23. To what extent are the recommendations of Healthy People 2020 nutrition incorporated in the students' nutrition education?
24. What would you consider being benefits of adding nutrition throughout curriculum?
25. In your opinion, are there any barriers to expanding the nutrition content within the dental hygiene program curriculum? If so, what are they?
26. In your opinion, what would be an ideal standard for nutrition content model in dental hygiene education programs (if time and credits were of no concern)?

Appendix M

Journal of Dental Education

INFORMATION FOR AUTHORS

The *Journal of Dental Education (JDE)* is a peer-reviewed monthly journal that publishes a wide variety of educational and scientific research in dental, allied dental and advanced dental education. Published continuously by the American Dental Education Association since 1936 and internationally recognized as the premier journal for academic dentistry, the *JDE* publishes articles on such topics as curriculum reform, education research methods, innovative educational and assessment methodologies, faculty development, community-based dental education, student recruitment and admissions, professional and educational ethics, dental education around the world and systematic reviews of educational interest. The *JDE* is one of the top scholarly journals publishing the most important work in oral health education today; it celebrated its 75th anniversary in 2011.

I. Types of Manuscripts Considered and Requirements for Each

The Editor will consider the following types of manuscripts for publication:

Submissions for Peer Review:

- Original Articles (see below for categories within this type)
- Review Articles

Solicited or Pre-approved by the Editor:

- Letters to the Editor (solicited or pre-approved by the Editor)
- Guest Editorials (solicited by the Editor)
- Perspectives (pre-approved by the Editor)
- Brief Communications (pre-approved by the Editor)
- Point/Counterpoint (solicited by the Editor)

Special Reports:

- Miscellaneous (submitted by ADEA staff)

Submissions for Peer Review

1. Original Articles

This type of article addresses subject matter in the following categories:

a. Predoctoral Dental Education
b. Advanced Dental Education
c. Allied Dental Education
d. Interprofessional Education
e. Community-Based Dental Education

f. Global Dental Education—Manuscripts pertaining to global health education or issues pertinent to the global dental education community. (Not intended solely for submissions from international authors. International authors should submit manuscripts under pertinent topic areas provided in this section.)
g. Use of Technology in Dental Education
h. Assessment
i. Faculty Issues/Development
j. Continuing Education

Original Articles should report the results of hypothesis-based research studies and may be either qualitative, quantitative or of a mixed methods nature. Manuscripts must address how the findings advance our understanding of the questions asked in the study and make a novel contribution to the literature. The limitations of the study should also be addressed. Small studies of local relevance/interest, limited to one class/course, or small course/student-based surveys may not meet the criteria to be published as an Original Article.

Original Articles should be no more than 3,500 words, excluding the abstract, illustrations and references. A maximum of six figures and tables can be submitted (the figures can be multi-panel), and the number of references should not exceed 50 (unless the article is a systematic review).

Original Articles should have the following general organization (see "Document Preparation, Organization and Formatting" below for more detailed instructions):

Title: An informative and concise title limited to 15 words with no more than 150 characters.

Abstract: For research studies, a structured abstract of no more than 250 words should be submitted with the following subheads:

> Purpose/Objectives: Briefly summarize the issue/problem being addressed.
>
> Methods: Describe how the study was conducted.
>
> Results: Describe the results.
>
> Conclusion(s): Report what can be concluded based on the results, and note implications for dental education.

Abstracts for other types of manuscripts should be in paragraph form, with no subheads.

Introduction: Provide a succinct description of the study's background and significance with references to the appropriate published literature. Detailed literature review/discussion should be reserved for the discussion section. Include a short paragraph outlining the aims of the study.

Materials and Methods: A statement that the study has been approved or exempted from oversight by a committee that reviews, approves and monitors studies involving human subjects **MUST** be provided at the beginning of this section, along with the IRB protocol number.

In this section, provide descriptions of the study design, curriculum design, subjects, procedures and materials used, as well as a description of and rationale for the statistical analysis. If the design of the study is novel, enough detail should be given for other investigators to reproduce the study. References should be given to proprietary information.

Results: The results should be presented in a logical and systematic manner with appropriate reference to tables and figures. Tables and figures should be chosen to illustrate major themes/points without duplicating information available in the text.

Discussion: This section should focus on the main findings in the context of the aims of the study and the published literature. The authors should avoid an extensive review of the literature and focus instead on how the study's findings agree or disagree with the hypotheses addressed and what is known about the subject from other studies. A reflection on new information gained, new hypotheses and limitations of the study should be included, as well as guidance for future research.

Conclusion: The article should end with a short paragraph describing the conclusions derived from the findings and implications of the study for dental education.

Acknowledgments: The acknowledgments should report all funding sources, as well as any other resources used or significant assistance.

Disclosure: Authors must disclose any financial, economic or professional interests that may have influenced the design, execution or presentation of the scholarly work. If there is a disclosure, it will be published with the article.

Clinical Trials: Any educational research studies that are designed as "clinical trials" must register the trial before submitting to the *Journal of Dental Education*. The registration number must be provided in the manuscript.

The studies can be registered at U.S. National Institutes of Health Clinical Trials Registry, EU Clinical Trials Register, or WHO International Clinical Trials Registry Platform.

2. Review Articles

The *JDE* will not consider articles that consist of a general review of topics or published information that is more appropriate for a textbook. However, systematic reviews that focus on trends, issues, new programs or innovations in dental education that are of global interest are welcome. These reviews should not be exhaustive reviews of the literature, but should be concise and address important and relevant questions that affect dental education. Reviews should be presented in a scientific format and use the methods of a systematic review. Authors can refer to the *Cochrane Handbook for Systematic Reviews of Interventions* for more details. In addition, the Editor asks authors of reviews to make sure they follow the PRISMA checklist and flow diagram to ensure the highest quality of systematic reviews and meta-analyses.

For review articles, a structured abstract of 250 words or fewer that addresses the question of interest must precede the review. A brief background and significance section with a review of the literature should be provided. The question being asked and the justification for the review should be addressed. As with any systematic review, the search strategy and the inclusion and exclusion criteria should be outlined. The authors should describe the findings of the search and the quality of the studies retrieved. The discussion section should compare the findings of the study to the literature at large. Limitations and future areas of interest/research should be identified. Review articles should be limited to 3,500 words with no more than 80 references. No more than six tables and figures should be included. Acknowledgments and any conflicts of interest should be documented as described in the Original Article section.

Solicited or Pre-approved by the Editor

1. Guest Editorials

Each issue opens with a "From the Editor" note or a Guest Editorial solicited by the Editor, usually consisting of a short commentary on articles in that issue or on critical topics of interest to readers. The Editor's annual report about the journal will be published in the January issue.

2. Letters to the Editor

Letters to the Editor should be responses to articles published in the *JDE* in the previous three-month period. They should add to the discussion in a scientific manner, without being personal reflections or reactions. On occasion, letters that deal with the profession, education and training, as well as issues critical to dental education, will be considered. Letters should be brief, focused on one or a few specific points or concerns, and can be signed by no more than four individuals. The letter should be limited to 400 words and six references in *JDE* format. Authors should submit letters directly to the Editor (JDEeditor@adea.org).

3. Perspectives

Perspectives articles should provide an opinion-based but well-supported commentary on controversies, innovations or emerging trends in dental education. On occasion, manuscripts addressing historical figures/perspectives that are impacting current practices will also be considered. Perspectives articles may also be solicited by the Editor on issues that are critical in dental education. Authors who want to independently submit a commentary should contact the Editor ahead of time by e-mail. These articles will be limited to 2,000 words, no more than 10 references, and no more than two figures and/or tables.

Perspectives articles should consist of a) an introduction that addresses why this topic is of general interest to a North American and/or global audience; b) a main section that contains the information relevant to the area being discussed, the author's perspective on it and the grounds for that perspective; and c) a summary that describes the importance of the commentary/perspective to the current and future status of the topic and recommendations concerning how these items can be addressed.

Authors should submit inquiries for submission of perspectives directly to the Editor (JDEeditor@adea.org).

4. Brief Communications

Brief Communications should be used to inform readers about significant findings in studies based on a limited data set, such as a topic of local relevance/interest or limited to one class/course. These communications will typically contain novel items/findings that are time-sensitive. These articles should include an unstructured abstract of 150 words or fewer. This category of article will be limited to 1,000–1,500 words, no more than 10 references and no more than two tables and/or figures. Authors should submit inquiries for submission of Brief Communications directly to the Editor (JDEeditor@adea.org).

5. Point/Counterpoint

Point/Counterpoint articles will be solicited by the Editor, who will provide those authors with information about required length and format.

Special Reports

In addition to the above types of manuscripts, the *JDE* occasionally publishes several types of articles and reports that fall outside the standard peer-review process. These include Association Reports (which are written by ADEA staff members) and special reports/sections/issues (which are the result of special activities or studies conducted by ADEA or other groups and are considered on a case-by-case basis by the Editor). Each year, the ADEA Annual Proceedings and the abstracts of poster and TechExpo presentations at the ADEA Annual Session & Exhibition are also published in the *JDE*. All these types of documents undergo systematic internal review and selected external review as determined by the Editor.

II. Requirements and Policies for Submitted Manuscripts

The *JDE* considers only manuscripts that are in MS Word and submitted electronically (see "Submission and Production Procedures" below for the submission process). All manuscripts submitted to the journal should follow the "Uniform Requirements for Manuscripts Submitted to Biomedical Journals," compiled and published by the International Committee of Medical Journal Editors (ICJME). Authors are also encouraged to refer to the code on good publication practice produced by the Committee on Publication Ethics.

No Prior Publication or Duplicate Submissions. Manuscripts are considered for publication only if they are not under consideration by other journals and have not been published previously in the same or substantially similar form. Submitting authors should attest to their compliance with this requirement in their cover letters. Should a prior or duplicate publication be discovered, the Editor will address the matter with the affected author/s and the other journal's editor following guidelines published by the ICJME and by the Committee on Publication Ethics.

Plagiarism. Plagiarism is a violation of scholarly standards and will not be tolerated. If a case of plagiarism is alleged or discovered, the Editor will address it with the affected author/s, following ICJME guidelines. Authors should exercise extreme care in quoting or paraphrasing material from published sources, so as not to risk plagiarism.

Conflict of Interest. A conflict of interest exists when professional judgment concerning a primary interest may be influenced by secondary interests (professional, personal, financial, etc.). Forms declaring any conflict of interest must be submitted for each author when the manuscript is submitted for consideration. The form can be found on ScholarOne Manuscripts in the upper right-hand corner under ''Instructions & Forms.''

Human Subjects. It is the author's responsibility to obtain approval or exempt status from his or her institution's Institutional Review Board for studies involving human subjects; this approval or exempt status must be mentioned at the very beginning of the Methods section. Failure to meet these requirements is likely to place the manuscript in jeopardy and lead to a rejection.

Editorial Assistance. Manuscripts considered for submission must be written in standard academic English that is comprehensible to English-speaking readers. The American Medical Writers Association (AMWA) offers a Freelance Directory with contact information for editors who provide assistance in the writing of medical literature, especially for authors whose first language is not English. Please visit their website for further information.

III. Document Preparation, Organization and Formatting

Manuscripts submitted for consideration should be prepared in the following parts, each beginning on a new page:

Title page

Abstract and keywords

Text

Acknowledgments

References

Tables

Figures

Figure titles if figures are provided as images

Blinding. Both blinded and non-blinded manuscripts should be prepared once the original manuscript has been completed. All institutional references should be removed from the body of the manuscript to produce the blinded version; please indicate in the file name which version is blinded.

Document Format. Create the documents on pages with margins of at least 1 inch (25 mm) and left justified with paragraphs indented with the tab key, not the space bar. Use double-spacing throughout and number the pages consecutively. Do not embed tables and figures in the body of the text but place them after the references; include callouts for each table or figure in the text (e.g., see Table 1). Unless tables vary significantly in size, include all in one document. If any figures are large files, submit them as separate documents.

Title Page. The title page should carry 1) the title, which should be concise but descriptive, limited to 15 words and no more than 150 characters; 2) first name, middle initial and last name of each author, with highest academic degrees; 3) an affiliations paragraph with the name of each author or coauthor and his or her job title, department and institution, written in sentence style; 4) disclaimers if any; 5) name, address, phone and email of author responsible for correspondence about the article and requests for reprints; and 6) support or sources in the form of grants, equipment, drugs, etc. See published articles for examples.

Individuals listed as authors must follow the guidelines established by the ICMJE: 1) substantial contributions to conception and design, or acquisition of data or analysis and interpretation of data; 2) drafting the article or revising it critically for important intellectual content; and 3) final approval of the version to be published. It is the submitting author's responsibility to make sure that authors have agreed to the order of authorship prior to submission.

Abstract and Key Words/MeSH terms. The second page should carry the title and an abstract of no more than 250 words. For research studies, the abstract should be in the structured form described above. Abstracts should be written in the third person, and references should not be used in the abstract. The abstract should include the year of the study and, for survey-based research, the response rate. Below the abstract, provide three to five key words or phrases that will assist indexers in cross-indexing the article and will be published with the abs tract. At least three terms should come from the Medical Subject Headings listed at the National Library of Medicine. Guidelines for words found in the Medical Subject Headings can be found here. Authors should confirm these terms still exist in the Index Medicus or should search for more accurate terms if not found in our list. **NOTE:** Authors will also be prompted to identify Key Words when submitting their manuscripts in ScholarOne. These Key Words may differ from the items presented here. The Key Words identified in ScholarOne are generated from a list that will best match the submitted manuscript to a Peer Reviewer with expertise in the area(s) identified.

Text. Follow American (rather than British) English spelling and punctuation style. Spell out numbers from one to ninety-nine, with the exception of percentages, fractions, equations, numbered lists and Likert scale numbers. The body of the manuscript should be divided into sections preceded by appropriate subheads. Major subheads should be typed in capital letters at the left-hand margin. Secondary subheads should appear at the left-hand margin, be typed in upper and lower case and be boldfaced. Tertiary subheads should be typed in upper and lower case and be underlined. For authors whose first language is not English, please use a medical writer or a native English-speaking colleague to edit the manuscript prior to final submission. Manuscripts will be rejected prior to peer review if there are numerous usage or grammatical errors.

Please Note: In preparing the main document for submission, save the original file with the word "unblinded" at the end of the file name. Please also remove all author names and affiliated institutions from the original manuscript, and save this version with the word "blinded" at the end of the file name.

References. Number references consecutively in the order in which they are first mentioned in the text. Each source should have one number, so *be careful not to repeat sources in the reference list*. Identify references by Arabic numerals, and place them in the text as superscript numerals within or at the end of the sentence. Do not enclose the numerals in parentheses, and be sure to follow American rather than British or European style conventions (e.g., the reference number follows rather than precedes commas and periods). Two important reminders: 1) references should not be linked to their numbers as footnotes or endnotes and 2) references to tables and figures should appear as a source note with the table/figure, not numbered consecutively with the references for the article.

Follow the style of these general examples. Titles of journals should be abbreviated according to the Index Medicus style. Do not use italics or boldface anywhere in the references. If the publication has one to four authors, list all of them; if there are more than four authors, list the first three followed by et al.

Book

1. Avery JK. Essentials of oral histology and embryology: a clinical approach. 2nd ed. St. Louis: Mosby, 2000.

Chapter in an Edited Volume

2. Inglehart MR, Filstrup SL, Wandera A. Oral health and quality of life in children. In: Inglehart MR, Bragramian RA, eds. Oral health-related quality of life. Chicago: Quintessence Publishing Co., 2002:79-88.

Article in a Journal

3. Seale NS, Casamassimo PS. U.S. predoctoral education in pediatric dentistry: its impact on access to dental care. J Dent Educ 2003;67(1):23-9.

Report

4. Commission on Dental Accreditation. Accreditation standards for dental education programs. Chicago: American Dental Association, 2010.

Web Source

5. American Dental Hygienists' Association. Position paper: access to care. 2001. At: www.adha.org/profissues/access_to_care.htm. Accessed: November 27, 2012.

Figures. Figures may be charts or graphs, photographs, or scientific images; any illustration that consists of text should be called a table (see below). Each figure should have a title, numbered consecutively with Arabic numerals in the order in which they appear in the text. Figures may be provided pasted into an MS Word document or as a separate TIFF or JPEG. Do not put the title on the image itself. Rather, if the image is in a Word document, place the title below the image; if the image is in a TIFF or JPEG, provide the figure titles in a list at the end of the manuscript. For graphs, be sure to label both axes. Include a key to symbols, patterns or colors in the figure either as a legend on the image or as a note below the figure. Any sources should appear in a Source note below the figure. Remember that the total number of figures and tables submitted with an article must not exceed six.

Figures should be used selectively to illustrate major points that cannot be expressed well in textual format. Authors should be able to articulate (for themselves, not as part of the submission) why a figure is necessary and what it adds to the understanding of the points made in the manuscript. Figures should be of the highest possible quality—typically 1,000 dots per inch (dpi) for monochromatic images and 600 dpi for images including halftones. Illustrations should not exceed 8½ x 11 inches, and all lettering should be at least 1½ mm high. If your article is accepted, we may request illustrations in higher resolution than those you've submitted.

Display of Quantitative Information:*JDE* readers expect authors to employ the highest standards of information design to display information in figures. It is recommended to review the seminal work by Edward R. Tufte, "The Visual Display of Quantitative Information," before designing figures that display quantitative information: Tufte, Edward R., The visual display of quantitative information. 2nd ed. Cheshire, Connecticut: Graphics Press; 2001, ISBN-13: 978-0961392147.

Illustrations: Illustrations should be employed to showcase complex relationships that can be explored by the reader to gain additional insight beyond what was already presented in the manuscript. While illustrations are part of the manuscript, they need to fulfill a purpose for themselves and must have value as standalone elements—telling a particular story or showcasing a relationship not easily expressed in words. It is recommended to review works on information design, such as "The Functional Art: an Introduction to Information Graphics and Visualization" by Alberto Cairo, before designing illustrations: PeachPit Press, 2012, ISBN-13: 978-0321834737.

Figure Checklist:

1. Planning:

· Small, noncomparative and highly labeled data sets belong in tables rather than figures.

· Show data variations, not design variations.

· The number of information-carrying (variable) dimensions depicted should not exceed the number of dimensions in the data; i.e., no 3D bars for pocket depths in mm.

· Above all else show the data (data ink) not design variations.

· Range frame should replace non-data-bearing frame.

· The same ink should often serve more than one graphical purpose.

· Organize and order the flow of graphical information presented to the eye.

(adapted from E. Tufte: The visual display of quantitative information.)

2. Design:

· Variations in font size reflect importance and have meaning.

· Data sets are labeled directly, avoiding cognitive overhead for the reader to decode patterns or shades.

· All symbols (*, #, etc.) are explained in the legend.

3. Execution:

· All source files are available on request, and minimal resolution guidelines have been followed.

· If JPEG images or other compressed formats are used, export has been done with maximal quality setting.

· Color is not used.

· Vector graphics are preferred (using drawing or illustration programs such as Adobe Illustrator).

Tables. Each table should have a title, numbered consecutively with Arabic numerals in the order in which they appear in the text. All tables should be in column format. Arrange column headings so that their relation to the data is clear. Indicate explanatory notes to items in the table with symbols or letters (note that asterisks should be used only with p-values) or in a general note below the table. Any sources should appear in a Source note below the table. All percentages in tables should include the % sign.

Note that tables may be uploaded in PDF form for initial consideration and peer review; however, *tables must be uploaded as MS Word documents for final review and, if accepted, for production*. Remember that the total number of figures and tables submitted with an article must not exceed six.

Permissions. Any aspect of the article that is not the author's original work (e.g., figures or tables from other publications) must be fully credited to the original publication. It is the author's responsibility to acquire permission to reprint the material and pay any fees. Evidence of required permissions must be in the author's hands before the article can be published.

Manufacturers. Manufacturers of equipment, materials and devices should be identified with the company name and location in parentheses immediately after the first mention.

Commercial Products. Do not use brand names within the title or text, unless the paper is comparing two or more products. If identification of a product is needed, a generic term should be used and the brand name, manufacturer and location (city/state/country) mentioned in parentheses.

IV. Submission and Production Procedures

Submissions should be made via the ScholarOne system, following these steps:

1. Launch your web browser and go to the *JDE*'s submission homepage at http://mc.manuscriptcentral.com/jdentaled.

2. Log-in, or click the "Register here" option if you are a first-time user of ScholarOne Manuscripts. Follow the instructions to create a new account. If you have forgotten your login details, go to "Password Help" on the journal's ScholarOne Manuscripts homepage and enter your email address. You will be sent instructions on how to reset your password.

3. Prior to starting the process of submission, please review your manuscript against the Author Submission Checklist and make sure you have the following items prepared for uploading:

    a) Separate title page (with all author information/titles as requested)

    b) Original manuscript (NOTE: MeSH terms must be provided as requested after abstract)

    c) Blinded version of manuscript as described

    d) Figures

    e) Tables

    f) IRB letter

    g) Conflict of interest form

4. After logging in, select "Author Center." Click the "Submit a Manuscript" link. Enter data and answer questions as prompted. Click on the "Next" button on each screen to save your work and advance to the next screen. Keep advancing until you reach the "upload" page.
5. To upload your files, click on the "Browse" button, locate the file on your computer and select the appropriate designation. Click the "Upload" button when all files have been selected. Please review your submission (in both PDF and HTML formats) before sending to the Editor. Click the Submit button.

Review Process. Manuscripts submitted as Original Articles, Perspectives, Brief Communications and Review Articles will be peer-reviewed by individuals, selected by the Editor or Associate Editor, who have expertise and experience pertinent to the topic. The journal follows a blind peer review process. The Editor and/or Associate Editor also review all manuscripts. The review process can take up to four months.

From Review to Acceptance. If the manuscript is accepted or changes are recommended, it will be returned to the author with the reviewers' comments for the author's responses and revisions. After the author has made changes, the manuscript is returned for final review to the Editor. If the Editor finds it acceptable, he notifies the author of its formal acceptance and assigns it to an issue. Currently, the time from acceptance to publication is approximately eight to ten months.

Agreement to Publish. On acceptance or provisional acceptance of the manuscript for publication, the author will be asked to sign a publication agreement, which must be signed and submitted before the article is published. This form is a legal document specifying that the article is original and that the author holds all rights in it and grants the journal the exclusive first serial rights to it, for both paper and online publication. If the article is coauthored, all authors must sign the agreement.

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V. Key Contacts

General questions (not for submission of manuscripts; see below). Contact Dr. Nadeem Karimbux, Editor, *Journal of Dental Education*, Tufts University School of Dental Medicine, One Kneeland St., DHS-15, Boston, MA 02111; JDEeditor@adea.org.

Submission. Direct questions about submission of manuscripts through ScholarOne to Ryan Leach, Publications Associate, *Journal of Dental Education*, 1400 K Street, NW, Suite 1100, Washington, DC 20005; 202-289-7201 phone; 202-289-7204 fax; leachr@adea.org.

Proofs and production. Direct questions about proofs and other matters after article acceptance to Lynn Page Whittaker, Managing Editor, *Journal of Dental Education*, 127 Autumnwood Avenue, Athens, GA 30606; whittakerl@adea.org.

Reprints and copyright permission. Address correspondence relating to copyright and other business matters to Christopher Daniels, Senior Vice President for Communications and Membership, American Dental Education Association, 1400 K Street, NW, Suite 1100, Washington, DC 20005; 202-289-7201 phone; 202-289-7204 fax; danielsc@adea.org.

SECTION II: Publishable Manuscript

A Study of Nutrition In Entry-Level Dental Hygiene Education

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Abstract

A Study of Nutrition In Entry-Level Dental Hygiene Education

Purpose: The purpose of this study was to document the extent of nutritional information included in dental hygiene program curricula, identify perceptions and barriers to expanding nutritional content, and determine if there is a need for a proposed nutrition curriculum model.

Methods: This was a mixed method study involving qualitative and quantitative aspects. An invitation letter was sent to all 335 program directors. Fourteen nutrition instructors and 10 program directors were interviewed regarding their perceptions and opinions of nutrition education for dental hygiene students, and 55 course syllabi were analyzed.

Results: All aspects of the content analysis results revealed nutrition content in entry-level dental hygiene programs is diverse. Some programs did not include nutrition content, while others provided oral and whole health nutrition intervention subject matter. Some programs offered multiple applied clinical applications and patient contact opportunities while most required none. The interview results disclosed a variety of opinions and perceptions of dental hygienists' role in nutrition. Several interviewees viewed dental hygienists' role in nutrition to be an integral part of patient care, while others indicated the role is minimal to provide caries prevention or none.

Conclusion: Although dental hygienists are expected to provide nutrition assessments and interventions, no standards or standardized competencies exist for nutrition in dental hygiene education. A standardized nutrition model could be beneficial for entry-level dental hygiene education programs to ensure an expected level of quality and participation in Healthy People 2020's intervention initiatives request.

Key words: nutrition, nutrition education, nutrition counseling, dental hygienists, dental hygiene students, entry-level dental hygiene education programs, preventive care, interdisciplinary collaboration

Introduction

Healthy People 2020 Partners in Prevention Initiative, National Centers for Disease Prevention and Health Promotion, and the Academy of Nutrition and Dietetics implore all health care providers to participate in interdisciplinary collaboration and provide nutrition counseling to address the epidemic of nutrition and lifestyle related diseases in the United States.[1,2,3] However, nutrition knowledge is not usually considered in most patient care plans throughout the health care system.[4,5,6]

Nutrition deserves a consideration in the dental hygiene care plan as an integral component of oral and general health.[5,7] A diet consisting of fermentable carbohydrates, sugars, and processed foods contributes to dental diseases as well as to chronic diseases such as diabetes and obesity.[5,8] To the contrary, oral conditions may indicate systemic diseases, infections, and nutrient deficiencies.[10] Incorporating nutrition in the dental hygiene care plan could improve the outcomes of patient care and health.[5,7,8,11,]

Currently, the Commission on Dental Accreditation (CODA) requires nutrition to be implemented into the dental hygiene curriculum.[11] The American Dental Hygienists' Association (ADHA) includes nutrition in the assessment portion of the dental hygiene process of care.[11] Nutrition is not included in the American Dental Education Association's (ADEA) Competencies for Entry in to the Allied Dental Professions document. However, the ADEA 2005 Compendium of Curriculum Guidelines includes minimum nutrition knowledge in dental hygiene education.[13,14] CODA, the ADHA, and

the ADEA do not specify competencies, standards or recommendations to ensure adequate knowledge of nutrition and the ability to perform nutrition assessments and interventions for entry-level dental hygiene programs. Standards to evaluate and measure essential nutrition knowledge do not exist, rendering student's attainment of effective nutrition knowledge impossible to ascertain.

In order to ensure adequate nutrition knowledge and provide predictable and appropriate nutrition interventions, a study of the current status of nutrition in entry-level dental hygiene education programs is a necessary step. Therefore, the aim of this study was three fold: to document the extent of nutritional information included in dental hygiene program curricula; identify perceptions and barriers to expanding nutritional content within the curriculum; and determine the need for a proposed nutrition curriculum model to address the possible lack of nutrition knowledge and to implement effective standards.

Materials and Methods

The Idaho State University Human Subjects Committee approved this study (Study #4138) as exempt from review under guideline 1, research on educational practices in educational settings on August 13, 2014. This non-probability study used a mixed methods approach consisting of qualitative and quantitative methods. Variables considered included: the quality of nutrition content, the quantity of student exposure opportunities to nutrition courses and clinical applications, and whether the nutrition curriculum could potentially contribute to the health outcomes of patients, perceptions of the current quality and quantity of nutrition courses, and the need for a standardized nutrition curriculum for entry-level dental hygiene programs.

An invitation letter was emailed to all 335 entry-level dental hygiene program directors in the United States to determine interest in participating in this study. Program directors were asked to share their nutrition course syllabi for a content analysis. In addition, program directors were invited to participate in an interview to learn perceptions of nutrition instruction in entry-level dental hygiene programs.

To conduct the content analysis of the syllabi a rubric was created based on a review of the literature.[15] Table 1 shows the framework for the rubric. The rubric categories analyzed consisted of the nutrition content, learning methods and patient contact opportunities, syllabus content, online resources, course learning objectives, evidenced based, course assignment, and faculty knowledge. The content analysis focused on the nutrition content in the dental hygiene program, frequency of patient contact, and the potential improvement of patients' health.

The qualitative portion of this study employed interviews of 11 nutrition instructors, three program directors who taught nutrition, and 10 program directors who did not employ a stand-alone nutrition course instructor. Prior to the recorded interviews an informed consent document and demographic questions were obtained via email. Interviews were conducted by telephone and audio recorded using a predetermined list of questions based on a literature review. The recorded, semi-structured interviews were transcribed and reviewed several times for accuracy. Interviewees were encouraged to dialogue without limitations. Interviews were scheduled at the convenience of the interviewee and lasted approximately 30 minutes. Inductive analysis of the interviews were conducted using the Thomas method.[16] The inductive approach

permitted clarifying and condensing lengthy interviews into summaries, identifying similarities and themes within the research questions and findings.

Results:

The results are provided in two domains. One is the analysis of the course syllabi and the other consists of analysis of interviews.

Syllabi Analysis:

From the initial preliminary invitation to program directors, fifty-five nutrition course syllabi were provided for the content analysis. Of the 55 syllabi, 51 represented stand-alone courses and four represented lecture hours of nutrition content infused in another course such as preventive dentistry, dental health, or comprehensive care. Nutrition courses were not required as prerequisites at the institutions with infused nutrition content. A variety of course credit hours were offered for nutrition. Of the courses offered in 51 dental hygiene programs, two of these courses were a one-credit course, 32 offered this course as a two-credit course, 14 were three-credit courses, and three offered four credits for their nutrition courses.

Nutrition Content:

The nutrition content analysis focused on clarity, relevant and current resources, elements of basic and advanced nutrition, and the incorporation of the American Dietetic Association process of care. The nutrition content analyzed indicated 34 (62%) of the 55 syllabi presented in a uniform and clear method. Twelve (22%) syllabi portrayed limited clarity, the content of eight (15%) syllabi were unclear, and one (2%) syllabus did not contain nutrition content.

Relevant resources were referenced and presented current information in 37 (67%) of the courses analyzed. Twenty-four (44%) syllabi referred to resources five years or older, and referenced the Food Pyramid that was replaced by ChooseMyPlate in 2010. Of those syllabi that listed current or five years or older resources, nine (16%) referenced resources current and resources older than five years. Three (5%) courses did not list any resources. The use of evidence based material is of concern when resources are five years old or more.

The next content considered was if the nutrition information included elements beyond the basic protein, carbohydrate, and fat fundamentals. Forty-one (75%) syllabi included application elements as well as nutrition deficiencies and diseases in the content. Ten (18%) courses included applied nutrition for dental hygienists, but did not list nutrition deficiencies and diseases in the content. One course (2%) indicated basic nutrition consisting of only protein, fats, and carbohydrates in the content, and three (5%) courses did not list the nutrition content.

The American Dietetic Association (ADA) acknowledged the evidence-based nutrition process of care to consist of assessment, diagnosis, intervention, and monitoring/evaluation.[17] The process of care was intended to be repeated at every patient appointment.[17] The process of care included health history reviews, interdisciplinary consultations, screenings, and referrals.[17] Of the 55 syllabi reviewed, only one (2%) nutrition course incorporated the ADA process of care. Three (5%) courses integrated nutrition assessments, but no other elements of the ADA process of care, and 49 (89%) courses did not incorporate the ADA process of care in any form. As indicated above, two (4%) courses did not contain any content.

Learning methods and contact opportunities:

Nutrition learning methods and patient contact opportunities were evaluated in each syllabus provided. Only one (2%) nutrition course encouraged nutrition assessments on every patient and required a comprehensive nutrition care plan for one patient each semester for three semesters. Eleven courses (20%) did not specify any nutrition application experiences. Twenty-eight (51%) syllabi indicated one nutrition application, which consisted of either self-assessments or assessments of classmates. Three (5%) courses expanded the practice assessments to one patient contact. Twelve (22%) courses indicated two or more applied activities and one patient contact opportunity. Of the 55 nutrition courses, 43 (78%) syllabi included a practice application, such as a self- or classmate analysis. However, at least 28 (51%) syllabi did not include patient contact or an opportunity for the application of nutritional interventions.

New Information:

An analysis of syllabus content focused on new information related to nutrition. Twenty-four (44%) syllabi did not reference information beyond the textbook chapters. Nine (16%) syllabi encouraged new information researched by the students such as fad diets and nutrient sources. Eleven (20%) syllabi listed limited new information and another eleven (20%) syllabi referenced sources for the latest nutrition information available.

Web-based links:

In addition to new information referenced, web-based references were considered as part of the content analysis. Thirty-two (58%) syllabi did not reference web-based resources. Fourteen (25%) courses showed minimal web-based resources

limited to choosemyplate.com. Two (3%) courses had web-base resources other than choosemyplate.com, and seven (13%) syllabi provided multiple credible and relevant web-based resources adding to the learning experience.

Course Learning Objectives:

The analysis of course learning objectives considered assignments measured and learning taxonomy. Four (7%) of the syllabi did not include course-learning objectives. Five (9%) syllabi did not indicate measured objectives. Eighteen (33%) contained learning objectives were identified and measured. Twenty-eight (51%) syllabi provided details on how the student would conduct the assignment(s) as well as how the assignment(s) would be evaluated.

The taxonomy of objectives was evaluated and the results revealed 21 (38%) syllabi listed at least three higher-level learning objectives. Twenty-four (44%) syllabi showed mainly lower-level learning objectives combined with one or two higher-level. Six (11%) only exhibited lower-level learning objectives, and four (7%) did not identify the learning objectives. The characteristics of the objectives indicate inconsistency in the learning standards required in the entry-level dental hygiene programs evaluated.

Course Assignments:

The relationship of the assignments to the learning objectives and the resources were explored. Thirty-seven (67%) syllabi had course assignments that discussed the purpose of the assignments, activities, and/or projects related to the learning objectives and used current resources. Seven (13%) syllabi contained a discussion of the purpose of the assignments related to learning objectives, but used out-of-date resources. Four (7%) syllabi presented an unclear purpose or was not evidence based, and seven

(13%) syllabi did not contain any assignments. Course assignments varied and included self-analyzed diet diaries, food label analysis, media credibility, case scenarios, and nutrition or caries counseling.

Instructor knowledge:

The final consideration of the course syllabi content analysis was the credentials and qualifications of the instructors teaching the nutrition course. Forty-four (80%) of the instructors did not present a biography on the course syllabus or on the institution website. Five (9%) of the faculty biographies presented unknown expertise in nutrition content, and five (9%) indicated a definite expertise in nutrition content. One (2%) presented a biography containing expertise in nutrition content and contributed research studies in the course. Within the course syllabi, instructor credentials were listed and they appear in Table 2. As can be seen from this table, the majority of the instructors were dental hygienists with a masters' degree.

Qualitative Analysis

Twenty-four individuals agreed to be interviewed for the qualitative portion of this study. Of those 24, 11 were nutrition instructors, three had a dual role of program director and nutrition instructor, and 10 were program directors of programs that did not encompass a stand-alone nutrition course. All 14 nutrition instructors (including program directors who taught nutrition) were female with a mean age of 51. The nutrition instructors taught a range of one to more than 10 years. The autonomy the nutrition instructors reported they had regarding the content of the nutrition course taught was as follows: six reported complete, six moderate, and two stated some autonomy. Two male (both dentists) and 12 female program directors not employing nutrition instructors had

a mean age of 56. Less than one to more than 10 was the range of years employed as program director. The program directors reported autonomy as follows: five reported complete, three moderate, one some autonomy, and one did not answer the question. Table 3 contains a sample of the questions asked during the interview. Of those questions, the following themes emerged: Current nutrition content, necessary content, patient contact opportunities, topics not addressed, content emphasis, key elements that could contribute to patient health, barriers, and opinions of an ideal content model.

Current Nutrition Content

Though varied in content, all the nutrition instructors interviewed felt the students received adequate quality and quantity of nutrition content for dental hygiene students. *"We focus on the basics of nutrition and how it affects oral health"*, stated one instructor. *"The course is tailor made for the dental hygienist as it relates to decay and periodontal disease"*, said another. Faculty who taught nutrition viewed nutrition content as a necessary part of dental hygiene education for the purpose of providing assessments and interventions to patients. *"The mouth reflects what the patient is eating and what they eat affects their oral cavity and overall health"* and *"the course teaches them how to apply basic nutrition in their own life and then how to apply it toward patient counseling"* were comments regarding the importance of nutrition knowledge for dental hygienists.

On the other hand, the program directors teaching nutrition and those that did not employ a stand-alone course had contrasting views such as, *"Nutrition is as important as teaching patients to brush and floss"*, and *"The role is minimal overall, but important to convey to the patient that sugars cause decay"*. One program director without a

nutrition course stated, *“Dental hygienists will not be reimbursed in private practice, so they can’t do much with nutrition”*.

Necessary Content

The necessary nutrition content was a common theme as indicated by the nutrition instructors comments such as *“we owe it to the patients to let them know how their eating affects their oral cavity”, “the students need the basics before they can learn to provide a nutrition analysis and counseling for patients”,* and *“the students need to know when and how to refer to a dietician or other healthcare specialist”.* These comments exemplify the need for adequate nutrition content in entry-level dental hygiene programs.

Patient Contact Opportunities

Applied nutrition and patient contact opportunity responses were diverse. There were several courses that did not provide clinical applications. *“The students perform diet counseling with a classmate, then some fictitious case studies”,* signified no patient contact opportunity. *“The students perform a self analysis, then a dietary analysis for a patient”* denoted the student was most likely prepared and had an occasion for patient contact.

Topics Not Addressed

The topics not addressed in the nutrition content consisted of common elements such as nutrition counseling, addressing nutrition myths and fads, analyzing evidence, biochemistry as prerequisite knowledge, nutrient disorders, when to refer and cultural/ethical diversity. *“There is no time to review evidence based material”* and “*The ability to provide nutrition knowledge, identify nutritional disorders, and recognize when*

a referral to a registered dietitian is needed" were typical comments of nutrition instructors. In contrast, all the program directors teaching nutrition felt all necessary topics were covered in their courses.

Content Emphasis

The U.S. Department of Agriculture ChooseMyPlate was a common topic emphasized in all of the courses taught by the nutrition instructors and utilization of the SuperTracker for diet diaries and analyses. *"We use ChooseMyPlate to discuss choosing foods wisely and how to read labels"*. The Eaglesoft nutrition analysis software, Myfitnesspal, and the NutritionistPro were other applications used for diet analyses. One instructor placed a strong emphasis on when and where to refer. The programs without a stand-alone nutrition course that integrated nutrition in other courses introduced the students to the out-of-date food pyramid.

Key Elements That Could Contribute to Patients Health

Key elements that prepare students to benefit and enhance the health of the patients they served involved the case studies and a type of application experience where a self or patient analysis was conducted. *"Going through the motions of the case study forces them to talk to patients about nutrition"*, and *"The students learn how to provide a dietary analysis"* illustrated perceptions of nutrition instructors.

Barriers to Expanding Nutrition Content

Credit limit requirements, overcrowded curriculum, and lack of qualified instructors were the most common barriers identified to expanding the nutrition content within the dental hygiene program. *"There is other content that is considered more important and the institution is requiring credit hours to be cut"*, stated a program

director teaching nutrition. Another barrier is the lack of general science and basic nutrition knowledge. *"Students will say 'I didn't know that oil goes in the fat group', or they don't understand that an apple is a fruit. There is no time to review the very basic information",* stated a nutrition instructor.

Opinions of an Ideal Nutrition Content Model

When asked what an ideal nutrition education content model would include, the nutrition instructors responded with common opinions such as, *"The students should be able to analyze patient needs and distinguish between myths and supportive science", and "Ideally I would like to see a basic nutrition course, then an advanced nutrition course related to dental hygiene patient care".*

Some program directors without a stand-alone nutrition course felt a stand-alone course would be ideal. *"If I could design a perfect program, I would have a stand-alone nutrition course"* was a comment representative of several. Others felt the ideal nutrition content would encompass the knowledge of *"how nutrition can cause a cavity and affect periodontal disease".*

Knowledge of Healthy People 2020 Nutrition Initiatives

The program directors from institutions that did not provide a stand-alone nutrition course indicated a slight to moderate or no knowledge of the Healthy People 2020 nutrition initiatives. The nutrition instructors indicated a moderate to extreme knowledge of the Healthy People initiatives, though only half exposed the knowledge to the students.

Discussion

This study attempted to gain a better perspective on nutrition education in entry-level dental hygiene programs. A review of the nutrition syllabi content analysis and the interview transcripts revealed some trends in nutrition content within entry-level dental hygiene education programs. Nutrition content is required by CODA[12], however, there is no standard in which to measure necessary content to provide adequate services to dental hygiene patients. Dental hygiene programs are creatively including nutrition content without violating the institution credit limitations and adding to already overcrowded curriculum. A number of programs do not include any nutrition content. The nutrition content varies in each of the institutions analyzed and may or may not benefit the patients served. Ninety-eight percent of the courses analyzed did not consider the American Dietetics Association patient care recommendations and 71 percent did not specify any patient contact opportunities, indicating nutrition counseling and interventions were not encouraged or measured.

Perceptions of needed nutrition content vary widely with no agreement. Though the ADHA scope of practice includes nutrition assessments[11], some program directors believe dental hygienists' role as nutrition educators should be none or minimal, while others believe the role should be inclusive to oral and whole health.

To address the Healthy People 2020 nutrition initiatives and the request for nutrition interventions by all health care providers, a minimum nutrition content is necessary in entry-level dental hygiene programs. A study of essential content for nutrition intervention therapy provided by dental hygienists is suggested. In addition, in consideration of credit limitations and overcrowded curriculum as well as the changes in

public health needs, a study is recommended to determine the need to increase the currently entry-level dental hygiene programs to emulate other health care providers such as physical therapists, nurses, and others especially regarding nutrition content. Another recommended study is to determine the knowledge, confidence, and ability to apply nutrition interventions from currently practicing dental hygienists.

Interdisciplinary collaboration was not indicated in the syllabi analyzed. The Academy of Nutrition and Dietetics specifically endorsed adopting and recommended specific interdisciplinary competencies between dental/dental hygiene and dietetic students[18]. The literature review also disclosed successful interdisciplinary collaborative education models currently used in medical school settings between medical and dietetic students. When developing an education model for dental hygiene students, consideration of evidence-based interdisciplinary collaboration is recommended.

This study was not without limitations. This study used a non-probability sample, therefore, the results could not be generalized and bias may have occurred in sample selections. This study may not reflect all programs that offer a nutrition course, but the study is relevant to entry-level dental hygiene education. Samples of nutrition syllabi were voluntarily obtained resulting in possible bias.

Conclusion

Nutrition is an integral component of oral and general health. Recommendations for teaching nutrition in entry-level dental hygiene programs exist. However, nutrition education for entry-level dental hygiene students varies throughout U.S. institutions. Some programs require nutrition as a prerequisite, some teach nutrition content within other courses throughout the curriculum, while others provide a stand-alone course.

Opinions and perceptions of the dental hygienists' role in providing nutrition interventions and the essential nutrition content are also diverse. Without a standard of nutrition knowledge for dental hygiene students, clinical dental hygienists are not able to reliably provide an expected standard to patients in need of nutrition interventions. This study implies that dental hygiene students may or may not have the knowledge to provide necessary nutrition counseling to their patients, or the wisdom of when and where to refer. Therefore, a proposed standard nutrition model created for dental hygiene interventions within the dental hygiene care plan is recommended.

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Tables

Table 1: Nutrition Syllabus Content Analysis Rubric

	0 None	1 Minimal	2 Average	3 Greater than Average	Comments
Nutrition Content					
Nutrition learning methods and patient contact opportunities					
New Information -Synchronous -Asynchronous					
Web-based Links					
Course Learning Objectives					
Evidence Based					

	0 None	1 Minimal	2 Average	3 Greater than Average	Comments
Course Assignments, Readings, Activities and/or Projects					
Knowledge					

Table 2: Nutrition Instructor Credentials

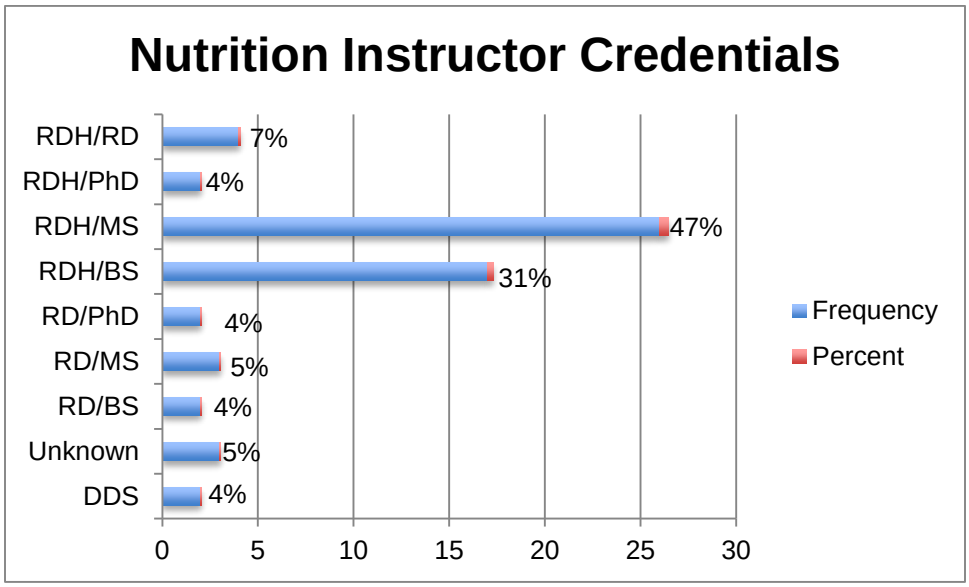

Table 3: Interview Questions

Questions for Nutrition Instructors	1. Please share your opinion and perceptions of the quality and quantity of nutrition courses presented to the dental hygiene students at the institution you teach. 2. In your opinion, can you describe how much nutrition is needed and is your program meeting these needs? 3. How many applied clinical nutrition application or patient contact opportunities are the students provided? 4. Are there any topics missed? 5. What topics are emphasized in your course? 6. What are the key elements that prepare your students to contribute to and benefit the patients they serve? 7. What (if any) are the barriers to expanding the nutrition content within the dental hygiene program? 8. What would be an ideal standard nutrition content model for entry-level dental hygiene education programs?
Questions for Program Directors who teach nutrition	1. What is your opinion of the role dental hygienists should serve in providing nutrition education counseling? 2. Please share your opinion and perceptions of the quality and quantity of nutrition courses presented to the dental hygiene students at the institution you teach. 3. How is nutrition incorporated throughout the dental hygiene education program? 4. How much nutrition content is needed and is your program meeting these needs? 5. How many applied clinical application or patient contact opportunities are the students provided? 6. Are there any topics missed? 7. What topics are emphasized in your course? 8. What are the key elements that prepare your students to contribute to and benefit the patients they serve? 9. What would you consider being benefits of adding nutrition throughout the curriculum? 10. What are the barriers (if any) to expanding the nutrition content within the dental hygiene program curriculum? 11. What would be an ideal standard for a nutrition content model in dental hygiene education program?
Questions for Programs directors of programs without a stand-alone nutrition course	1. What is your opinion of the role dental hygienists should serve in providing nutrition education counseling? 2. Is there a required prerequisite nutrition course? 3. How is nutrition incorporated throughout the dental hygiene education program? 4. What would you consider being benefits of adding a stand-alone nutrition course to the program? 5. What are the barriers (if any) to adding a nutrition course in your program? 6. What would be an ideal standard for nutrition content model in dental hygiene education programs?