2008

INFORMATION-SEEKING BEHAVIORS OF PRACTICING DENTAL HYGIENISTS IN VIRGINIA

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Dissertation Approval Certificate

This is to certify that the dissertation prepared by
Ms. Joan Marie Pellegrini entitled

Information Seeking Behaviors of Practicing Dental Hygienists in Virginia

has been approved by her committee as satisfying completion of the dissertation requirement for the degree of Doctor of Philosophy.

[redacted]		
Director of Dissertation	✓ Pass	Fail
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Committee Member	✓ Pass	Fail
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Committee Member	✓ Pass	Fail
[redacted]		
Committee Member	✓ Pass	Fail
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Committee Member	✓ Pass	Fail
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Monday, April 28, 2008
Date

INFORMATION-SEEKING BEHAVIORS OF PRACTICING DENTAL HYGIENISTS IN VIRGINIA

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

by

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ACKNOWLEDGMENT

To my dissertation chair:

Dr. John Kregel. Thank you for your invaluable assistance in guiding me through the dissertation phase. I appreciate your having acted as my track chair for my doctoral studies.

To my dissertation committee:

Dr. John Oehler, for being not only a valued member of my committee, but my academic advisor for the majority of my doctoral studies.

Dr. Susan Leone, for valiantly stepping up to join my committee, providing editorial direction and taking great interest in my research and dissertation.

Dr. Leanne Campbell Lee, for providing support through the data gathering and analysis of this investigation.

And last, but by no means least, Dr. Frank Farrington. Thank you for being a positive role model for the ultimate dental educator—facilitator, researcher, community volunteer and compassionate oral healthcare provider.

To my cohorts:

Dental hygiene colleagues, dental educators, fellow doctoral candidates, and students—past, present and future—I have learned much from all of you. I hope I have been an inspiration to you as well.

To my mother, Angela Pellegrini (1919-1989):

Thank you for providing me a phenomenal model for independence and empowerment. You set the bar high. I hope I met—and exceeded—your expectations.

To my sons, David and Stephen Caponigro:

Thank you for being such terrific young men. Your patience during the last several years allowed me to return to my studies and follow my dreams. I hope I have inspired you to achieve your dreams as well.

TABLE OF CONTENTS

Page

LIST OF TABLES

Table Page

LIST OF FIGURES

ABSTRACT

INFORMATION-SEEKING BEHAVIORS OF PRACTICING DENTAL HYGIENISTS IN VIRGINIA

By Joan M. Pellegrini, R.D.H., Ph.D.

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

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This study explored how currently licensed, active dental hygiene practitioners in the Commonwealth of Virginia, retrieve, validate and process new knowledge in the discipline which provides a basis for clinical decisions on selection of dental hygiene interventions for patients. The research design was a nonexperimental, correlational design using mail survey methodology. A self-developed questionnaire was mailed to 500 practicing dental hygienists in the Commonwealth of Virginia. The survey contained questions on demographics of the respondent, current methods of retrieving new information in the discipline, and preferences for information retrieval. The completed surveys that were returned yielded a 52.7% response rate, and provided descriptive data for analysis concerning the variables of interest in the research questions.

The analyses conducted in this study focused on the sample characteristics, including gender, ethnicity, years since graduation, membership in the professional organization, actual information-seeking methods used, access and frequency of use of the Internet, preferences for information retrieval, and critical assessment of the new information in the discipline.

In general, the findings indicate three areas of relationship between graduation era (before and after 1990) and online continuing professional education, Internet retrieval of new evidence on which to base decisions for clinical patient care, and contacting a dental or dental hygiene educator for new information in the discipline. Traditional resources for receiving new knowledge in the discipline were favored, with the greatest number in professional journals received at home, followed by face-to-face continuing education lectures. Online continuing education led the preferred Internet or computerized retrieval sources. Almost two-thirds of the respondents indicated they evaluate new knowledge retrieved from the Internet, and the same number indicated agreement that they question the source and content of nontraditional information resources prior to incorporation and translation of the new knowledge into clinical decisions for patient care.

The author concludes with additional findings, continuing professional education opportunities for practicing clinicians and implications for critical thinking skills and information retrieval in the dental hygiene education curriculum.

Chapter 1

INTRODUCTION

Entering the 21st century, dental and allied health educators note that foundational knowledge in the health sciences is changing at a rapid pace. Telecommunications, more informed consumers, computer technology and instantaneous reporting of research findings provide a rapid turnover of knowledge necessary for clinical decision making in the practice of dental hygiene (Gravois, Bowen, Fisher, & Patrick, 1995, p. 1027). Problem-based learning and evidence-based clinical practice necessitate critical thinking skills to evaluate the most up-to-date concepts and theories in the profession. Research in dental hygiene, dentistry, medicine and allied health sciences provides foundational knowledge on which to base appropriate patient interventions. Foundational knowledge includes theoretical information on which to base decisions in dental hygiene care provision. Content of foundational knowledge includes human anatomy and physiology, microbiology, histology, dental/oral anatomy, periodontology, nutrition, disease prevention and health promotion and dental hygiene theory and practice.

In order to provide competent patient care, dental hygiene practitioners must keep abreast of the most current research and practice information in the

profession. Dental hygiene students, as future practitioners, develop appropriate information-seeking behaviors in order to have a framework for locating research information (Finley-Zarse, Overman, Mayberry, & Corry, 2002, p. 116). This study will focus on how currently licensed, active dental hygiene practitioners in the Commonwealth of Virginia retrieve, validate and process that information. New knowledge in the profession provides a basis for decisions on selection of dental hygiene interventions for patients/clients.

The Profession of Dental Hygiene

The first formally organized program of dental education was begun in 1827 by John Harris, an Ohio physician, surgeon and dentist. Chapin Harris, John's brother (also a physician and surgeon), co-founded the first dental college in the world, the Baltimore College of Dental Surgery in 1840. Through scientific research, dentistry recognized that dental decay (caries) and periodontal diseases are preventable. Far ahead of its medical colleagues, dental healthcare providers (in the 19th century) focused on preventive education/methodologies from the inception of its profession (Motley 1986, p. 1).

The profession of dental hygiene is the practice of "preventive oral healthcare, including the management of behaviors to prevent oral disease and to promote health" (Darby & Walsh, 2003, p. 10). Today's dental hygienist is "a licensed professional who provides preventive, therapeutic and educational services to patients within oral healthcare settings" (Wilkins 2004, p. 5; Wilkins & McCullough 1964, p. 13). Other descriptors in contemporary literature in the field

point to the functions performed by the dental hygienist, including a health administrator/manager, change agent, clinician, client advocate, educator/oral health promoter and researcher (Darby & Walsh 2003, p. 11).

The profession's first educational program of study began at the University of Bridgeport in 1913, under the direction of Dr. Alfred C. Fones. In 1914, the first class of formally educated dental hygienists graduated from that institution. History recognizes Irene Newman, Dr. Fones' dental nurse and a member of the first graduating class, as the first American-educated dental hygienist. In 1934, Fones stressed his conception of the role of the dental hygienist as health educator to the public. Since its recognition, the field has "promoted oral health, disease prevention to facilitate consumers, self-care, arrest of the disease process, and decrease the incidence of oral disease" (Darby & Walsh 2003, p. 3; Motley 1986, p. 3).

Overview of the Literature

Regulation of Clinical Practice of Dental Hygiene

Individual state regulations describe under what conditions a dental professional can practice his/her profession, and regulate how that licensure is maintained. Continuing education in the profession is a necessity. When a dentist or dental hygienist has been certified for graduation by the formal academic authorities, he/she is evaluated didactically by a written National Dental Hygiene Board Examination and clinically, by a regional or state testing agency. If successful in passing the National Board and clinical board examinations, that

candidate is eligible for licensure to practice his/her specific dental healthcare profession. Governing agencies, such as the Virginia Board of Dentistry, set guidelines for mandatory continuing education as a prerequisite for continued professional licensure (Virginia Board of Dentistry 2000).

Continuing Education as a Key Element in Ethical Practice

One of the criteria for the ethical practice of dentistry or dental hygiene is to provide optimal oral health care for the patients entrusted to a clinician. A key element of ethical practice (beneficence) is to "do the patient no harm" (American Dental Hygienists' Association [ADHA], 1995). Many believe it is harmful (negligent) to practice dentistry or dental hygiene based on outmoded concepts. That is justification for mandatory continuing education (CE) by licensing agencies. It establishes a need for formal (accredited) CE offerings. Watkins (1999) indicates that continuing professional development becomes a lifelong activity, building a "portfolio of skills relevant to today's needs and flexible enough to adapt to tomorrow" (p. 61). Watkins further defines the four levels of professional knowledge (in ascending order), which he shows value-added for professional practice: cognitive knowledge (know what to do); applying knowledge (know how to do it); integrated knowledge (apply in collaboration) and dynamic knowledge (adapting the knowledge to major changes) (p. 62). Jones and Robinson (1997) describe continuing professional development as "maintenance and enhancement of the knowledge, expertise and competence of

professionals throughout their careers. . .with regard to the needs of the professional. . .the professions and society" (p. 197).

Decision Making and Evidence-Based Care Provision

Abrahamson et al. (1999), although discussing continuing medical education, note how the practicing healthcare provider is mandated to lifelong learning in his/her discipline, and that continuing medical education (CME) is being pressured to "change in response to the evolution in clinical practice" (p. 1288). They describe how variation in clinician practice behaviors has prompted emphasis on continuing education to provide "standards and quality of care that emphasize standardized clinical protocols, guidelines, and other quality assurance mechanisms" (p. 1289). Such justification is appropriate to the practicing licensed dental hygienists for the same reasons. Another point made by these same authors is the concept of fostering lifelong learning as a behavior to be valued during undergraduate (pre-professional) education. The dental hygiene education community does indeed try to provide these affective outcomes. The authors feel that self-assessment, problem solving, informed decision making and the exercise of clinical judgment are tools "for integrating current knowledge and making the transition to evidence-based practice" (p. 1292). Candy (2000) addresses the problem facing healthcare providers when faced with a glut of new information in their discipline. He feels that the practitioner must be "information-literate," that is, the practitioner must be "equipped not only with the ability to locate information but to evaluate its

relevance and credibility" (p. 229). Candy envisions this skill as a "constantly evolving attribute. . .alongside biomedical, clinical, pharmaceutical, legislative and other domains" (p. 228) best addressed as a provision of continuing education. He indicates that practitioners "need to be able to select and use information for professional and patient education and effectively employ written, electronic and oral communication" (p. 230). This concept embodies "reflective practice" (p. 230). Borduas, Gagnon, Lacoursière, and Laprise (2001) follow this theme with Schön's "knowing in action" model (p. 104) and reflective practice. This model recognizes that healthcare providers perceive the need to modify and refine their practice based on continued learning in their field.

Statement of the Problem and Study Purpose

As a function of current practices in dental hygiene education, students are expected to develop behaviors to retrieve professional research information, and develop critical thinking skills to evaluate, synthesize and apply concepts and theories in patient care. Clinicians who graduated from accredited dental hygiene education programs prior to the 1990s did not have the benefit of the Internet as a resource in their educational programs. The question arises as to whether the pre-1990 graduates retrieve and process information differently from post 1990 graduates who had virtual resources as part of their formal learning experience.

The traditional model for garnering information is through hard copy materials such as: printed textbooks, serial journals, monographs, printed

indices, government reports, formal lectures and discussion with learned faculty. A visit to the local library, a medical center library or attendance at a face-to-face continuing education "lecture" are more traditional sources of new information in the discipline.

With the advent of the Internet, advancements in telecommunications have significantly changed information retrieval schemes. Virtual library resources, such as electronic databases, online journals, electronic textbooks, online academic libraries, and peer-reviewed professional websites are the norm with currently enrolled students. Dental hygiene students at Virginia Commonwealth University (VCU) receive a rubric to validate websites for veracity, authenticity and reliability of the information provided. A copy of the rubric is provided in the Appendix A. The questions for this study are to determine if practicing dental hygienists in Virginia use virtual resources and if so, to determine whether they employ critical thinking skills to validate information they retrieve from those virtual resources.

With the unprecedented growth of the Internet, communication of new knowledge generated in dental and healthcare research has been made available to professionals (and consumers) at astounding speed. The turn-around of discipline-related knowledge in the 21st century occurs so rapidly that concepts taken as "gospel" by the discipline are outmoded and replaced in less than 3 years! Pelzer, Wiese, and Leysen (1998) allude to a 6-month

turn-around of information (p. 352). Prior to the 20th century, knowledge may have taken as long as 100 to 500 years to be replaced. Printed materials constituted the bulk of documentation available to academics and professionals, from the first monks copying manuscripts containing philosophy and natural science observation to the invention of printing press, which made text more readily available to scholars. With the advent of telecommunications, especially the microcomputers and the Internet, an "explosion of information" is accessible to the healthcare provider (Gravois et al., 1995, p. 1028).

Textbooks used by faculty and students contain information that may, at publication, already be 2 to 5 years out of date, merely by virtue of the length of time involved in the traditional publishing process. It takes at least a year for manuscript completion, 6 months to a year to progress through the approval/editing process and several months for the publication/distribution process. Printed journals have a shorter turn-around on current information, and are preferred as supplements to printed texts by faculty. With the dearth of professional journals available, it would take much time and money to readily access all that information. Electronic information retrieval significantly reduces the time and monetary expenditures, as well as the geographic accessibility (Chichester, Wilder, Mann, & Neal, 2001; Covington & Craig, 1998; Gutierrez & Wang, 2001; Pelzer et al., 1998; Richwine & McGowan, 2001, Self, Sayed, & Henry, 1997; Simmonds & Andaleeb, 2001).

Students (as well as faculty and the lay public) can access professional information through commercial websites, professional websites (which may have restricted areas available only to licensed healthcare professionals or dues-paying members of those professional organizations), academic libraries, and university websites.

An excellent example of a commercial website available is the Lexi-Comp® Online Drug Reference. This site is password protected, and available to the students, faculty and staff at VCU School of Dentistry (by institutional subscription). The healthcare providers reference patient medications online (the site is updated weekly), and are able to research drugs and drug interactions that may not be listed in the most current printed drug references. Keeping up with implications of patient medication(s) and decision making for dental hygiene interventions is a critical skill for a practicing dental hygienist. With the overwhelming number of drugs new to the consumer market in a relatively short time, it is imperative the clinician be aware of the implications of that drug therapy to the patient's overall general health. The online reference has enabled the healthcare provider to be able to access this information within minutes. Students practice this information-seeking behavior as an integral part of their clinical training. They carry these behaviors with them into real-world clinical practice (after graduation and being licensed as registered dental hygienists).

Early comments concerning virtual library resource use indicated concerns on the part of healthcare providers with computer skills/literacy and unfamiliarity

with "surfing" the World Wide Web. Gravois et al. (1995) and Self et al. (1997) noted concern for lack of computer literacy. Later literature does not note this concern. Areas still of concern include cost and accessibility.

More prominent in later literature is the concept of critical thinking about the information garnered from the Internet. Haaland (1999) mapped the literature of dental hygiene, identifying core journals for information related to the profession. Her findings indicated five journals (*Journal of Dental Hygiene*, *Journal of the American Dental Association, Journal of Periodontology*, *Journal of Dental Education* and the *Journal of Clinical Periodontology*) accounted for 34.5% of the citations referenced during the study. The remaining 384 journals accounted for the rest of the citations during the study period 1985 to 1995. It is imperative to note that those five journals are all peer-reviewed official publications of professional dental organizations—the American Dental Hygienists' Association (ADHA), the American Dental Association (ADA), the American Academy of Periodontology (AAP) and the American Dental Education Association (ADEA). The authority and validity underlying content in these "core" journals provide current information needed to base decisions in clinical practice of dental hygiene.

Critical appraisal as defined by Gravois et al. (1995) is the "ability to assess the validity, reliability, and applicability of published information and to incorporate the results of this assessment into patient management" (p. 1028). Covington and Craig (1998) echo the theme of acquisition of information-seeking

skills "necessary to access the information and development of analytical skills to evaluate the validity and reliability of that information" (p. 577). Corry (2001) anticipates that "future developments in Internet access will include improved technology. . . personalization or customizing access, collaborative filter and improved information retrieval" (p. 81).

Hersch, Crabtree, Hickam, Sacherek, Rose, and Friedman (2000) investigated factors associated with successful information retrieval to answer clinical questions. This study was interesting from the perspective of two of the identified factors—logical reasoning and verbal reasoning. The study defined the logical reasoning as the "ability to reason from premise to conclusion," that is, "selectivity in assessing relevant and nonrelevant citations in a retrieval system" (p. 325). Verbal reasoning, as evidenced by the ability to comprehend vocabulary, is associated with the "use of a larger number of search expressions and high-frequency search terms in a retrieval system" (p. 325). In other words, critical cognitive skills are associated with information-seeking behaviors. Chichester et al. (2001) assumes a dental hygiene student (and ultimately a successful graduate) will be a "self-directed, problem-based adult learner who can recognize gaps in their knowledge; pose well-formulated, answerable clinical questions; locate the best available evidence; critically appraise it; and integrate the results with their clinical experience" (p. 157).

Research Questions

Within the bounds of this study, the following questions will be explored:

1. Is there a relationship between when respondents graduated from their entry level dental hygiene curriculum and preferred methods of seeking new knowledge in the profession?

2. Are recently graduated registered dental hygienists more likely to use the Internet to seek new biomedical/professional information than clinicians who have been practicing longer?

3. Is there a difference in preferences for retrieval of the new professional knowledge gathered using traditional knowledge sources compared to Internet/computerized resources?

4. Do those dental hygienists using the Internet for new information in the profession critically examine the resources for validity, reliability and credibility?

Methodology

Upon approval of the Virginia Commonwealth University Institutional Review Board (IRB), the research phase of the study began. A pilot study (beta test) tested the survey instrument. The pilot participants, selected from a collegial group, are practicing dental hygienists, dental hygiene educators or social science educators. After revision based on results of the beta test, the survey instrument (created by the investigator) was sent to study participants.

The subjects of the study were a random sample of actively practicing dental hygienists, licensed in the Commonwealth of Virginia, identified from a

mailing list of the Virginia Board of Dentistry. A demographics and attitudinal survey instrument (based on a Likert-type scale), developed by the investigator, was used to collect data.

Randomly selected participants were sent the survey and a consent form. The survey queried demographics, familiarity with use of the Internet, and preferences regarding retrieval of new knowledge in the profession. The demographics section queried gender, type of entry-level dental hygiene education program—certificate, associate or baccalaureate degree, date of graduation from his/her dental hygiene education program, and type of current employment setting—clinical practice, education, research, sales, etc.

Statistical analysis of the data occurred after receipt of participant responses. It was the intention of the study to provide insight into underlying preferences in information-seeking behaviors, as well as computer literacy and critical thinking skills exhibited by the practicing dental hygienists.

Operational Definitions

Within the context of this study, terms are operationally defined as follows.

Dental hygienist. A licensed oral healthcare professional who provides preventive, therapeutic and educational services to patients within oral healthcare settings.

Dental hygiene. The practice of preventive oral healthcare, including the management of behaviors to prevent oral disease and to promote health.

Virginia Board of Dentistry. Regulatory government agency, appointed by the Governor to oversee the practice of dentistry, dental hygiene, dental assisting and dental laboratory technology in the Commonwealth. Laws passed by the Virginia Legislature (General Assembly and State Senate) are interpreted through Rules and Regulations proposed by the Board. The Board is responsible for governance, enforcement and regulation of public health and safety in the practice of dentistry in Virginia.

Dental hygiene licensure. The license means the "document issued to an applicant upon completion of requirements for admission to practice dental hygiene."

Active practice. Those licensed dental hygienists who currently practice their profession, either in private dental offices, clinics, hospitals or alternate settings.

Professional organization. Association of professional members, joined together with a common mission, vision and goals to benefit all participants. In this case, the professional organization is the ADHA.

Continuing education requirements. Mandated information retrieval necessary for providing healthcare consistent with current theories and practice in the profession.

Information seeking behaviors. Methods that a practitioner employs to find out new theories, concepts and research to incorporate into evidence-based practice.

The Internet. A global communications networking tool, recognized for its value in communications, entertainment, employment and information resources.

New professional knowledge. Concepts, theories and evidence from research findings on which to base clinical care and decision making.

Entry-level dental hygiene degree. The terminal degree received at graduation from an accredited dental hygiene education program. Subsequent to graduation from the dental hygiene program, the candidate is eligible to apply for dental hygiene licensure to become a registered dental hygienist.

Traditional information resources. Print resources commonly found in library settings or classrooms bound by physical space.

Computerized information resources. Virtual resources, not bound by time, space and hard copy (print) formats. Computerized formats such as CD-ROMS, DVDs, Internet websites and databases are examples of electronic information resources.

Continuing education. Formal process of seeking and incorporating new knowledge in the discipline into clinical decision making and practice.

Summary

The intent of the study was to survey a random sample of actively practicing, licensed Virginia dental hygienists to identify their information-seeking behaviors for new knowledge in the discipline. The study was designed to recognize the preferences of a cohort of registered dental hygienists (graduates of entry level dental hygiene education programs prior to the "computer age") and their use of the Internet for researching professional knowledge compared to recent graduates who have experienced technology and virtual resources as part of their dental hygiene education.

Learning strategies practiced by past, current and prospective dental hygiene students vary greatly. Familiarity with the Internet and use of virtual tools differ from learner to learner, depending on their previous educational experiences and exposure. Not all learners are of the same generational or socioeconomic background. These factors may influence the learner's comfort level and understanding of how to best use nontraditional resources. Within the dental hygiene curriculum, students who have had computer experience from earliest elementary school activities may fare better than (older) nontraditional students who are embarking on second or third careers—and have had no contact with virtual resources. Hybrid or online course work, currently employed in dental hygiene curricula may not be the optimal learning strategy for a learner not enamored of virtual learning.

Preferred learning strategies may not coincide with current teaching strategies. This can be noted in the curriculum and in continuing professional educational experiences. Media tools, such as PowerPoint® or streaming video clips may not provide the best experiences for all learners. Difficulty in retrieval of new information in the discipline, be it from "face-to-face" presentations, electronic library resources or professional organization websites, can present problems for dental hygiene clinician. Conclusions from this study have implications on how best to provide learning experiences and information retrieval strategies for entering students in the dental hygiene curriculum as well as for continuing education programs for clinicians in the Commonwealth of Virginia.

Chapter 2

LITERATURE REVIEW

This section provides the rationale for the proposed research questions and proposed methodology. In addition, it provides context and interpretation of the findings. Recent articles from traditional library resources, electronic formats (found on the Internet) and from electronic databases provide information on behaviors of health care professionals in their search for new knowledge in their disciplines. Practitioners, in academic and clinical settings, continue to expand their professional knowledge in order to make appropriate treatment choices and provide competent clinical care to their patients. This review of literature from educational and health organization sources provides evidence of changes in information seeking behaviors.

Theoretical Framework

The practice of dental hygiene in the 21st century has a foundation in evidence-based decision making. This paradigm integrates the most up-to-date information in the discipline to make decisions about the care of clinical patients (Forrest & Miller, 2001). These authors describe the need for improvement in the quality of dental hygiene care, due to difficulty that clinicians manifest in synthesizing scientific evidence into their practice behaviors, and a lag in the

time that current discipline-related knowledge becomes available with its application to care and clinical decision making. The reasons for this are varied, but the traditional dental hygiene education paradigm has relied on "authority" approach to learning and practice (Forrest & Miller, 2001, p. 52). The authors point to the authority as being persons (faculty or superordinates), printed resources, and most often—the way they were taught to practice in their entry-level dental hygiene education experience. Based on this argument, these authors recognize "the longer clinicians are out of school, the bigger the gap in their knowledge of up-to-date care" (p. 51).

Chichester et al. (2001) discuss the evidence-based approach in the dental hygiene education curriculum. A change in paradigm is noted in a description of the dental hygiene student (and later, practicing clinician) as a self-directed adult learner who is able to recognize she/he needs more current information and decision-making tools, be able to locate the best available evidence, critically appraise it then integrate the results with their clinical experience. In essence, the healthcare provider they describe does not rely on an "authority figure" approach to problem-solving and clinical decision making. Instead these authors describe a contemporary practicing dental hygienist integrating critical reasoning strategies with current information in the field. They recognize an educational model whereby the student must be encouraged to "access current scientific literature, critically evaluate the validity of its clinical

findings, and challenge the effectiveness of traditional dental hygiene interventions" (p. 157).

Chichester (2001) and her co-authors propose the "gold standard" for developing these behaviors in the dental hygiene curriculum—use of the Internet, educational or professional databases, discussion groups and study clubs, patient simulations and case studies. These same methods will provide a framework for the graduate licensed dental hygienist actively practicing her/his clinical skills in patient care (Chichester et al., 2001, p. 157). Forrest and Miller (2001) discuss the information "explosion" for contemporary practitioners. They recognize the information overload has demanded a need for problem solving in clinical care that is expressed in terms of preventive strategies, cost effectiveness, and awareness of community/cultural values (Forrest & Miller, 2001, p. 52). These authors point to numerous agency and commission reports identifying information management, use of technology, and critical reasoning skills for the competent healthcare provider. Training in "health information technology" or "health informatics" was proposed for faculty preparing future practitioners. This brings up the issue of whether practicing clinicians providing patient care may still be operating under a decision-making model of the "authority" mandating patient care decisions. Forrest and Miller (2001) feel the clinicians must use evidence from research in their clinical reasoning—and they must have online searching and critical appraisal skills (p. 57). Forrest and Miller (2001) provide support for evidence-based decision making in Table 1.

Table 1

Important Competencies That Support Evidence-Based Decision Making in Education

Categories	Competencies Identified in Commission Reports
1. Problem solving	Continue to learn
	Critical thinking
	Decision making
2. Technology and information skills	Assess and use technology appropriately
	Manage information
3. Research	Interpret and utilize research outcomes
4. Clinical skills	Provide contemporary clinical care
	Practice prevention
	Ensure appropriate and cost-effective care

Source: Forrest & Miller, 2001, p. 57.

Borduas et al. (2001) describe the contemporary practice of physicians in light of patients' needs, practice conditions, expanding scientific knowledge and treatment considerations. They recognize the changes in information technologies that precipitate development of new management strategies and propose physicians develop new strategies on which to base their clinical reasoning and decision making. Their solution is predicated on Schön's model of "knowing in action" where the practitioner uses experience and reflection to solve patient-related problems. Schön (1987) used the concept of "knowing in action" to encompass those "sequences of procedures we execute; clues we observe and the rules we follow; or the values, strategies and assumptions that make up our 'theories' of action" (p. 255). Viewed in light of clinician decision making, reflection is the foundation of knowledge that underpins our health care discipline. With experience, much of this knowledge becomes tacit and action becomes spontaneous while providing patient care. When confronted with something—which Schön terms a "surprise," the clinician can respond in various ways. One can "brush it aside" or one can "reflect on the action." "Reflection in action" allows the practitioner to think about events/conditions that precipitated the surprise, to restructure actions that would alleviate the situation, or to understand the phenomenon itself and reframe the problem that led to the surprise (see Figure 1).

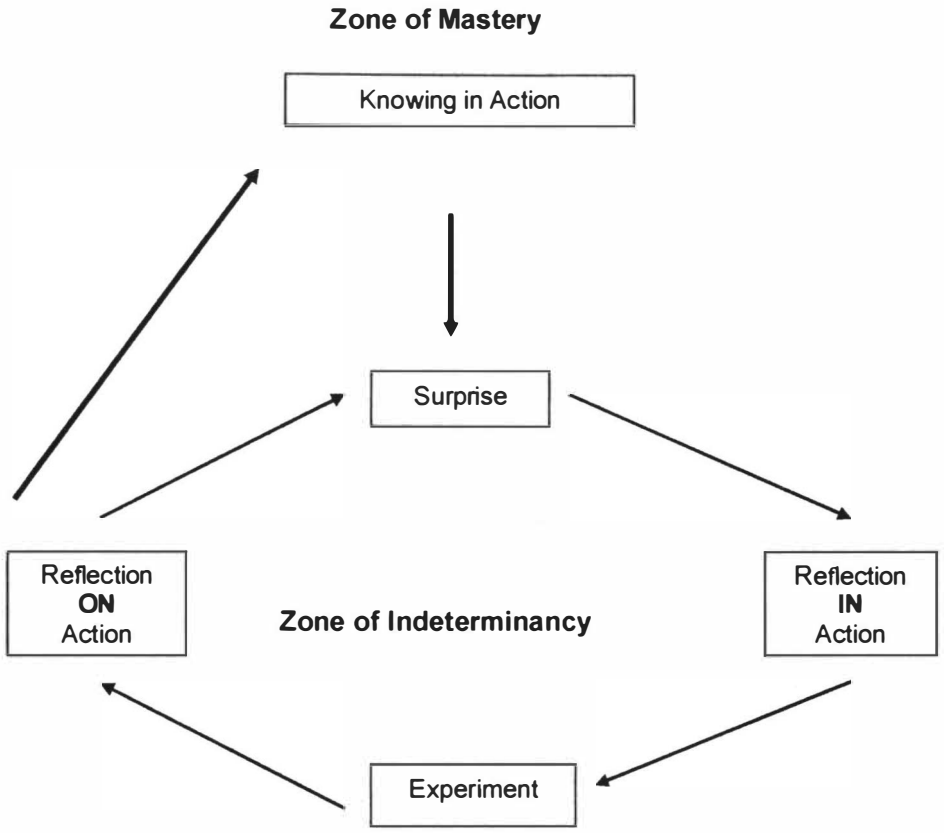

Figure 1. Schön's Model

Source: Adapted from Schön, D.S. (1987).

Borduas (2001) and her colleagues applied Schön's "knowing in action" model to plan and evaluate a clinical case study. The case was based on actual documented clinical care of a patient over a 15-year period. Participants in the interactive continuing medical education workshop were asked to compare their "take" on the case, making decisions based on their clinical experiences. Participants were asked to compare their clinical decisions to those of the original care provider—keeping in mind the changes in medical knowledge and standards of treatment that occurred through the 15-year time span. This process permitted the physicians to discuss the case with their peers—as well as specialists. The case study gave the participants an opportunity to practice "reflection" on their treatment choices. The authors concluded this adult learner-centered approach gave the workshop participants a framework to compare "clinical decisions and identify the gap in their current knowledge and desired knowledge" (p. 109). Further, Borduas et al (2001) felt that awareness of this knowledge gap is a key factor in creating the "self-directed learner" (p. 109). They point to Malcolm Knowles (1975) in describing self-directed learning where the individual takes the responsibility to diagnose his/her own learning needs, to formulate goals, to identify resources for making decisions and evaluating the outcomes. These theoretical frameworks lead back to the evidence-based decisions made in clinical practice, and the critical thinking strategies in seeking new information in the discipline.

Information Technology

Within the last half of the 20th century, information technology has provided ready access to the latest research findings. This information is available to clinicians, academics and the consumers. The impact technology has made on clinical decisions by care providers is significant. This includes the effect of awareness of healthcare principles, research and clinical findings with relationship to the consumer/patient. A discussion on the development of the Internet might be helpful in understanding the impact of the "information superhighway."

The Internet is a collection of computers, interconnected through an "international telecommunications network" (McMillan 2000, p. 76). Originally developed by the U.S. Department of Defense in the late 1960s, the intention was to provide an experimental network for military research. In the 21st century, the Internet is recognized for its value in communications, entertainment, employment and information resources. In education—as well as healthcare—it provides access to a plethora of educational research documents, professional (health related) websites, government reports, professional journals, discussion forums and virtual libraries.

Bowen, Meischke, Bush, Wooldridge, Robbins, Ludwig, and Escamilla, (2003) investigated predictors of Internet healthcare information-seeking behaviors by women. They reported levels of mental health, general health perceptions, older age and higher income levels predicted women's

health-related Internet use. The investigators recognized that the Internet is an "important channel for the dissemination of specialized and individualized materials" including health care information, as compared to traditional information sources such as health care professionals or mass media communications (Bowen et al., 2003, p. 941). While this study sample was primarily Caucasian, it did conclude that as a healthcare resource, the Internet increased health awareness of users—and created a more "savvy" healthcare consumer.

Beyea (2000), Guest (2000) and Mazurat (2001) describe online educational resources as a source of information to assimilate new knowledge into current practice. Beyea, as director of research at the Association of Perioperative Registered Nurses, provides a roadmap for journal readers to learn more about evidence-based practice by visiting Internet sites with hyperlinks to related information. The directives in this article point the novice web user to background information in the discipline, analytical tools, glossaries, search strategies, tutorials, articles, discussion lists and other materials related to evidence-based practice in perioperative nursing.

Guest (2000) describes the "new paradigm for healthcare professionals" with the description of the Internet as "new electronic tools to improve patient relations and oral healthcare" (p. 2). Guest notes that dental practitioners will continue to encounter "more enlightened consumers" as consequence of public access to healthcare resources on the Web. Some professional sites, as the web

home where his article was published (Procter and Gamble's http://www.dentalcare.com) have both a password-restricted professional site and a public access healthcare consumer site. While this article was published several years ago, there are more new sites each day that provide valuable information to improve healthcare and provide new information in the discipline. His conclusion is valid today and bears repeating. Guest feels the dental care provider must keep current in his/her knowledge base, and must include training in the use of the Internet as "part of their 'lifelong learning' portfolio" (p. 7).

Mazurat (2001) describes the Internet as a "ubiquitous tool" (p. 32) for conventional and continuing dental education. He feels that technologic applications may promote replacement of textbooks, creation of new forms of instructional systems, a merge of information, instruction and practice management systems; and in increase in quality of instruction in the discipline. But he feels that there should be interaction between practitioners, an opportunity for healthcare providers to engage in discussion with peers in "an ongoing relationship that transcends time and distance" (p. 32).

Not all literature on computer informatics in healthcare education is a product of the last two decades. It is interesting to revisit a report from a working dental education conference held in October 1969. Sponsored by the U.S. Department of Health, Education and Welfare, the U.S. Public Health Service and the National Institutes of Health, the conference participants included faculty from 35 American and Canadian dental schools. The published report of the

proceedings on "Computer Applications in Dental Education" provides documentation of some of the forward thinking of those dental educators in attendance. Similar discussions occur whenever professional dental educators meet today. Such topics as curriculum flexibility, self-paced learning, computer-assisted instruction (CAI), enriched learning experiences with multiple media, and random access to learning tools were highlighted in the 1971 conference report. CAI was envisioned by Grubb (1971) as "the use of a computer to improve the student's interaction with the subject matter, materials and teacher" (page 50). Grubb's 11 "modes of interaction" have value today: drill, practice, problem review, diagnosis and prescription, tutorial, gaming, simulation, fact finding, computation, logical problem solving, and exploration (p. 51). Nowhere in the 1971 report was there any notion of the Internet—today's "information superhighway." Tira (1971) describes the efforts of faculty at the Ohio State University Dental School to produce self-instructional packages for courses. In the case of a physiological chemistry course for sophomore dental students, the faculty course director successfully completed the "package," but there were only three computer terminals available for the 155 students to complete the computer-based course (p. 108)! Dental educators continue to produce self-instructional curricula, but with the advent of university student computer initiatives, all students have access to the computer hardware necessary to complete the learning activities.

Library Resources

The traditional library is a building housing books, journals, and other hard copy materials. Contemporary library resources have experienced tremendous change with the advent of the Internet. Libraries can be physical as well as virtual entities. Virtual libraries are resources available over the Internet. Hybrid libraries, more common in current academic settings can be physical buildings holding hard copy materials, computer terminals with Internet access, and electronic media. Changes in healthcare systems, telecommunications and computer technologies have brought about the need for "virtual" or hybrid libraries.

Richwine and McGowan (2001) investigated the implications for a "virtual health sciences library." Their image of this virtual entity is that it has no specific physical location—unlike a traditional library setting. Geographic isolation is not a barrier with the ubiquitous World Wide Web. The authors point out graphics, text, video streaming, journals, and other documents in electronic format are available on demand. Access to the user is as close as the nearest computer connected to the Web. These researchers studied healthcare professionals' use of the virtual library—including extent of use of virtual medical information resources, barriers to use, and computer use by 170 physicians, 224 nurses and 113 "other" allied healthcare providers in Southern Indiana. The investigators found that, while the intent of the survey was to determine "point of care" use of virtual resources, most of the respondents accessed the Web from home. Corry (2001) monitored

dental alumni use of dental library outreach services over a 10-year period. Her conclusions noted evidence-based dental practice will affect the way practitioners access up-to-date information—and respond to Internet-savvy healthcare consumers (patients) who want to make decisions regarding their oral health treatment options.

Prior research has indicated the need for informational resources for public health nurses in rural Virginia. Self and her colleagues (1997) report findings from a training program that illustrated the need for access to technology as a new venue for continuing education for nurses geographically isolated from their colleagues. The concerns of the study participants included access to equipment, availability to technology in all public health offices and issues of privacy.

A study supported by a National Library of Medicine grant looked at providing computer resources in clinical practice sites. Byrnes, Kulick, and Schwartz (2004) studied the effects of using PubMed as a tool for practicing evidence-based care and support of clinical decision making. Major barriers to success included connectivity to the Internet, lack of support from hospital information systems and difficulty for the clinical staff to access computers. An unexpected, but positive finding was the enthusiasm in integration of information seeking behavior by the nursing staff. The project was more positively received at the most remote sites, described by participants as imparting a sense of empowerment to both patients and care providers at point of care.

Response to clinical point of care information retrieval was described by Hersch et al. (2000). The study compared information retrieval on clinical problems between medical students and nurse-practitioner students. Although the study had a small sample size (n=29), the results showed both groups were able to improve their ability to respond to clinically-based questions using online research strategies. Detlefsen (1998) investigated "who does the health sciences research" and "where is it published." She found transition to a paperless work environment may affect the timing and delivery of new medical knowledge. She recognized a topic for future study, the impact of "newer problem-based medical curricula on younger, newly-trained physicians" (p. 389).

Patterns of use of online journals and databases were reported by DeGroote and Dorsch (2003). The researchers found convenience of access and availability of full text articles appears to play a role in selection of online resources. Their findings suggest that databases without links to full text, and electronic journals without bibliographic links are less often selected for use. Seventy one per cent of the survey respondents preferred online resources. Some of the reasons provided included cost of printing in the traditional library, 24 hour access to resources, access from remote sites, more convenient, clearer quality to article copy, and quicker or easier to locate resources.

Factors related to nurse educators' information-seeking behaviors were reported by Scollin (2001). The author indicated that a majority of respondents used one or more online resources for scholarly research. The most frequently

mentioned online resources were the Internet, electronic databases and email. Less frequently mentioned, but still noteworthy sources were ListServs and newsgroups. The conclusions reiterated the need for training, technical support, access and adequate time to effectively locate new information in the discipline. Atack and Rankin (2002) provided a description of registered nurses' experiences with web-based learning. In order to keep pace with changes in the healthcare knowledge base, registered nurse consumers of continuing education responded to a survey and participated in focus groups to share challenges and successes in this learning format. The authors noted barriers of insufficient time and access to course materials. For those nurses who did not finish the 16-week cybercourse, the issues of computer competency, erroneous perceptions about the workload, and inadequate preparations emerged as the greatest barriers to learning.

States with a greater rural population provide challenges for continuing professional education provision. In Nevada, the entire population of nurse practitioners (n=191) was surveyed by Charles and Mamary (2002). The response rate for this survey of preferred modes of acquiring continuing education was 54%, with the majority of respondents being female, averaging 13 years in practice and reported earning 20-39 credits of continuing education in the year prior to the study. The preferred methods included in-person conference attendance, print-based self-study and interactive video conferencing. The least favored mode was the live satellite conference. While the Internet or CD-ROM

based instruction were mentioned, they were not selected as preferred methods. Seventy seven percent of the survey respondents indicated "interest in receiving instruction to facilitate their use" of computer-based instruction (Charles & Mamary, 2002, p. 90).

A British nurse educator, Kennedy (2004) provided standards for online teaching. His description of the characteristics show the method should be "meaningful, measureable, monitorable and managed" (p. 24). The author applied these standards to online teaching (defining it as "borderless education by nature") in general and nursing education in particular. He provides "best principles" that guide evidence-based practice: "Orientation to practice, use of evidence to substantiate practice, consensus in decision making, selecting priority areas, aiming for achievability, and testing in practice before confirming in policy" (p. 27).

Models for Developing "Internet-Savvy" Learners

Studies in the late1990s provide insight into the need for computer literacy and development of information-seeking behavior of dental hygiene students. Haaland (1999) identified core sources in the field of dental hygiene and determine the extent of indexing coverage in database used for information retrieval. Her findings noted a majority of references cited were journal articles. This reliance on current journal literature is characteristic of healthcare literature in general. She also noted the MEDLINE database provided the best overall indexing.

Decisions on assessing the value of an online course were addressed by Mazurat (2001). The author offers guidelines on assessing quality of the online experience (see Table 2). The author recommends the potential online participant assess the degree of interaction, learner support and the learning principles espoused.

Table 2

Guidelines for Decisions to Take on an Online Course

1. What is the content and design of the course?
2. What are the regulations affecting enrollment and completion of the course?
3. How current is the course content? How relevant is the course to my goals?
4. What credit is associated with the completion of the course? Is the credit transferable?
5. What support is provided to students who wish to enroll or are already enrolled?
6. How does one gain access to the course material and support services? How does one communicate with fellow students and staff?
7. What is the cost, direct or indirect?

Source: Mazarat, 2001, p. 32.

With the new millennium, greater use of the Internet and computer technologies is seen in the dental hygiene education process. Chichester and her colleagues (2001) described a majority of dental hygiene education programs surveyed reported providing a formal library orientation to entering students (88%), instruction in literature indices and databases (86%), and use of the Internet for conducting literature searches (69%). Further findings note that students evaluate information retrieved from the Web (see Tables 3 and 4).

The investigators noted textbooks were the most widely used resource by students (62%) followed by library databases (37%). In this study (published in 2001), dental hygiene discussion/chat rooms were rarely used (44%) or never used (24%). Based on advances in course content programs used today, these totals might radically be altered.

Chichester and her colleagues reported while dental hygiene educators are aware that textbook information is out of date, that method of information retrieval is most widely used by students in their educational program. The researchers found that to rely only on textbooks and expert faculty knowledge is not an effective method of modeling critical thinking skills. While the textbooks may be a foundation for basic discipline information, the astute learner needs to find alternate information sources with current evidence in the discipline in order to provide basis for optimal clinical decision making.

Table 3

Formal Instruction in Information Seeking, Research, and Clinical Application in U.S. Dental Hygiene Programs

Factors	*n* =	Yes (%)
Evaluation of research findings for clinical importance	212	90
Evaluation of the validity and reliability for clinical importance	209	89
Orientation to the library	207	88
Use of library literature indices and databases (MEDLINE, CINAHL, Pub Med)	202	86
Use of internet for conducting searches	186	79
Evaluation of information retrieved from the Internet	162	69
How to apply evidence-based findings to patients in clinic	160	68
How to make recommendations to patients based on evidence	157	67

Source: Chichester et al., 2001, p. 59.

Table 4

Faculty Barriers to Implementing an Evidence-Based Philosophy in U. S. Dental Hygiene Programs

Barriers	*n* =	Yes (%)
Lack of faculty skills	87	37
No faculty available time	80	34
Lack of financial resources/backing	78	33
Lack of technical support	66	28
No available support staff	49	21
Lack of interest from faculty	35	15
Lack of library resources	21	9
No available databases	5	2

Source: Chichester et al., 2001, p. 60.

Response to Technology in Dental/Dental Hygiene Education

Schleyer, Torres-Urquidy, and Straja (2001) developed an instrument to measure dental students' computer behaviors. Adopted from a 1995 Computers in Medical Care study, the researchers added another attribute, one concerning information resource use. The queries related to this attribute asked the respondents to describe the extent of their use of online computing resources (e-mail, the Web, MEDLINE, Internet search engines and an intranet site). While this pilot study was undertaken to validate the survey instrument, it did show the use patterns of the respondents, with the most responses involving "dial-up from home to use the school's information resources" followed by MEDLINE/online library catalog use (p. 887).

Dental hygiene student perceptions of an online dental terminology learning module were described by Grimes (2002). The qualitative study of 13 students yielded four major themes from the participants: convenience of use, technical issues related to computer application, sense of belonging and learning strategies. Grimes reported some students expressed a sense of isolation from classmates and faculty to be a significant disadvantage. She indicated faculty need to be aware of how the subject content lends itself to online instruction. Participants noted the focus of the method required they be self-directed in order to successfully complete the course. This reflects the shift from instructor-centered to student-centered instruction. Grimes noted that visual learners fared

better than other types, and recommended further study be conducted in this area.

Olmsted (2002) and Grimes (2002) explored dental hygiene student performance in distance education programs, using emerging electronic/computer technology. Olmsted described the dental hygiene curriculum delivery method at four Midwest schools. This program was one of the first in the United States to use interactive television to deliver didactic courses over a two-way, fully automated fiber optic network. Learners can see, hear and interact with the class facilitator and classmates from other schools in the consortia during the presentations. Learner performance outcomes (grade point averages and passing scores on the National Dental Hygiene Board Examination) showed that both the host and distance learners were acceptable. This leads to the conclusion that distance education is a viable alternative to produce quality dental hygiene graduates to meet access to care needs. While this study did not specifically address information-seeking behavior, it did demonstrate familiarity with emerging technologies by the dental hygiene student. Grimes (2002) surveyed directors of accredited dental hygiene programs (n=255) to query their school's use of distance education. Unlike the program design described previously by Olmsted (2002), the description of distance education in the Grimes study was "education delivered to learners at an alternative site from the presenting institution" (Grimes, 2002, p. 1136). The technologies utilized included: asynchronous computer-based courses,

CD-ROM only courses, synchronous computer-based delivery, video streaming and chat, video delivery, telecourse, interactive television or point-to-point broadband. In addition, print-based delivery methods provided content. Respondents indicated advantages of the distance technologies were: convenient access for students, flexibility in student participation while maintaining employment, ability to teach outside the physical boundaries of the institution and flexibility in the curriculum to attract potential students. Learners exhibited more creativity, enhanced critical thinking, improved student computer skills, and demonstrated the ability to interact in a nonthreatening environment. Technology improved access to expanded health care provided to underserved populations, increased cost effectiveness, improved utilization of faculty resources, increased capacity to respond to broad range of student learning styles, improved teacher/learner interactions and increased student responsibility. Disadvantages included limited computer access, equipment, skill of students, decreased student contact and discussion, technology issues and demands on the faculty.

Statistical analysis of dental hygiene student performance was performed by Bearden, Robinson, and Deis (2002) to determine differences between online and on-campus enrollment. The same instructor taught both sections, and all students took the same examination (on campus). Findings noted the online students had higher grade point averages, but performed to a lower mean grade than on-campus learners. Scores in the content area (nutrition) on National

Dental Hygiene Board Examinations were similar for both groups. These variables did not produce statistical significance or any meaningful model from analysis of the differences in performance between online and on-campus learning outcomes.

A CD-ROM format provided new information in the dental specialty of orthodontics in an investigation reported by Marsh, Hannum, Trotman and Proffit (2001). A survey sent to 300 orthodontists queried the clinicians on their computer assets, capability and Internet habits. Survey participants were invited to reply if they were interested in evaluating a new computer-based program of orthodontic continuing education. Of those who responded, 116 participants volunteered. Those volunteers were randomly assigned to two sample groups. One group received a dynamic (graphics with animation) version of the program. The other group had the same content—but without all the bells and whistles (graphics and animation). The investigators found there was neither advantage nor disadvantage to the graphics and animation of the program. The authors concluded that computer-based instruction is effective in providing new information and techniques to orthodontists.

Multiple campuses of London dental schools and post graduate centers in southeast England took part in 40 videoconferences in the Pilot Regional Online Videoconferencing in Dentistry (PROVIDENT) project. Eaton, Francis, Odell, Reynolds and Mason (2001) reported the participants (n=257) were overwhelmingly positive in their assessment of the program. Frequent comments

on the value of the video conference method included: Not having to travel to major metropolitan areas for training, interactive discussion with presenters (experts) and perceived educational value of the training.

Innovation in eCurriculum was the focus of a study by Hendricson et al. (2004). They surveyed all 66 North American dental schools. The electronic curriculum refers to "computer-based learning including educational materials available on CD or DVD, online courses, electronic mechanisms to search the literature, email, application of instructional technology, multimedia projection systems and Internet-compatible classrooms" (p. 1041). The survey response rate was 100%. Findings recognized the respondents have made efforts to provide instructional technology resources to faculty, but use of the eCurriculum components by faculty is low.

Web-based dental continuing education offerings were investigated by Spallek, Pilcher, Lee, and Schleyer (2002). The exploratory study surveyed course participants' (n=169 respondents) experience with the nine online courses. The investigators noted trends in analysis of the respondents' comments. Lack of interaction with instructors and fellow learners proved disappointment, based on respondents' expectations. A majority of the learners accomplished their goals of "gaining new knowledge and deepening their understanding of the subject" (p. 402). However, the researchers noted the respondents wanted more up-to-date information in the discipline that covered the topic area of the web-based course. Participants reported convenience as a

benefit of the instructional method as well. Respondents accessed the course materials from home or office, during or outside work hours. The investigators concluded that successful online continuing dental education courses need to be current in their content (re-evaluated and updated regularly), provide in-depth coverage of course content, be guided by an instructor knowledgeable in online teaching techniques as well as the subject matter, and be marketed effectively among dental professionals.

Online Education in Health Care Disciplines

Nursing student perceptions of online learning were reported by Ali, Hodson-Carlton and Ryan (2004). This qualitative study (n=20 graduate nursing students) provided themes of "student learning through reflection, exploration, use of critical thinking, interaction with others, sharing of information and use of resources" (p. 111). Student information-seeking behaviors improved with instruction and exposure to online resources. Smith-Stoner and Willer (2003) described the shift from text-based program content to multimedia technologies and Web search activities in nursing education. The investigators pointed to selected Internet sites and publisher-bundled multimedia information sources for today's "MTV generation." The authors concluded course-specific multimedia may increase student learning, and that value content is relevant to student goals.

A model for a Bachelor of Science in Nursing degree completion course using face-to-face and online instruction was described by Kozlowski (2002).

Course participants ranged from students who were "novice Internet explorers" to technologically proficient "navigators (p. 23). She recommended "orientation within the first two weeks of an online course to assess and/or evaluate" (p. 24) computer literacy. Learners were assessed in three domains: cognitive, affective and psychomotor. The cognitive assessment included responses to questions in the program modules; rebuttal to facilitator postings; and evaluation of student postings in terms of depth, completeness and synthesis of knowledge. Additional assessments included: psychomotor attributes, organization of presentations, appropriateness of audiovisual materials, and clarity of verbal/nonverbal communication. The course evaluation responses by participants reported access to course materials, convenience of the course format and computer proficiency as the benefits of the hybrid design. Students asked that more courses in the discipline be offered in this format.

An instructional design model for an online clerkship in family medicine was reported by Wiecha, Vanderschmidt, and Schilling (2002). The HEAL model is based on facilitation of learning by problem solving, investigation and discovery (heuristics), student interactions, educational feedback cycles and reflection. The online instructional methodology has a foundation of evidence-based medicine guiding the learners in their clinical decision making.

Student perceptions with online case-based instruction were described by Hayward and Cairns (2001). A convenience sample (n=34) of students enrolled in a cardiopulmonary science course were surveyed at the end of the online case

study exercise and queried concerning student interaction/collaboration and Internet use. The conclusions from the students' responses showed concern about the accuracy of information found on the Web, but that it was "cheaper and easier to locate references online and then obtain the actual articles at the University library" (p. 236). Participants also described difficulty in managing the sheer volume of information available on the Web. Students needed to "possess the ability to filter information and assess its value in terms of usefulness in completing case assignments" (p. 236). The investigators admit it would be beneficial to provide student instruction in effective Internet search methods prior to beginning case study activities.

The use of "Cybercases" developed by nursing faculty was described by Niederhauser, Bigley, Hale, and Harper (1999). The authors report this approach as being self-directed, problem based and applicable in simulated clinical settings. Volunteer participants were divided into groups to search for Internet resources to support clinical decisions, validate those resources and as a group then to discuss assigned cases posted on the Web. Each group had a faculty facilitator to keep discussion on track. The authors recognized the benefit of this approach as enhanced clinical decision-making ability and an appreciation for the value of continuous lifelong learning through new modes of information-seeking behavior.

A comparative time series design study was reported by Umble, Cervero, Yung, and Atkinson (2000). This study compared the effects of traditional

classroom version and a satellite broadband version of the public health training program. Findings supported the efficacy of the distance learning format. The broadcast reached 10,640 participants, more than had been trained in the previous 10 years of traditional classroom courses. Instructional and graphic designers involved in development of the course content used the services for the Centers on Disease Control (CDC), and shared credibility through association with the premier government agency in the public health community.

Information Seeking Behaviors in Medicine

Family practitioners' use of the Internet as an information resource was surveyed by Cullen (2002). Her study asked family practitioners (n=363 randomly selected members of the Royal New Zealand College of General Practitioners) on their use of the Web, and their skills in assessing and evaluating the retrieved information. Her conclusions noted the Internet could be a valuable tool for information gathering. Evidence-based practice depends on identification, use and application of new information in the field. Bryant (2004) explored factors that motivate general medical practitioners to pursue information. Her study used hybrid methods of gathering data on physicians in Great Britain. She presented a ranking of "perceived information needs" as related by study subjects. They are (in descending order) "clinical care, keeping up-to-date, information from patients, pharmacological information, gaps in knowledge, curiosity and uncertainty" (Bryant, 2004, p. 88). Bryant noted the preferred information seeking

approaches from her subjects were personal collections (journals and texts), electronic resources, contacting individuals and a medical library.

Physician Internet medical information-seeking behaviors and online continuing education use patterns were described by Casebeer, Bennett, Kristofco, Carillo, and Centor (2002). Findings in this study noted nearly 100% of the study participants (n=2200 office-based physicians) reported access to the Internet through office, hospital or home connections. Medical care providers who reported regular use of the Internet indicated discussion with patients concerning (patient) information searches was helpful in open dialogue between healthcare provider and care recipient. The greatest disadvantages expressed by physicians were time constraints in Web searching, dissatisfaction with speed of search efforts and difficulty in searching for information. Eighty percent of the respondents reported Web use to access medical information, including literature searches, accessing online journals and searching for specific patient care information. Critical demands from the respondents pointed to ease of use of the Web and validity of content found for use in evidence-based decision making. Continuing medical education for practitioners was examined in the survey, with responses noting immediacy, relevance, credibility and ease of use being the criteria for assessing value of the program.

From this same research group, Bennett, Casebeer, Kristofco, and Strasser (2004) provided a survey to 3,347 actively practicing physicians in all specialties, randomly selected from the American Medical Association physician

listing. These respondents noted their reasons for using the Internet were accessing the latest research on specific topics, accessing new information in a disease area, information related to a specific patient problem, drug dose information and new therapy or product information. Journals were noted as the most important clinical information source, followed by national continuing medical education meetings, videotape/audiotape/CD-ROM, Web sites and local continuing medical education meetings. A majority of the respondents (73.9%) felt the Internet was useful or extremely useful compared with other information resources.

The third paper from this research group, Bennett, Casebeer, Kristofco, and Collins (2005) compared information-seeking behaviors of family physicians with physicians from other specialty areas. A random sample of 2,200 physicians was sent the survey (used in the previous two studies), with family physicians classified according to their self-identification. Findings indicated that family physicians search for specific information related to patient care, and more often use hand-held computers. This technology allows flexibility at the point of care, and provides greater use of just-in-time information in evidence-based practice. The study also recognized specialists' need for greater in-depth knowledge in a narrow focus, their need to use technology to search for "cutting edge research" and journals, and contact with a more limited population of colleagues over a distance. The study also addressed hand-held computer use. Immediacy of access to answers for clinical questions was the greatest advantage. Information

at point of care, drug references and clinical practice guidelines ranked as distinct benefits of the technology.

New Mexico practicing general surgeons (n=133) were surveyed concerning their information-seeking behaviors (Shelstad 1996). Many of the practitioners worked in remote areas, not served by professional medical libraries. The intent was to study the information management skills of this population. The topics studied included: information retrieval purposes, retrieval sources, barriers to access, method of access to the information, and continuing education needs. Results indicated the purposes for seeking information as patient care, continuing medical education and curiosity. Urban practitioners used the resources for teaching and publication—significantly more than rural surgeons. Rural surgeons used the information more frequently for continuing medical education, patient care and medico-legal consideration. The investigator noted professional meetings, medical literature and colleagues were the most frequently noted information sources. Urban surgeons used hospital/medical libraries more frequently than their rural counterparts. Barriers in rural practice most often cited were isolation from expert colleagues, medical schools and library resources—as well as limited hospital budgets for support of information sources. Data from this 1996 study suggest that surgeons, whether rural or urban based, demonstrated little use of technology for information retrieval. Suggestions for continuing education in information retrieval techniques are the major component of the investigator's conclusions (Shelstad, 1996).

Use of the Internet by patients to participate in their healthcare decision making has been reported in the literature. In describing the Internet as a "new medium" of information technology, van Woerkum (2003) recognizes the changing role of the physician in light of patient Internet searching behaviors. His contention is that the informed patient has a more active communication style, involved with healthcare decisions for their own treatment. This proactive stance on the part of some patients will force the physician to deal with a different type of patient-clinician relationship. The author posed three options for the physician interaction: the medical model (restricting interaction to standard medical protocols—diagnosis, treatment and advice); the patient-oriented model (with the patient as a consumer with needs to be met, patient satisfaction is the criterion for judging the effectiveness of care); and the educational model. This option "attempts to equalize the opportunities of patients" by improving patient-clinician communication (van Woerkum, 2003, p. 1018S). Physicians can develop websites, with "trustworthy" hyperlinks, and provide guidance and direction to patients seeking information. The physicians can provide email contact opportunities and recommend Internet resources for patients to become informed. Continuing the theme of public review of scientific articles, Styra (2004) concluded the "Internet has accelerated psychiatrists' access to new research findings," eliminating distance barriers and offering both the profession and the public "equal access to scientific articles, clinical trials and guidelines" (p. 5). A

point made clear in this study was the need for psychiatrists to be prepared to mentor patients who use the Internet to research their conditions.

An experimental study compared computer use and training in information retrieval before and after an educational intervention. Pediatricians (*n*=52) participating in the study reported by D'Alessandro, Kreiter, and Peterson (2004) showed greater use of Internet resources to pursue/answer clinical questions and higher rates of computer usage after the intervention compared with previous studies. The conclusions presented by the researchers noted physicians seeking information at the point of care should depend more on computer technologies, as they are effective—and time-efficient.

A systematic review of 19 studies describing knowledge management in clinical practice in the United States was performed by Dawes and Sampson (2003). The review concluded that while the Internet has made great inroads as an information source, the physician behaviors in seeking that information have not kept pace. The authors noted the most frequently quoted sources of information on which to base clinical decisions were text sources and colleagues. Only one of the studies reported information databases to be the primary resource for new information in the field. As the authors concluded, careful attention to information delivery enables physicians to remain up-to-date in discipline content and improve evidence-based decision making.

Information Seeking Behaviors of Health Care Professionals

In-person continuing education remains the most frequent and most preferred format, with Internet formats gaining in popularity. This report was compiled in a review of 17 articles on Internet continuing education by healthcare professionals (Cobb 2004). The report also indicated the most frequently mentioned barriers to online information-searching behaviors include lack of computer competence and technical problems with the search programs.

An ethnographic study describing how practicing physical and rehabilitation therapists gather, evaluate and implement evidence from professional literature in their clinical decision making was reported by Rappolt and Tassone (2002). The main themes emerging from the analysis reflected that most participants did not systematically evaluate and apply new knowledge in their clinical practice; formal continuing education was highly valued, but in short supply (due to geographic constraints); participants relied heavily on informal consultation with peers as a sources of new knowledge in the discipline; and finally, a sense of resignation to organizational barriers to implementing new knowledge in the clinical setting.

In a survey of a public health community, Lee, Giuse, and Sathe (2003) reported their purpose was to provide understanding of needs in the discipline, and to promote access to data repositories and communications tools. Public health workers in Tennessee (n=571) were surveyed about their

information-seeking behaviors, frequency of resources used, computer skills and Internet access. The data obtained from the survey depicts an "information crisis in public health" (p. 333). Issues of "significant diversity in education, job functions, computer access and computer skills" (p. 333) affects public health outcomes in the state. Due to demands of their job positions, many public health care providers have limited time opportunities to explore information on the Internet. These healthcare providers do not rely on particular information resources, but rather, as the authors note, "use resources that are close at hand" (Lee, Giuse, & Sathe, 2003, p. 333).

Injury prevention and control are an integral aspect of public and community health. Bernhardt, Runyan, Bou-Saada and Felter (2003) provided details of an Internet-based continuing education program for the public health professional training needs. The investigators describe creation, implementation and evaluation of Violence and Injury Control through Education, Networking and Training on the Web (VINCENTweb). The Web-based course, based on content delivered by video-based satellite-link-up conference in 1997, was converted to the online project. Conference attendance included 1,200 participants at 120 satellite link sites. Response to the learning experience showed a majority of respondents to a sub-sample exit survey reporting a change in their professional behaviors. These professional behavior changes resulted from of reflection on content information and training.

Revisiting their study of veterinary medical students from 1987, Pelzer et al. (1998) looked at differences in the way that students used the veterinary medical library. They sought to determine the effect of electronic resources on current student library use and information seeking behaviors. The investigators found that the electronic environment provided options for discovery of new knowledge in the discipline. This will be helpful to the graduating clinicians as they practice in remote locations, with access to information available on the Internet. This up-to-date information becomes the basis for their evidence-based clinical decision making.

Information Seeking Behaviors in Dentistry

Of great interest to this study are reports in literature of dental hygiene information-seeking behaviors. Covington and Craig (1998) found the greatest barriers to information access by practicing dental hygienists were geographic isolation, lack of electronic information sources and cost. The researchers conclusions stressed the importance of education preparation for dental hygiene graduates that will "enable them to cope with an increasing volume of information" in the discipline (p. 577). The investigators emphasized the need for students to acquire skills to access information and develop analytical strategies to evaluate the validity and reliability of that information.

A majority of the practicing hygienists surveyed and reported by Gravois et al. (1995a) felt computer competency is an integral aspect of student skills, and should occur while the students were in their dental hygiene education

curriculum. They further indicated this computer training should not be at the expense of clinical dental hygiene education experiences. The respondents to the survey were primarily from a private practice setting, and any computer experience they had would most likely be reflective of the computer use in that setting. The investigators also reported limited use of either a traditional library or online retrieval of information "pertinent to practice or professional development" (Gravois et al., 1995a, p. 1031). In a second publication from this study, Gravois, Fisher, Patrick, and Bowen (1995b) noted preferred sources of new information in the discipline came from: discussions with colleagues, face-to-face continuing education courses, journals and newsletters. These clinicians "tended to rely" on clinical experience, credible printed sources (journals), and discussion with colleagues to enhance their knowledge base and understanding of new information in the discipline.

Computer use in private practice settings (in 1995) was primarily limited to business office functions. Within the last several years, this has changed. Computer applications for the clinical operatory are increasing daily. Current instruction in dental hygiene education programs recognizes and promotes online drug information searches at point of care, clinical digital intra-oral photography, digital radiography (x-ray images) and capture to patient records, voice activated recording of patient assessments in patient records, and computerized patient information sites the student (and ultimately the practicing clinician) can provide to the patient.

The "Dental Hygiene Forum" provides online continuing education to practicing dental hygienists. Fehrenbach, Baker-Eveleth, and Bell (2001) describe the program, its design and assessment. The authors indicate that the program has met its goal of providing quality continuing education to employed dental hygienists no matter where the clinician is located. Further, the investigators report that this methodology is worthwhile in the advancement of the high standards of care and lifelong learning habits.

A comparison of practicing dental hygiene clinicians with dental hygiene educators viewed similarities and differences in the information-seeking behaviors of both groups (Finley-Zarse et al., 2002). The findings showed both groups used traditional sources of information in the discipline: continuing education courses, attendance at professional meetings, textbooks, journals, dialogue with a dentist or dental hygiene colleague. Computer-based information resource collection varied significantly between the two groups. Dental hygiene educators reported 97% electronic information source use—the Internet, electronic databases and online discussion groups. Information management and computer literacy have implications for the future practice environment of dental hygienists. Technology is pervasive in all areas of contemporary dental and dental hygiene practice. Computer literacy, critical thinking and information management skills are necessary for evidence-based practice.

Dental practitioner information-seeking behaviors impact dental hygienists in their employ and are of concern to the study as well. The Internet Dental

Forum is a fee-based discussion board for dental clinical practitioners. Subscribers (*n*=455) to the Forum were surveyed on their Web use (Schleyer, Forrest, Kenney, Dodell, & Dovgy, 1999). The authors cited computer usage in dentistry increased from 11% in 1984 to 79.5% in 1997. The investigators queried dental practitioners on the "need to develop computer search skills and have appropriate equipment and connectivity" (p. 1503). The majority of respondents self-reported they were comfortable with computers. However, the study sample was drawn from paid participants in an online discussion forum. When asked why they used the Internet, the respondents indicated keeping current with information in the discipline, answering patient-specific questions, and patient education information. Some of the discipline-related information was dental product materials, and information concerning therapies, drugs, and medical conditions. A sidebar to the dentists' responses noted differences in information sought by dental hygienists. The hygienists used the Internet "predominantly for clinical treatment, patient education and their own education" (p. 1508). Dental assistants used the Web primarily for education and ordering supplies. The business office staff used the Web for financial or practice management functions, ordering supplies and education (p. 1508). While these authors noted the respondent sample appeared biased to reflect more positive aspects of Internet use, they did discuss major benefits of computer use in dental practice. Information exchange, a sense of community with other practitioners who are geographically distant, and the ability to retrieve the most current

knowledge in the discipline aided the practitioners who responded in clinical decision making. The authors did note the respondents cautioned the verification (reliability and validity) of information retrieved from the Internet. Their final recommendation was that "dental informatics research must address modalities of chair side computer use" for computers to become an "integrated tool to support clinical care" (Schleyer, 1999, p. 1510).

Validation of Information Resources

An astute researcher validates information gathered during the review of the literature. McMillan (2000) recommends that the information consumer "determine authorship, audience, scope, currency and subject coverage" (p. 95). He notes that peer review of materials may not be evident in many cases. The author does provide several websites that provide critical thinking concerning Internet information resources. *The Chronicle of Higher Education* has reported an educational testing service provides (for a fee) an instrument that will evaluate "how well students can judge the validity of online information" (Young, 2004, p. A33). This test measures global aspects of computer literacy, in measuring student appraisal of web-based information resources, spreadsheet design, composition of e-mail, and other electronic skills. The Educational Testing Service is behind this initiative. The data from the Information and Communication Technology (ICT) Literacy Assessment is intended for use by educational administrators for use in resource allocation, curriculum planning, and determination of effectiveness of student competency in computer literacy.

Young (2004) goes on to quote a professor of communications who thinks "unless students could integrate information technology in with other cognitive skills, it was really not causing any transformation in learning" (p. A 33). Issues of the "digital divide" in information management skills are a very real concern among educators (page A 33).

Consumer evaluation of sources of healthcare information on the Web was reported by Dutta-Bergman (2003). The author found the most trusted sources of information (in descending order) were the personal physician, the medical university and the federal government. Federal government sources included the National Institutes of Health (NIH), National Cancer Institute (NCI) and the Centers for Disease Control (CDC). Other less favored sources of information mentioned included insurance companies, hospitals, and community health organizations (i.e., American Cancer Society, March of Dimes).

Building a conceptual framework for evaluating quality of (diabetes) consumer information resources was addressed by Seidman, Steinwachs, and Rubin (2003). These researchers sought to apply the "quality of care measurement paradigm" to make criteria for Internet information resource discrimination more robust (p. e29). They quote Mark Twain, "A lie can travel halfway around the world while the truth is putting on its shoes" (p. e29). The authors feel consumers gathering information concerning healthcare decisions (for themselves and their families) has the "power to reshape the organization and delivery of health care" (p. e30). The investigators note that access to valid,

appropriate information has potential to "empower lay people and raise the level of dialogue" between patient and clinician, enriching that relationship and ultimately improving the modern healthcare system (Seidman et al., 2003, p. e31).

Criteria on which to evaluate research or resources in health care was reported by Forrest and Miller (2001). The rubric they provide is abstracted from the Health Evidence Bulletin-Wales (http://hebw.uwcm.ac.uk/) (see Table 5).

Table 5

Conventions Used to Indicate Type of Evidence

Type I evidence	At least one good systematic review (including at least one randomised controlled trial)
Type II evidence	At least one good randomised controlled trial
Type III evidence	Well designed interventional studies without randomization
Type IV evidence	Well designed observational studies
Type V evidence	Expert opinion; influential reports and studies

Source: Forrest & Miller (2001); *Health Evidence Bulletin-Wales* (1999)

The evidence quantification can be helpful in reading research design and findings. Applying the evidence in a clinical setting can be assessed using the following, from the same sources (Table 6).

Table 6

Health Gain Notation (Used to Indicate Potential Benefit to Health)

Beneficial	Effectiveness clearly demonstrated
Likely to be beneficial	Effectiveness not so firmly established
Trade-off between beneficial and adverse effects	Effects weighed according to individual circumstances
Unknown	Insufficient/inadequate for recommendation
Unlikely to be beneficial	Ineffectiveness is not as clearly demonstrated
Likely to be ineffective or harmful	Ineffectiveness or harm clearly demonstrated

Source: Forrest & Miller (2001); *Health Evidence Bulletin-Wales* (1999)

Criteria for evaluating website information in the dental hygiene education program at Virginia Commonwealth University (VCU) are based on a rubric presented by Forrest and Miller in 2000. The Faculty Development Workshop on "Bringing Your Classroom Into the New Millennium" was presented during the American Association of Dental Schools (now American Dental Education

Association) annual session. A copy of the format provided to VCU students appears in the Appendix A. Whenever a dental hygiene student uses information resources from a website, a copy of this critique must be submitted by the student. This educational exercise provides a framework for validating information on the Web, as well as acting as a model for later Information-seeking behaviors.

Critical appraisal, application, synthesis and evaluation of new information from research in the discipline is necessary to provide evidence on which to base ethical, appropriate decisions for patient care and the profession of dental hygiene.

Sample Size Determination

Literature from dental hygiene and other healthcare disciplines shows survey response rates vary. Rate of response from dental hygienists (n= 300 hygienists who subscribed to a commercial publication) was 63% while in the same study dental hygiene educator response (n= 300 randomly selected full-time dental hygiene educators drawn from membership of the ADEA) was 78% (Finley-Zarse et al., 2002).

Another investigation provided questionnaires to 71 dental hygienists (selected for longevity in the profession and variation in employment practices) demonstrated a 62% response rate. Not all questions on those returned questionnaires (n=44) had responses. The authors analyzed only those responses given, and did not account for missing data (Gravois 1995b).

A survey of 130 dental hygienists in British Columbia yielded a response rate of 81.5% (n=106 returned questionnaires), but not all respondents answered every question (Covington & Craig, 1998). Their analysis provided percentages based on the responses they received (Covington & Craig, 1998, p. 574). Charles and Mamary (2002) sent a questionnaire concerning preferences in continuing education choices to Advanced Practitioners of Nursing (APN) in Nevada (n=191). This represented the entire population of licensed APNs in the state. They sent out the 191 surveys with 103 returned for a 54% response rate (Charles & Mamary, 2002, p. 89).

In the reviewed healthcare literature, Dawes and Sampson (2003) described information-seeking behaviors of physicians, citing these responses for surveys/questionnaires (see Table 7).

Other survey research noted in the healthcare provider literature showed distribution methods other than mailed questionnaires. Tennessee public healthcare providers were provided a "comprehensive information needs" survey. This survey, drawn from findings of a focus group interaction by librarians, public health officials and informatics specialists was distributed in the workplace to state public health workers (n=775). The response rate for this study was 73%, with 571 surveys completed. (Lee et al., 2003, p. 325). In a query of information-seeking behavior of veterinary medical students, 398 questionnaires were distributed in class or in student mailboxes (if the student's were on

Table 7

Physician Information-Seeking Sampling Response Rates

Study	Subjects/Sampling Method	Response Rate (%)
Strasser, 1978	Practicing physicians (*n*=258) (systematic sample in NY state)	45.6
Connelly et al., 1990	Family physicians (*n*=126) (convenience sample in MN)	52.0
Bowden et al., 1994	Physicians (*n*=442) (random sample in TX)	53.2
Shelstad & Clevenger, 1996	General surgeons (*n*=99) (purposive sample in NM)	74.4
Gorman, 2001	Primary care physicians (*n*=486) (random sample in OR)	48.6

Source: Dawes & Sampson (2003)

off-campus rotations). The overall return rate was 82% with 328 returned (Pelzer et al., 1998, p. 347). In a study done with Virginia public health nurses, the investigators developed an "Information Assessment Questionnaire" distributed at the end of a training program designed to increase public health nurses' knowledge and use of health science information resources. Of the 60 nurses who participated in the course, 31 completed the survey for a response rate of 51% (Self et al., 1997, p. 153). It is common sense to expect higher response rates if questionnaires are "handed out" or distributed in the workplace or educational setting than if the surveys are sent by surface mail. Based on the range of response rates identified in the healthcare literature, this investigator anticipated a mail survey to have at least a 45% response rate.

Summary

Information technology is reshaping the clinical practice setting. The review of literature in the health sciences indicated more care providers are using electronic modes of information retrieval in order to make evidence-based care decisions for their patients. Communication between colleagues and with other health care providers appeared as another benefit of computer use. New methods of providing continuing education in the biomedical disciplines were noted in current literature as well.

Assessing the information acquired from computerized resources continues to be of concern to educators within entry level professional programs as well as consumers of that information. As the patient population increases, its

use of the Internet to share in decisions concerning their biomedical care, the care providers must retrieve and assess the same information in order to better respond to patient needs and inquiries. Modern health care is a shared responsibility between the practitioner, the patient, and their support network. With access to the most up-to-date information in the discipline, appropriate clinical decision making is the goal of optimum health care.

The review of literature provided powerful justification for this research study. The proposed research questions reflect the issues reported in this chapter. The research questions are found in Table 8.

The population frame for the study will be actively practicing dental hygienists in Virginia. This population has not been studied or reported previously. Relationships between length of years in dental hygiene practice (time since entry-level graduation), preference for traditional or nontraditional information resources, information-seeking behaviors and critical thinking skills to examine the resources for validity, reliability and credibility will be explored. Findings of the study can have direct implications to educational programs—entry level dental hygiene education and continuing professional education—in the Commonwealth of Virginia.

Table 8

Research Questions

1. Is there a relationship between when respondents graduated from their entry level dental hygiene curriculum and preferred methods of seeking new knowledge in the profession?
2. Are recently graduated registered dental hygienists more likely to use the Internet to seek new biomedical or professional information than clinicians who have been practicing longer?
3. Is there a difference in preference for retrieval of the new professional knowledge gathered using traditional knowledge sources compared to Internet/computerized resources?
4. Do those dental hygienists using the Internet for new information in the profession critically examine the resources for validity, reliability, and credibility?

Chapter 3

METHODOLOGY

In this chapter, the study design, sampling process, survey development and revision, and survey administration procedures are described. Data analysis procedures will be provided in context for each of the research questions posed for this investigation. This chapter concludes with the study delimitations.

Study Design

This study was conducted using a nonexperimental, correlational design using mail survey methodology. A written, mailed questionnaire provided descriptive data for analysis concerning the variables of interest in the research questions:

1. Is there a relationship between when respondents graduated from their entry level dental hygiene curriculum and preferred methods of seeking new knowledge in the profession?

2. Are recently graduated registered dental hygienists more likely to use the Internet to seek new biomedical/professional information than clinicians who have been practicing longer?

3. Is there a difference in preference for retrieval of the new professional knowledge gathered using traditional knowledge sources compared to Internet/computerized resources?

4. Do those dental hygienists using the Internet for new information in the profession critically examine the resources for validity, reliability and credibility?

The questionnaire provided an economical, easily scored and confidential method to query the sample subjects on standard questions, using uniform methods (McMillan & Schumacher, 2001; Mitchell & Jolley, 2004; O'Sullivan, Rassel, & Berner, 2003). By use of mailing as the distribution technique, participants who are not Internet users could respond to the survey. Attitudes, perceptions, beliefs, values, perspectives and preferences as described in responses to the questionnaire were examined. These affective traits are of value in education as they influence motivation in learning, which in turn affects achievement (McMillan, 2000). Affective traits are developed during the educational process of a dental hygienist, whether prior to the entry level dental hygiene education setting, during the dental hygiene curriculum, or since graduation and licensure.

The ADEA, Section on Dental Hygiene Education, provides dental hygiene education programs with "Competencies for Entry Into the Profession of Dental Hygiene" (2004). This document, approved by the ADEA House of Delegates in 2003, was published in the *Journal of Dental Education*. Distribution in this

manner made it readily available to all dental hygiene educators. Five specific competency areas for the graduate hygienist are described:

1. Core competencies: "the ethics, values, skills and knowledge integral to all aspects of the profession."

2. Health promotion and disease prevention: general knowledge of "wellness, health determinants, and characteristics of patient/client communities."

3. Community: the role of the dental hygienist at the local, state and national levels, with emphasis on influencing "others to facilitate access to care and services."

4. Patient/client care: use of dental hygiene skills to "assess, diagnose, plan, implement, and evaluate treatment" provided.

5. Professional growth and development: a dental hygienist must "possess transferable skills, e.g., in communication, problem-solving, and critical thinking" (ADEA, 2006, p. 760).

Within the "Core Competency," a description of the behavior of the competent hygienist touches on affective skills addressed in this study: "assume responsibility for the dental hygiene actions and care based on accepted scientific theories and research as well as the accepted standard of care" and "continuously perform self-assessment for life-long learning and professional growth" (ADEA, 2006, p. 761).

Accepted scientific theories and research data change rapidly with the advent of the "information superhighway." The dental hygienist's

Information-seeking model needs to adapt to new informational resources. The new informational resources have implications for consideration in the dental hygiene curriculum, for dental hygiene educators and instructional designers of continuing professional education.

The study collected data to examine relationships between selected variables and information-seeking behavior of randomly selected, actively practicing dental hygienists in the Commonwealth of Virginia. Selected variables included, but were not limited to, the preferred method of locating new knowledge in the discipline, years of graduation from the entry level dental hygiene education program, and evaluation of information retrieved for use in evidence-based clinical decision making.

The demographics of the sample respondents describe the actively practicing dental hygienist in Virginia: gender, age, ethnicity, dental hygiene licensure status, and current practice setting. Demographic responses describe the educational preparation (entry level degree received prior to dental hygiene licensure), the highest educational degree achieved after their entry-level dental hygiene educational experience and membership in the professional dental hygiene organization.

Dental hygiene education has followed general education trends with the increased use of computers and the Internet in the curriculum. From the early 1990s, computer hardware and software became an integral aspect of the coursework and clinical activities in dental hygiene education. This investigation

examined respondents who graduated before the computer age, comparing their responses to more recent graduates who used computer technology as an integral aspect of their preclinical training. The study examined differences in information-seeking behaviors between the pre-1990 and post-1990 graduate cohorts, as well as between age cohort preferences, regardless of time since graduation. Regardless of which method of information retrieval the practicing clinician employs, the study looked at whether the dental hygienist validates the information retrieved before incorporating the new knowledge in clinical decision making. Data analysis and conclusions provide cues for development of continuing professional dental hygiene course offerings, and expansion of educational opportunities in the dental hygiene curriculum.

Population and Sampling Frame

The population of interest for the study was actively licensed dental hygienists practicing in the Commonwealth of Virginia. The Virginia Board of Dentistry licenses dental hygienists to practice in the Commonwealth. Standards for licensure, as well as requirements to maintain current registration for practice of the profession, are within their purview as well (Code of Virginia, 2004). Licensure in the Commonwealth of Virginia is limited to those persons who are graduates of an ADA-accredited dental hygiene education program, successful in their completion of the written National Dental Hygiene Board Examination, a clinical examination, and written examination in jurisprudence. Continued licensure is dependent on payment of yearly registration fees and completion of a

minimum of 15 hours (each year) of continuing professional education in the discipline.

As of January 2006, there were 4,076 actively licensed dental hygienists registered in Virginia (Virginia Board of Dentistry website, 2005). These lists were further classified as to status of the dental hygiene licensee: active licensure, inactive licensure, and license to teach (but not provide direct patient care) in educational settings. Those dental hygiene practitioners licensed with an out-of-state address were excluded from this study. The search for those registered dental hygienists (with active licensure) who have a Virginia address yielded 3,302 names. The researcher (an actively practicing, licensed dental hygienist) and those licensed dental hygienists who participated in the expert review of the study survey were excluded. The remaining dental hygienists with active licensure constituted the study sampling frame. From the active licensed in-state residents, a representative random sample of 500 was drawn for the purposes of the survey.

Sample Size and Sampling Methodology

Literature from dental hygiene and other healthcare disciplines discussed survey response rates, as described in Chapter 2. Response rates varied with the method of sampling, ranging from 45% with systematic sampling (Strasser, 1978) to 48%-53% random sampling (Connelly, Rich, Curley, & Kelly, 1990; Gorman, 2001) to a 74% convenience sample (Shelstad & Clevenger, 1996).

This mail survey was sent to a random sample of licensed dental hygienists in Virginia. The investigator anticipated at least a 45% response rate.

A list of all licensed dental hygienists was retrieved from the Virginia Board of Dentistry website in January 2006. The investigator removed the names of those registrants with an out-of-state address from the database. The adjusted total for licensed registered dental hygienists living in Virginia was 3,302. Adjustment was made, with removal of the names of survey instrument expert reviewers from the population of registered dental hygienists in Virginia. The final population of actively practicing dental hygienists in the Commonwealth of Virginia was 3,296.

Upon receipt of approval from the Virginia Commonwealth University Institutional Review Board (IRB) found in Appendix B, the investigator-developed questionnaire was reviewed by selected dental hygiene and social science educators for content and format. After revision, the survey was mailed to a random sample of 500 licensed dental hygienists with a Virginia mailing address. An identifier code was used to maintain confidentiality of respondents for analysis of the data.

To achieve its intended purpose, it would be appropriate that there be uniform geographic distribution of survey respondents across the Commonwealth. Unfortunately, there is not geographic equity in the distribution of dental hygienists around the state, with a limited number of clinicians living and working in rural areas. Most licensees are clustered around the larger cities

and metropolitan areas of Virginia. The sampling reflected the nature of actual distribution of licensed dental hygienists in Virginia.

Of great concern was the cost of mailing out written surveys. Paper, printing, envelopes and postage costs had significant economic impact on the number of questionnaires to be distributed. The investigator sent out 500 surveys by mail (U.S. Postal Service) to randomly selected, actively licensed dental hygienists in Virginia. The study received endorsement from the Virginia Dental Hygienists' Association (VDHA) Executive Board (found in Appendix C) and received a grant from the Virginia Dental Hygienists' Association Foundation (found in Appendix D) to defray cost of the survey. The cover letter for the survey conveyed that information to the study participant. A copy of the endorsement letter from the VDHA president and survey cover letter are found in Appendix E.

The mailing contained an invitation for survey participants to enter their completed response for a raffle. The entry was on a separate form, apart from the survey instrument (Appendix F). This entry form was saved separate from the surveys to ensure confidentiality of survey responses. The raffle prize was a paid registration fee for the next VDHA Annual Session (April 2008). The approximate cost of this prize was $50 to $70 (depending on whether or not the winner is a VDHA member). The Annual Session (state organization meeting) included opportunities for continuing professional education, as well as participation in

governance opportunities at the House of Delegates sessions. Networking opportunities for participants with professional colleagues is an added benefit.

O'Sullivan et al. (2003) recommend re-contacting nonrespondents to markedly improve the survey's response rate. McMillan and Schumacher (2001) note that while the researcher needs to make additional efforts to check the reasons why nonrespondents do not reply, for most mail surveys with a large sample (n<200), the nonrespondents will not affect the results in an "appreciable way" if the return rate is at least 70%. A suggestion from these authors is to obtain a random sample of the nonrespondents, and if possible, compare their responses with those of the subjects who completed the initial survey. McMillan and Schumacher (2001) indicate that perhaps the demographic characteristics of the nonrespondents are different from the respondents. If that is the case, the differences should be discussed as a part of the findings of the study. O'Sullivan (2003) and her co-authors indicate "the amount of time and money available also may set limits on the numbers to be sampled" (p. 157). They feel collecting and examining the collected data provides an investigator the opportunity to comprehend and modify his/her model.

Three weeks after the initial mailing, responses were tabulated. Fifty envelopes were returned as undeliverable by the U.S. Postal Service. Eight respondents had moved from Virginia. One respondent was deployed to Iraq with the National Guard. One month after the initial mailing, a reminder post card (found in Appendix G) was sent to those subjects (n=242) who had not as yet

returned responses to the investigator. Twelve postcards were returned as undeliverable, with 5 email responses, and 4 telephone requests for resending of the survey instrument. Fourteen surveys were returned as result of reminder mailing.

Institutional Review Board Considerations

Upon approval of the prospectus, the study protocol was submitted to the Virginia Commonwealth University Institutional Review Board (VCU IRB) for an expedited review prior to conducting the reliability phase of the study. An introductory letter, and an entry form for the VDHA Annual Session registration fee raffle, accompanied the survey being sent to study participants. The letter addressed the study purpose, VDHA endorsement, intended use of the findings, the respondent's right to not answer certain questions, the voluntary nature of the respondent's participation, and contact information should questions or problems arise. Informed consent was implied in the cover letter by return of the completed survey to the investigator. The introductory letter (Appendix E), raffle entry (Appendix F) and copy of the survey instrument (Appendix H) are contained in the appendix. Documentation sent to and received from the VCU IRB is found in Appendix B.

Survey Instrumentation

The survey instrument was developed by the investigator. (A copy is found in Appendix H). The core competencies necessary for the practice of dental hygienist, as described in Chapter 2, are the foundation for the inquiry on

information-seeking behaviors. These domains of problem solving, technology/information retrieval skills, research and clinical foundation knowledge support the evidence-based decision making of the profession. The first section of the survey queried respondents on demographics. Questions related to active practice status in the Commonwealth, graduation and corresponding degree from their entry-level dental hygiene curriculum, highest level of education attained, age, gender, type(s) of dental hygiene practice setting and membership in the national professional organization (the ADHA) provided insight into the respondent's professional background.

The second section of the survey instrument queried the respondent on access to the Internet, and information-seeking behaviors. Such areas as traditional information resources, electronic and Internet based resources were assessed for preferences to locate and validate new information in the discipline. This new evidence is the basis for clinical decision making while practicing the art and science of dental hygiene. The questions were presented in two formats to test respondent reliability. The first was a checklist to indicate formats from which the subject obtains new information in the discipline. The second was agreement with a series of statements rated on a 5-point Likert-type scale. The statements followed the same content as the checklist, so it is assumed the correlation between the two query formats would be high.

It was hoped the format and wording of the survey was clear to the respondents, enabling the respondents to complete the survey in the least

amount of time, with the least amount of confusion, and return them in a timely fashion to the investigator for data analysis.

Validity of the Survey Instrument

Content validity refers to the degree to which the survey items represent a balanced and sufficient sampling of relevant dimensions, knowledge and skills. (Mitchell & Jolley, 2004) The construct can be strengthened with expert review of the instrument to assure the questions/items measure the appropriate content and context. The study used experts in dental hygiene education, clinical dental hygiene practice and higher education to independently view the survey instrument. Review of the survey instrument occurred after IRB approval of the study. Independent review of the instrument, rather than a focus group methodology, enabled assessment across disciplines and provided a wider range of perspectives on content validity (Mitchell & Jolley, 2004). Several content experts (dental hygienists/educators, practicing clinicians and social science educators) had been contacted. They agreed to participate in the review of the survey instrument. These colleagues represent dental hygiene education colleagues, clinical dental hygienists in active practice, and educators whose specialty areas do not include the biologic sciences. All indicated a willingness to participate in the survey instrument validation process (see Table 9).

Table 9

Expert Review Participants

Name	Affiliation	Degree, Area of Expertise
Diaz, Coral	VCU School of Dentistry; Division of Dental Hygiene	RDH, MS, MPH; Dental hygiene educator
Greene, Margaret L.	ADHA President; Adjunct faculty, Old Dominion Univ.; private practice clinician	RDH, MS; Dental hygiene educator; President, ADHA
Isringhausen, Kim T.	VCU School of Dentistry; Chair, Div. Dental Hygiene	Dental hygiene educator
Neel, Nancy L.	Retired, VCU School of Dentistry; Div. Dental Hygiene	RDH, MS; former dental hygiene educator
Orban, Louanne	Private practice clinician	RDH; 40+ yrs. clinical practice
Snyder, Angela M.	Collateral faculty, VCU School of Education	Ph.D; Research and evaluation
West, Michael	VCU School of Education	Ph.D; Research and evaluation

The reviewers completed the survey and provided feedback on the instrument. The debriefing provided comments on survey content, format (layout of the survey items), clarity of survey questions and ease of survey completion. A copy of the content reviewer form is found in Appendix I. Debriefing of the expert reviewers addressed what was unclear or missing from the content of the survey. The survey instrument was modified based on comments from the expert review participants.

The mail survey instrument was sent after modification based on the expert review. The expert review served as the pilot test of the survey instrument. The random sample (n=500) of licensed Virginia dental hygienists was surveyed using the expert-reviewed instrument. Returned surveys were analyzed relative to response rate. It was anticipated that if a 45% response rate is not achieved, a second mailing of surveys would be sent to provide an adequate sample to analyze data on the research questions. The responses received provided a 53% return. Data analyses were based on the responses.

Other threats to internal validity were considered. Selection was most likely the greatest threat. By using random selection of subjects of the sampling frame, this threat was minimized. The sampling frame was entered into an Excel® format. A systematic selection of each 6th licensee was the method used.

Instrumentation was a threat, considering the survey instrument was created by the researcher. It was the intent of using subject content and

methodology "experts" to review the questions to decrease threats against content and construct validity.

"Graduation from entry-level dental hygiene program" is a variable that was considered in the research questions. Exploration of "use of computers and virtual resources" in the dental hygiene curriculum was another of the variables of interest being assessed with the study. Date of graduation was viewed as a way to explain the instructional technology or Internet exposure a student received during his/her entry-level dental hygiene education process: Students enrolled in the curriculum prior to 1990 were not afforded experience in didactic and clinical computer applications as were those enrolled after that date. Graduates from 1990 onward had access to the virtual tools and resources as an integral framework in the curriculum.

Another consideration that would affect respondent use of technology is utilization of "virtual tools" in dental practice. Increasingly, computers function in the dental business office as well as the dental/dental hygiene operatory. Intra-oral photographic imaging, patient education programs, digitized recordkeeping, digital radiographs (x-rays), drug reference websites (updated daily or weekly) and online diagnostic tools for decision making in patient care are now commonplace, rather than the exception. Whether the dental hygienists in practice learned of these virtual tools during their dental hygiene entry-level curriculum or on the job, clinicians now use computer technology to their greatest advantage. The question as to whether or not the actively practicing dental

hygienists use virtual resources when seeking new knowledge in the discipline is the crux of this research study.

Other limitations considered as threats to internal validity were the Hawthorne effect (subjects may respond differently since they know they are in a study), demand (subjects perceive they will help the study if they give certain responses), social desirability (the subject wants to be characterized in a positive way), and the novelty effect. Since all Virginia licensed dental hygienists are graduates of ADA-accredited dental hygiene educational programs, and have passed a written National Board examination for licensure, they have command of the English language. There should be no language barriers as a threat to validity of the survey instrument.

Reliability Analysis

Reliability is the degree to which the measure (survey instrument) produces consistent results not strongly influenced by random error or chance (Mitchell & Jolley, 2004). Measures to assess internal consistency of the questions on the survey can reduce the probability of random error in responses. Inter-item correlation was calculated to assess internal consistency and reliability. This is addressed in the next chapter.

Survey Distribution and Data Management

Survey packets were mailed to a random sample of 500 actively practicing dental hygienists licensed and residing in Virginia. Each survey packet included a cover letter explaining the research study, the survey, an entry ticket for the

VDHA registration raffle and self-addressed stamped envelope in which to return the completed survey and raffle ticket. Informed consent for participation in the survey was implied with the return of the completed survey to the investigator. Surveys were marked with an identifier code to maintain confidentiality of respondents. The study received funding to offset the cost of distribution. The VDHA Executive Governing Board endorsed the study. In their recognition of endorsement, they recommended seeking funds from the Virginia Dental Hygienists' Association Foundation (Appendix C). Funding was approved and provided in January 2007 (Appendix D). Internet survey response was not an option available for respondents to complete the survey online, but it appeared as a preference statement at the end of the survey. The most important reasons for not choosing the Internet for this survey is that (a) the Board of Dentistry mailing list obtained (in January 2006) did not provide email addresses for the licensed dental hygienists, and (b) using an Web-based format would eliminate access to the survey for those respondents not connected to the Internet.

A paper-and-pencil (written) survey was provided by mail to respondents. An Internet-based survey questionnaire design would not have provided the most viable strategy for reaching a random sample of participants in this study. Huang (2004) indicates that while conventional surveys are monetarily costly, the Web makes survey distribution quick, easy, less expensive and can be accomplished in a time-saving manner. Huang does admit that Web surveys rely on the Internet environment; target respondents must be Internet users. Print or telephonic

surveys can be distributed to the general population (Huang, 2004). Couper (2000) recognizes that use of Internet survey research provides sampling error because "not all members of the frame population are measured" (p. 471). He uses the term "coverage error" to indicate those persons missing from the frame may be without Internet or Web access. He quotes Eaton (1997) on Internet survey research, "It will be at least a generation before Internet surveys are reasonably representative and they may never be fully representative, as the final group of non-adopters may remain significantly large due to cost and/or inability to adopt [*sic*] to the new technology" (Eaton, 1997, as cited in Couper, 2000, p. 471).

Research Questions and Data Analysis

The data were coded and input into a MicroSoft *Access* ® database (MicroSoft Corp, 2003) for recording. The records in Access® were then entered into *SPSS 16.0* (SPSS, 2008) for analysis. Descriptive statistics were used to describe the demographic characteristics of the respondents with regard to gender, age, year of entry-level dental hygiene graduation, category of entry-level dental hygiene education, current practice setting(s), membership in the professional organization, highest level of education attained, computer access and computer use patterns. Variables were coded for nominal and interval values. Measures of central tendency (mean, median), frequency counts, percentages and cross tabulations were assessed as appropriate. Chi-square values (with construction of contingency tables to display frequency of responses

in each category of the variables) were reported to demonstrate relationships between methods of information-seeking behaviors and demographic characteristics of the respondents. Table 10 categorizes the research questions, variables of interest, and methods of analysis.

Management of Missing Data

Data provided by respondents were analyzed as it appeared in the returned questionnaires. Any missing data in the demographics section were reported as not having been answered. Missing responses in the attitudinal section were reported. All responses will be included in the final data analyses. Discussion of areas of nonresponse is provided. It was expected that through expert review, questions that were ambiguous or highly sensitive were modified to present a survey that was acceptable to those who provided responses.

Delimitations

The manner in which the sampling frame was described for survey distribution was delimited to those dental hygienists holding an active license to practice, to include only those actively licensed clinicians who reside in Virginia. Further delimitation excluded those who participated in the expert review of the survey instrument as well as the investigator (who holds an active license to practice dental hygiene in the Commonwealth of Virginia).

Table 10

Research Questions, Variables and Methods of Analyses

Research Question	Independent Variable	Dependent Variable	Methods of Analyses
1. Is there a relationship between when respondents graduated from their entry-level dental hygiene curriculum and preferred methods of seeking new knowledge in the profession?	Graduation date (before or after 1990)	Preferred method of receiving new information	Descriptive statistics, Chi-square
2. Are recently graduated registered dental hygienists more likely to use the Internet to seek new biomedical or professional information than clinicians who have been practicing longer?	Graduation date (before or after 1990)	Use of Internet	Descriptive statistics, Chi-square

Table 10-continued

Research Question	Independent Variable	Dependent Variable	Methods of Analyses
3. Is there a difference in preference for retrieval of the new professional knowledge gathered using traditional knowledge sources compared to Internet/computerized resources?	Methods of information retrieval for new information	Preferred information retrieval method	Descriptive statistics, Chi-square
4. Do those dental hygienists using the Internet for new information in the profession critically examine the resources for validity, reliability and credibility?	Use of virtual resources	Critical analysis of information	Descriptive statistics

Chapter 4

RESULTS

In this chapter, the findings of the study are discussed. The researcher first provides demographic data on the survey respondents. Recognizing characteristics of the respondents gives us a better understanding of the nature of the practicing dental hygienist in Virginia. Comparative analyses are discussed to examine the relationship between when the respondents graduated from their entry-level program and preference for information-seeking behavior in the discipline.

Response Rate

The survey instrument was mailed out to 500 randomly selected practicing dental hygienists in the Commonwealth of Virginia. The list was obtained from the Virginia Board of Dentistry, with those licensees having an out-of-state address removed from the survey sampling frame. Also removed were any individuals with an inactive or teaching license. Additional deletions were the "expert reviewers" who participated in the pilot study (beta test) for review of the survey instrument. The remaining practicing dental hygienists constituted a population of 3,296. The method for randomization was selection of each 6th name on the Excel® spreadsheet list described previously.

Of the 500 surveys mailed out, 50 envelopes were returned by the U.S. Postal Services as undeliverable. Reminder post cards were sent to nonrespondents from the mailing (n=242) with 12 post cards returned as undeliverable. After the initial mailing and post card reminder, 231 surveys were returned for analysis. This resulted in a 52.7% survey return rate.

Sociodemographic Characteristics of Respondents

The first section of the survey instrument queried sociodemographic characteristics of respondents. Among these characteristics were gender, age, year of graduation from the entry-level dental hygiene education program, category of entry level education degree awarded, highest level of education attained, current practice setting(s), membership in the professional organization, computer/Internet access and computer frequency use patterns.

Many of the characteristics of the survey respondents will be provided in terms of those individuals graduating from their entry-level program prior to 1990 and after 1990 when computer technology and Internet access became a viable component of the dental hygiene curriculum. This concept of a pre- and post-1990 graduation cohort is one of the key variables in the study. Two of the research questions specifically ask if there are distinctions in preference and behaviors related to information-seeking behaviors. The descriptors will provide characteristics of the sample according to pre/post-1990 graduation date.

The majority of the sample was female (98.7%). Table 11 demonstrates the breakdown of gender into pre-1990 and post-1990 groups.

Table 11

Respondents' Gender Breakdown by Graduation Before/After 1990

	Pre-1990 Frequency	Pre-1990 %	Post-1990 Frequency	Post-1990 %	Total Responses
Missing cases	-	-	-	-	12
Male	1	0.9	2	1.9	3
Female	114	99.1	102	98.1	216
Total	115	100	104	100	231

Age was noted in decades, from 20 to 69. No respondents indicated being over 69 years old. For all respondents, the frequency of age distribution revealed: 20-29 years at 10.4%, 30-39 years at 22.6%, 40-49 years at 30.7%, 50-59 years at 28%, and 60-69 years at 4.3%. When examined for categories of age with pre/post-1990 graduation, distribution is noted. Not all respondents fell into the traditional student category, several of the subjects entered dental hygiene after careers in other fields or later in their academic careers (see Table 12).

Table 12

Distribution of Respondents' Age by Year of Graduation

Year of Graduation	Age 20-29	Age 30-39	Age 40-49	Age 50-59	Age 60-69	Total
1962-1989	-	-	50	57	8	115
1990-2005	24	51	21	7	-	103
Total	24	51	71	64	8	218
Missing data - 13 cases with no response in both age and year of graduation						231

Graduation dates (from the entry-level dental hygiene program) ranged from 1962 to 2005. A graphic representation of the entry into the profession is shown in Figure 2.

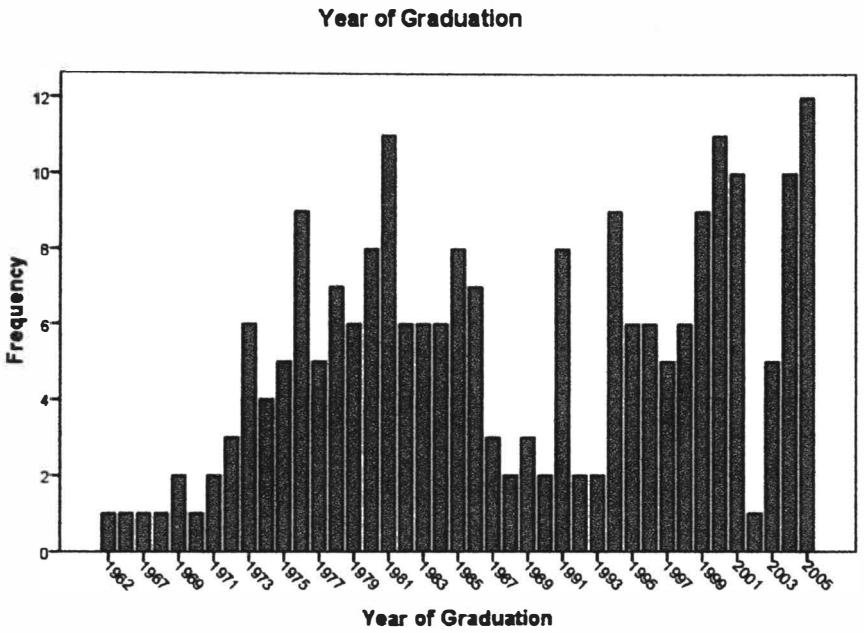

Figure 2. Bar Graph of Respondents' Graduation From Entry-Level Program.

The majority of the sample were Caucasian (87.4%). Eight respondents chose not to share their heritage, while other responses showed multicultural diversity: 1.7% African-American/not Hispanic, 4.3% Asian/Pacific Islander, 2.2% Hispanic/Latino, 0.4% Native American/Alaskan native, and one respondent indicating "other." When the respondents are examined for pre- and post-1990

groupings, there is indication of a more diverse population entering the profession in more recent years (see Table 13).

Table 13

Respondents' Ethnicity Reported by Graduation Before/After 1990

Ethnicity	Pre-1990 Graduate Frequency	%	Post-1990 Graduate Frequency	%
African American (not Hispanic)	1	0.9	3	2.9
Asian/Pacific Islander	1	0.9	9	8.7
Caucasian	111	96.5	87	83.7
Hispanic/Latino	1	0.9	4	3.8
Native American/Alaskan Native	1	0.9	-	-
Other	-	-	1	1.0
Total	115	100	104	100

The number and percentage of minority dental hygiene graduates has increased since 1990. The reported percentages show an increase in African/American hygienists from 0.9% to 2.9%, Asian/Pacific Island respondents from 0.9% to 8.7%, and a .09% to 3.8% increase in the category of Hispanic/Latino hygienists. There was a decrease in the percentage (96.5% to 83.7%) of Caucasian hygienists.

When asked about current licensure, or current practice in the Commonwealth of Virginia, those responding "no" ended their survey responses at this point. A total of 95.2% respondents reported they are currently licensed and are able to practice in Virginia.

As suggested by one of the expert reviewers in the pilot test, the subjects were asked about membership in the ADHA. The replies showed only 27.3% of the respondents were dues-paying members of the professional organization. When examined for distinction between pre- and post-1990 graduate cohort membership, it was noted that only 33% of the pre-1990 graduates and 29.8% of the post-1990 graduates are members of the national professional association for dental hygienists.

For practice setting, respondents indicated 86.6% worked in a clinical private practice setting, 6.9% in a community or public health setting, 6.5% in an educational setting, 1.3% reported a position in sales, 3% held administrative positions, 1.3% respondents were employed in another healthcare industry, and 2.6% were working in another field. A total of 1.7% respondents were not employed at the time of the survey, and 2.2% indicated they were on hiatus from practicing dental hygiene. No respondents indicated being employed in a dental research setting (see Table 14).

Table 14

Respondents' Practice Setting by Graduation Before/After 1990

Practice Setting	Pre-1990 Graduate Frequency	%	Post-1990 Graduate Frequency	%
Private practice	100	87.0	97	93.3
Community	3	2.6	4	3.8
Education	7	6.1	8	7.7
Dental research	0	0	0	0
Sales	2	1.7	1	1.0
Administrator	4	3.5	3	2.9
Other health care	1	0.9	2	1.9
Another field	5	4.3	1	1.0
Not employed	2	1.7	2	1.9
On hiatus	3	2.6	2	1.9

The respondents indicated their degree received from the entry-level dental hygiene education program. The results showed 4.8% graduated with a certificate in dental hygiene, 41.6% received an associate's degree, and 49.8% of the dental hygienists graduated with a baccalaureate degree. When asked about the highest level of education/degree attained, 2.6% indicated their highest degree was a certificate in dental hygiene, 29.9% hold an associate degree as their highest degree, 56.3% earned a baccalaureate, and 6.5% of the hygienists attained a master's degree.

The respondents were asked to check all sources of discipline-related information retrieval that applied. The overall frequencies showed 90.5% of the respondents received professional journals at home, two individuals accessed journals at a library, while one respondent reported journal access at a medical center library. Approximately one-fifth reported using printed textbooks to retrieve new information in the discipline.

When asked about face-to-face continuing education programs, 83.5% reported attending lectures, while 42.4% attended interactive presentations that provided group discussion as part of the format of the program. Regarding the agency that provides the continuing education in the profession, 38.5% reported they attend professional organization meetings, either on the local component, state constituent or national organization level.

Nearly two-fifths of the respondents (58%) used study-at-home packages. Gaining in popularity are online continuing education offerings at 55.4%,

professional organization websites (28.1%), with 21.6% using commercial websites (such as Procter & Gamble®, Colgate-Palmolive® and other major dental product manufacturers).

Digital resources showed 10.8% response for digital journals, while professional clearinghouses (2.2%) and ListServs (6.9%) completed the formal discipline-related offerings. Convenience methods of gaining new information, while informal, were reported by some of the respondents. These included calling a former instructor (7.4%) and asking a dental colleague (31.2%). Methods of information retrieval are shown in Table 15.

Respondents were asked about access to and frequency of use of the Internet. Only three individuals (1.3%) indicated they had no convenient access. Nearly half of the hygienists (48.9%) reported using the Internet at both work and home, while 43.3% were connected to the "information superhighway" at home. A small minority (1.7%) reported use of the Internet only at work or at a local library (0.4%). Post hoc coding for Internet access took into account only one response per survey. If the participant checked *at home, at work, at a local library*, the data were entered as *both at home and at work*. Data were analyzed based on this coding.

It would appear that more graduates after 1990 have access to the Internet at both home and work (58.8%) than their colleagues who graduated prior to 1990 (44.4%). This could be an effect of working in a setting where computers and virtual tools are part of the workplace environment (digital

Table 15

Methods of Information Retrieval by Graduation Before/After 1990

Sources of Information	Pre-1990 Graduate Frequency	%	Post-1990 Graduate Frequency	%
Journals at home	110	95.7	96	92.3
Journals at library	1	0.9	1	1.0
Journals at medical center	-	-	1	1.0
Printed textbooks	20	17.4	24	23.1
Face-to-face CE	102	88.7	88	84.6
Face-to-face interactive	51	44.3	45	43.3
Professional organization	44	38.3	44	42.3
Mail CE	71	61.7	62	59.6
Online CE	53	46.1	74	71.2
Professional organization website	28	24.3	37	35.6
Commercial website	22	19.1	28	26.9
Digital journals	12	10.4	13	12.5
Clearinghouses	4	3.5	1	1.0
ListServs	10	8.7	6	5.8
Former instructor	5	4.3	12	11.5
Dental colleague	29	25.2	43	41.3

radiography, intranet links for clinical operatory to the business office, access to online sites for drug reference information, sites to download patient oral healthcare information). A possible explanation for the 53% response to Internet access at home by the pre-1990 participants might be that this age group is more likely to have children "plugged into" the Web, and can assist parents with Internet searches (see Table 16).

Table 16

Internet Access by Graduation Before/After 1990

Internet Access	Pre-1990 Graduate Count	%	Post-1990 Graduate Count	%
No convenient access	3	2.6	0	0.0
At local library	0	0.0	1	0.4
At work	0	0.0	4	3.8
At home	61	53.0	37	35.6
Both at home and at work	51	44.4	61	58.6
Missing cases	0	0.0	1	0.4
Total	115	100	104	100

Regarding the frequency the respondents logged on to the Internet (for any purpose), only 1 hygienist was not connected at all while 6 respondents (2.6%) rarely went online. The majority of respondents (76.2%) reported going online once a day. The percentage of frequency of Internet use reported for pre- and post-1990 cohorts appears close, with less than 0.7% separating the groups. Almost four-fifths of respondents accessed the Internet daily (see Table 17).

Table 17

Internet Use Frequency by Respondents' Graduation Before/After 1990

	Pre-1990 Graduate		Post-1990 Graduate	
Internet Access	Count	%	Count	%
At least once a day	91	79.1	83	79.8
At least once a week	15	13.0	14	13.5
At least once a month	4	3.5	4	3.8
Rarely	4	3.5	2	1.9
Not at all	1	0.9	0	0.0
Missing cases	0	0.0	1	1.0
Total	115	100	104	100

Looking at the respondents' characteristics, it is noted that the sample was overwhelmingly female in gender, and primarily Caucasian. The sample

ranged in age from their 20s to 60s with slightly over one-quarter of the respondents reporting membership in a national dental hygiene professional organization. Clinical private practice accounted for the majority of employment settings. Almost half of the subjects entered the profession with a baccalaureate degree, with a minority of hygienists completing a master's degree after entry in the profession. Most of the respondents reported receiving journals at home, with a lesser number using printed textbooks for new information in the discipline. More than four-fifths of the subjects attended face-to-face lectures, but less than half participated in presentations with small-group interaction. Slightly over one-third of the respondents attended professional organization meetings to get new information in the discipline. Just over half the subjects reported going online to retrieve new knowledge in the field. Most of the subjects accessed the Internet at least once a day from either work or home.

Statements of Preference in Seeking New Information

The second section of the survey asked a series of questions to rank the preference of method of retrieval of professional information. At this point, the frequency of responses will be provided, with later explanation and analysis of the retrieval methods. The preferences were rated in a Likert-type scale, with the values of (1) strongly disagree, (2) disagree, (3) neutral (neither agree nor disagree), (4) agree, (5) strongly agree.

Question 12 dealt with reading about new information in the discipline from current professional journals the respondent receives. The majority of the

respondents (79.2%) indicated "agree" or "strongly agree." Question 13 described preference for use of biomedical (printed) texts to gain new knowledge in the discipline. The greater number of responses came in the "neutral" range, with no one strongly disagreeing, and 32.6% either disagreeing or having no strong feeling about the textbooks. Queried on the retrieval in a library setting, 49.8% strongly disagreed, or disagreed (29%); both negative response categories accounting for 83.1%. Question 14, preference to go to a medical center library fell on the disagree side with 77.6%. The respondents' preference for online journal use is demonstrated in Table 18. The question about subscription to online professional journals showed no clear response.

Table 18

Respondents' Frequency for Preference of Online Journal Use

	Frequency	Valid %	Cumulative %
Strongly disagree	50	22.8	22.8
Disagree	45	20.5	43.4
Neutral	28	12.8	56.2
Agree	54	24.7	80.8
Strongly agree	42	19.2	100
Missing values	12	5.2	
Total	231	100	

The next preference statement asked about contacting a dental/dental hygiene colleague to obtain new information in the discipline. The greatest number of responses came at the "neutral" value (*n*=68), with "agree" being a close second (*n*=62). Together, those two values accounted for 59.4% of the responses for that query. To follow with the theme of "word of mouth" rather than documented resources, the next question asked if the hygienist would prefer to speak to her/his dentist or employer to obtain new information in dentistry. Respondents (35.1%) indicated they agreed with the statement. But interestingly, when asked about preference for calling a dental hygiene educator for new information in the field, 50% of the respondents either disagreed or strongly disagreed. Another 28.7% were ambivalent about contacting previous faculty.

Mail home study coursework was the focus of the next question. The preference noted with the highest frequency agreed with the statement (34.2%), with "agree" and "strongly agree" values accounting for 55.8% of the responses.

A popular mode of receiving new discipline-related information is the face-to-face continuing education presentation. One hundred eighty-five respondents preferred this method of information transmission. Face-to-face is a passive format in which the audience hears/sees the information being provided by the learned lecturer; 80.1% of those surveyed agreed with the face-to-face format. A lecture presentation with group interactivity showed similar agreement. Subjects (67.5%) stated their preference for the presentation with opportunity for

small group discussion, and manipulation of information—a more active learning strategy.

Online information retrieval and continuing education coursework was the focus of the next two preference statements. The majority of responses on the question of online advanced coursework or continuing education courses elicited values in the range "neutral" (24.2%) to "agree" (29.4%) to "strongly agree" (19.9%). Along with the online course statement, the next query addressed preference to search the Internet to obtain new information in the discipline. The majority of the hygienists agreed (32.5%). Combining the "agree" and "strongly agree" responses showed a 48% preference for "surfing the Web." To balance out the preference categories, the next question concerned multiple methods of preference for information retrieval. As expected, the greatest frequencies fell in the "agree" and "strongly agree" responses, the combined categories accounting for 73.2% of the responses.

Further questioning on use of Internet sites and decision making, the next statement asked about the use of Google® or similar commercial search engines to locate new information in the discipline. While 23.4% of the respondents indicated "neutral," combined values for "agree" and "strongly agree" accounted for 55.8% of the responses. MEDLINE® or other biomedical database/search engines are not popular with the majority of subjects. The highest frequency fell in the "neutral" range (37.2%). Other preference statements showed similar results. The query on use of any website to find professional information showed

the greatest frequency of response in the "neutral" range (29%). With use of the professional organization website, the findings showed preference with "agree" coming in with 36.8% of responses. Further discrimination of the website to include preference for professional (biomedical) refereed sites showed ambivalence with 37.7% of respondents in the in the "neutral" category.

Two Internet entities that provide professional information are often created by organizations or government agencies. They are ListServs and biomedical online clearinghouses. When asked about preference for these resources, the majority of respondents were in the "strongly disagree," "disagree" and the "neutral" range. ListServs had 97.2% response in those negative/ambivalent categories, while the biomedical clearinghouses had an 88% frequency towards the negative/ambivalent preference.

When asked about preference for online discussion groups, blogs or chat rooms as a method of receiving new information in the discipline, 70.4% of the respondents fell on the disagree side. Only 13% chose this as a method they would prefer. In asking about the evaluation of information retrieved from the Internet to use in making clinical decisions, the 63.7% of the responses indicated the hygienists "agreed" or "strongly agreed" to assess the validity of the data before putting the new information into clinical practice. To follow the line of questioning about the validity of information retrieved from the Web, the next question concerned "source and content" of new knowledge; 62.3% "agreed" or "strongly agreed" with that statement.

The final statement about preference asked if the respondent would have preferred to take the survey online. Only 17% of the subjects would have wanted to do so.

Comparison of Variables

In the remaining sections of this chapter, repeated reference will be made to the Pearson Chi-square statistic which is used to determine the relationship between variables. The larger the value of the Chi-square statistic, the greater the evidence against the null hypothesis of independence of the variables. If the p-value is less than 0.05, strong evidence exists against the null hypothesis of independence of variables and it can be concluded the variables are associated (Agresti & Finley 1997, p. 261). The Phi coefficient will be given if both variables are categorical; it is a Chi-square-based measure of association (SPSS 2007, p. 269). The alpha level for statistical significance of findings is $p<.05$ level. These data analyses will be used to address the research questions that underlie this study.

Assessing Reliability of the Survey Instrument

The survey instrument was designed by the researcher, with input from colleagues and participants in the pilot test. Returned surveys provided data to assess cross-tabulation between checklist items and preference statements measuring the same entities. The contingency table (Table 19) notes relationship between the test items with probability values of 0.05 or less (marked with an asterisk*). The pilot was tested for validity and it passed.

Table 19

Checklist Methods and Preference Statement (number)

from Survey Instrument

Checklist Method (Preference Statement)	Chi-square Statistic	p-value	Phi Value
Journals at home (12)	7.959	.093	.191
Journals at library (14)	1.095	.000*	.707
Journals at medical center (15)	4.496	.343	.143
Printed textbooks (13)	25.699	.000*	.343
Face-to-face CE (21)	42.068	.000*	.437
Face-to-face interactive (22)	31.724	.000*	.380
Mail CE (20)	54.608	.000*	.499
Online journals (16)	10.988	.001*	.224
Online CE (23)	88.052	.000*	.634
Professional organization website (29)	22.446	.000*	.321
Commercial websites (26)	13.532	.009*	.250
Clearinghouses (32)	2.639	.620	.110
ListServs (31)	12.530	014*	.243
Former instructor (19)	39.858	.000*	.428
Dental hygiene colleague (17)	52.646	.000*	.490
Dentist/dental colleague (18)	10.988	.027*	.224

Data Analysis Specific to Research Questions

Research Question 1

The first research question "Is there a relationship between when respondents graduated from their entry-level dental hygiene curriculum and preferred methods of seeking new knowledge in the profession?" was examined using cross-tabulation of reported preferences by the respondents' date of entry-level graduation ("grad") and are shown in Table 20. Those Chi-square and Phi values where p-value is less than .05 are marked by an asterisk. The preference statement number from the survey instrument is shown in parentheses.

Three statements showed significance at the $p<.05$ level indicating dependence of variables (marked with an asterisk). Tables 21-23 further explore the comparison of these variables by graduation cohort. The three areas showing a relationship between graduate pre/post 1990 are online continuing education or advanced coursework, Internet retrieval of new evidence on which to base clinical decisions for patient care and contacting a dental hygiene educator for new information in the discipline.

Table 21 highlights the preference for online continuing education/retrieval of knowledge in the discipline, when discriminated by respondent graduation before or after 1990. The values of the preference statements, based on the

Table 20

Preference for Information Retrieval by Graduation Before/After 1990

Preference by Graduation Era	Chi-square Statistic	p-value	Phi Value
Journals at home (12)/grad	1.794	.774	.091
Journals at library (14)/grad	2.872	.579	.115
Journals at medical center (15)/grad	2.610	.625	.110
Online journals (16)/grad	3.729	.444	.131
Printed textbooks (13)/grad	.460	.977	.046
Face-to-face lecture (21)/grad	6.575	.160	.174
Face-to-face interactive (22)/grad	5.096	.278	.153
Mail CE (20)/grad	3.785	.436	.132
Online CE (23)/grad	17.722	.001*	.286
Search Internet (24)/grad	16.807	.002*	.278
Variety methods (25)/grad	8.412	.078	.197
Professional organization website (29)/grad	7.884	.096	.191
Commercial websites (26)/grad	7.629	.106	.189
MEDLINE (27)/grad	3.948	.431	.136
Biomedical refereed sites (30)/grad	8.027	.091	.193
Any Internet site (28)/grad	8.252	.083	.196

Table 20-continued

Preference by Graduation Era	Chi-square Statistic	p-value	Phi Value
Clearinghouses (31)/grad	8.258	.083	.196
ListServs (31)/grad	4.726	.317	.150
Former instructor (17)/grad	8.838	.065	.202
Dental colleague (18)/grad	6.710	.152	.176
Dental hygiene educator (19)/grad	12.697	.013*	.243
Blogs, chat room (33)/grad	10.403	.507	.124

Table 21

Pre/post 1990 Graduation Date and Online Continuing Education Preference (Question 23)

Online CE Preference and Graduation Era	Pre-1990 Graduation	1990 and Later Graduation
Mean preference ± standard deviation	3.11 ± 1.260	3.76 ± 1.101
Standard error	.118	.109
Median preference value	3.00	4.00
95% CI (lower-upper bounds)	2.88 - 3.35	3.55 - 3.98

Likert-type scale previously described, indicates that those dental hygienists (who completed their entry-level dental hygiene education after 1990) agreed with use of online continuing education or advanced coursework more than their dental hygiene colleagues who graduated prior to 1990. This is true because the 95% confidence limits do not overlap.

Respondent preferences for retrieval of new knowledge in the discipline from any Internet site are highlighted in Table 22.

Table 22

Pre/post 1990 Graduation Date and Internet Search for New Information (Question 24)

Internet Search with Corresponding Graduation Era	Pre-1990 Graduation	1990 and Later Graduation
Mean preference ± standard deviation	3.04 ± 1.229	3.69 ± 1.085
Standard error	.115	.107
Median preference value	3.00	4.00
95% CI (lower-upper bounds)	2.82 - 3.27	3.48 - 3.90

Once again, the cohort of graduates after 1990 indicated agreement with use of the Internet for retrieval of new information in the discipline. Their colleagues who graduated prior to 1990 either disagreed or had no strong feeling

about Internet information retrieval evidenced by the non-overlapping confidence limits.

The third variable noted to show dependence between the variables of graduation before or after 1990 was the preference of the respondent to receive new information by calling a dental hygiene educator. This is highlighted in Table 23.

Table 23

Pre/post 1990 Graduation Date and Preference to Call a Dental Hygiene Educator (Question 19)

Call a Dental Hygiene Educator Corresponding to Graduation Era	Pre-1990 Graduation	1990 and Later Graduation
Mean preference ± standard deviation	2.25 ± 1.122	2.77 ± 1.125
Standard error	.106	.111
Median preference value	2.00	3.00
95% CI (lower-upper bounds)	2.04 - 2.46	2.55 - 3.00

The pre-1990 graduates of entry level dental hygiene programs disagreed with the notion of calling faculty to retrieve new information in the discipline. The later cohort of graduates was more likely not to have strong feelings about contacting a dental hygiene educator to receive new knowledge in the field, as evidenced by the non-overlapping confidence limits.

Within the bounds of the study, these three dependent variables (preference for online information retrieval, online continuing education and preference to call a dental hygiene educator) show a strong relationship with the date of graduation from the respondents' entry-level dental hygiene program (the independent variable).

Research Question 2

The question "Are recently graduated dental hygienists more likely to use the Internet to seek new biomedical or professional information than clinicians who have been practicing longer?" refers to use of the World Wide Web for information retrieval. Table 24 shows the frequency and percent of methods used by the respondents, categorized by graduation prior to or after 1990.

Separating out the "traditional" methods of information retrieval and examining them by graduation era of respondents, the analysis for comparison of variables appears in Table 25. Those values that show statistical significance at the $p < .05$ level are marked with an asterisk (*).

The two variables that show dependence with graduation from entry level program are contacting a former instructor for new information in the discipline ($p=.047$) and contacting a dental/dental hygiene colleague ($p=.011$). Both checklist items have small sample sizes. Former instructor rated only 17 responses, with 5 cases graduating between 1962 and 1989, and 12 respondents graduating 1990 to 2005. It can be inferred that the survey respondents in the more recent graduation cohort preferred to contact a former

Table 24

Current Information Sources for Pre/Post 1990 Graduates (Question 9)

	All Respondents		1962-1989 Graduates		1990-2005 Graduates	
	Frequency	%	Frequency	%	Frequency	%
Journals at home	209	90.5	110	95.7	96	92.3
Journals at library	2	0.9	1	0.9	1	1.0
Journals at medical center	1	0.4	-	-	1	1.0
Printed textbooks	44	19.0	20	17.4	24	23.1
Face-to-face CE	193	83.5	102	88.7	88	84.6
Face-to-face interactive	98	42.4	51	44.3	45	43.3
Professional organizations	89	38.5	44	38.3	44	42.3
Mail CE	134	58.0	71	61.7	62	59.6
Online CE	128	55.4	53	46.1	74	71.2
Professional organization website	65	28.1	28	24.3	37	35.6

Table 24-continued

	All Respondents		1962-1989 Graduates		1990-2005 Graduates	
	Frequency	%	Frequency	%	Frequency	%
Commercial website	50	21.6	22	19.1	28	26.9
Digital journals	25	10.8	12	10.4	13	12.5
Clearinghouses	5	2.2	4	3.5	1	1.0
ListServs	16	6.9	10	8.7	6	5.8
Former instructor	17	7.4	5	4.3	12	11.5
Dental colleague	72	31.2	29	25.2	43	41.3

Table 25

Traditional Resources Use for Information Retrieval

by Graduation Pre/Post 1990

Traditional Resources Compared to Graduation Pre/Post 1990	Chi-square Statistic	p-value	Phi Value
Journals at home/grad	1.094	.296	-.071
Journals at library/grad	.005	.943	.005
Printed textbooks/grad	1.100	.294	.071
Face-to-face lecture/grad	.791	.374	-.060
Face-to-face interactive/grad	.026	.872	-.011
Professional organization/grad	.372	.542	.041
Mail CE/grad	.103	.748	-.022
Former instructor/grad	3.944	.047*	.134
Dental colleague/grad	6.438	.011*	.171

faculty member for information in the discipline than those who completed their entry-level program prior to use of the Internet in the dental hygiene curriculum. The same inference can be made for the more recent cohort of dental hygiene graduates contacting a dental or dental hygiene colleague for new information to use in clinical decision making. The sample size for this variable is still small, with 29 of the older cohort and 43 respondents in the more recent cohort. Again, it can be inferred that the more recent graduate is more likely to contact a dental professional colleague for information in the discipline than the graduate from 1962 to 1989.

The comparison of variables showing relationship in reported use of Internet or digital based resources for continuing professional knowledge is shown in Table 26.

The use of online continuing education/advanced coursework shows a Phi value of 0.254, which indicates a weak association, despite a low p-value. Comparison of graduation cohort and professional organization websites, such as those from the ADHA, the ADA, and the ADEA, commercial website resources and digital journal use do not present statistical evidence to demonstrate relationship with graduation cohort. From the survey responses, we cannot make any inference. Very low frequency of cases in the categories of Clearinghouses and ListServs will not provide evidence of relationship either.

Table 26

Internet Resources for Retrieval of Biomedical Professional Information by Graduation Pre/Post 1990

Internet Resource	Chi-square Statistic	p-value	Phi Value
Online CE	14.086	.000	.254
Professional organization website	3.299	.069	.123
Commercial website	1.882	.170	.093
Digital journals	.230	.631	.032
Clearinghouses	1.55	.213	-.084
ListServs	.691	.406	-.056

In response to the second research question: "Are recently graduated registered dental hygienists more likely to use the Internet to seek new biomedical or professional information than clinicians who have been practicing longer?" the dependent variable "use of the online continuing education" shows a weak association with the date of graduation from the respondents' entry-level dental hygiene program (independent variable).

Research Question 3

The survey queried respondents to indicate the methods of retrieval of new information in the discipline in the first section, then asked for their preferences (based on a Likert-type scale) for use of those resources. Table 27 shows the cross-tabulation of checklist resource retrieval methods (independent variable) with preference statements (dependent variable) for the corresponding method of receiving new information in the discipline. Statistically significant Chi-square p-values are marked with an asterisk (*).

The variables showing association at the $p<.05$ level of statistical significance between the checklist resource method and the preference statements include: journals retrieved at the library (p=.000), printed textbooks (p=.000), face-to-face lecture presentations (p=.000), face-to-face group interactive presentations (p=.000), mail continuing education (p=.000), retrieval of online journals (p=.001), online continuing education or advanced coursework (p=.000), professional organization websites (p=.000), commercial websites

Table 27

Checklist Resource Methods Compared to Corresponding Preference Statements

Checklist Resources Method/ Corresponding Preference Statement	Chi-square Statistic	p-value	Phi Value
Journals at home (12)	7.959	.093	.191
Journals at library (14)	1.095	.000*	.707
Journals at medical center (15)	4.496	.343	.143
Printed textbooks (13)	25.699	.000*	.343
Face-to-face CE lecture (21)	42.068	.000*	.437
Face-to-face interactive (22)	31.724	.000*	.380
Mail CE (20)	54.608	.000*	.499
Online journals (16)	19.254	.001*	.297
Online CE (23)	88.052	.000*	.634
Professional organization website (29)	22.446	.000*	.321
Commercial websites (26)	13.532	.009	.250
Clearinghouses (32)	2.639	.620	.110
ListServs (31)	12.530	.014*	.243
Former instructor (19)	39.858	.000*	.428
Dental hygiene colleague (17)	52.646	.000*	.490
Dentist or employer (18)	10.988	.027*	.224

(p=.009), ListServs (p=.014), calling a former instructor (p=.000), calling a dental hygiene colleague (p=.000) and asking a dentist or employer (p=.027).

Discriminating the data by traditional or nontraditional (Internet/computerized resources), relationships are displayed in Tables 28 and 29.

The category of journals at a medical center does not appear associated in a comparison of retrieval methods with the preference for that method. Its probability value is not statistically significant, but the frequency of response in this category is extremely small (only one respondent indicated going to a medical center library to retrieve new information, and 5.1% of respondents agreed with the preference statement). The receipt of journals at home to retrieve new information in the discipline does not show strong association between the checklist resource method and corresponding respondent preference. All other traditional resources show association with the preference statements.

Table 29 provides a comparison of the "Internet/computerized" resource methods to receive new information on which to base clinical decisions. Biomedical clearinghouse use does not show an association with the corresponding preference statement. The frequency of response and confusion about the term clearinghouse may explain the outlier status of this method. The frequency of checklist responses was only five individuals, with 88% of respondents either disagreeing with or having no opinion about use of professional clearinghouse sites for retrieval of new information in the discipline.

Table 28

Traditional Information Resource Method and Preference Comparisons

Checklist Resource and Corresponding Preference Statement	Chi-square Statistic	p-value	Phi Value
Journals at home (12)	7.959	.093	.191
Journals at library (14)	1.095	.000*	.707
Journals at medical center (15)	4.496	.343	.143
Printed textbooks (13)	25.699	.000*	.343
Face-to-face CE lecture (21)	42.068	.000*	.437
Face-to-face interactive (22)	31.724	.000*	.380
Mail CE (20)	54.608	.000*	.499
Former instructor (19)	39.858	.000*	.428
Dental hygiene colleague (17)	52.646	.000*	.490
Dentist or employer (18)	10.988	.027*	.224

Table 29

Internet/Computerized Resource Methods and Preference Statements

	Chi-square Statistic	p-value	Phi Value
Online journals (16)	19.254	.001*	.297
Online CE (23)	88.052	.000*	.634
Professional organization website (29)	22.446	.000*	.321
Commercial website (26)	13.532	.009*	.250
Clearinghouses (32)	2.639	.620	.110
ListServs (31)	12.530	.014*	.243

Confusion with the terms clearinghouse and ListServ may be a result of bias. These tools are used by more computer-savvy individuals, the audience for these websites being more limited in its frequency and scope of use. Educators, administrators and researchers are most often included in subscription to these two entities, where general Internet users are not normally included in the circulation lists.

Online journal use, online continuing education or advanced coursework, professional organization website resources, commercial website resources, and ListServ resources show an association between how the respondents retrieve information in the discipline and their corresponding preference retrieval method. In a comparison of checklist and frequency with preference statements, the findings can be viewed in Table 30.

Traditional methods for receiving new information in the discipline with a strong association between actual behaviors (checklist) and preference (statements) by survey respondents are: receiving journals at home (90.5%) agreement, face-to face lecture (83.5%) agreement, face-to face presentation with group interaction (42.4%) agreement, mail continuing education offerings (58.0%) agreement. The survey participants strongly disagreed with going to a library or medical center for journals (.09% and .04% respectively), receiving new information from printed textbooks (19%), and calling a former instructor (7.4%). The respondents were neutral, neither agreeing or disagreeing, with asking a

Table 30

Frequency of Traditional Versus Computerized Resources Characterized by Checklist and Preference Statements

Checklist Resource with Corresponding Preference Statement	Checklist		Preference	
	Frequency	%	Mean + Standard Deviation	Median Value of Preference
Journals at home (12)	209	90.5	4.14 ± .785	4-agree
Journals at library (14)	2	0.9	1.66 ± .794	1-strongly disagree
Journals at medical center (15)	1	0.4	1.79 ± .944	2-disagree
Printed textbooks (13)	44	19.0	2.40 ± 1.079	2-disagree
Face-to-face CE (21)	193	83.5	4.29 ± .939	5-strongly agree
Face-to-face interactive (22)	98	42.4	4.00 ± 1.027	4-agree
Mail CE (20)	134	58.0	3.53 ± 1.209	4-agree
Former instructor (19)	17	7.4	2.48 ± 1.157	2.5-disagree
Dental colleague (17)	72	31.2	2.95 ± 1.162	3-neutral

Table 30-continued

Checklist Resource with Corresponding Preference Statement	Checklist		Preference	
	Frequency	%	Mean + Standard Deviation	Median Value of Preference
Professional organization website (29)	65	28.1	3.73 ± 1.076	4-agree
Online CE (23)	128	55.4	3.41 ± 1.232	4-agree
Commercial website (26)	50	21.6	3.64 ± 1.206	4-agree
Digital journals (16)	25	10.8	2.97 ± 1.463	4-agree
Clearinghouses (32)	5	2.2	2.35 ± 1.048	2-disagree
ListServs (31)	16	6.9	2.29 ± .873	2-disagree

dental or dental hygiene colleague (31.2%) about new information on which to base clinical decisions.

Online continuing education offerings or advanced coursework (55.4%) was preferred as a method to obtain new knowledge than with lessening frequency: professional organization websites (28.1%), commercial websites (21.6%) and digital journals (10.8%). The two methods of computerized information retrieval not preferred were ListServs (6.9%) and professional biomedical clearinghouses (2.2%). The median values for the preference statements for the latter two categories fell in the "disagree" (2) range. A possible explanation is that these methods of information retrieval have limited audiences, and are not routinely used by the general Internet consumer.

In this investigation, there is association between preference for retrieval of the new professional knowledge gathered using traditional resources compared to Internet/computerized resources. Receiving journals at home and attending face-to face lectures appear to be the preferred traditional methods used by the dental hygiene respondents. While not as frequently reported by the survey respondents, online continuing education leads the preferred options for receiving new information from the Internet or computerized retrieval methods.

Research Question 4

The final research question dealt with how the respondent viewed the quality and source of information retrieved from nontraditional sources. It queried "Do those dental hygienists using the Internet for new information in the

profession critically examine the resources for validity, reliability and credibility?" As previously described (in Table 15), the range of Internet use of the respondents was from no convenient access (3 participants, all pre-1990 graduates) to 112 participants who access the World Wide Web from both home and work (51 graduated from their entry-level programs prior to 1990, 61 graduated after 1990). Internet use ranged from at least once a day (91 pre-1990 graduates, 83 post-1990 graduates) to one participant (pre-1990 grad) who did not access the Web at all. Two preference statements queried the survey participants relative to their evaluation of the source and content of information retrieved from Internet/computerized sources.

The first preference statement asked if the respondent "evaluated the retrieved Internet information before using the data to make clinical decisions." Frequency of participant response showed 10.4% strongly disagreed, with 4.8% disagreeing. Thirty-five hygienists were neutral, neither agreeing nor disagreeing; 29.9% were in agreement and 33.8% strongly agreed they evaluated the information retrieved prior to decision making with the information received from non-traditional resources. Despite 14 missing cases, 63.7% of the respondents agreed that they evaluate new knowledge in the discipline which was retrieved from the Internet or computerized resources before incorporating it into their clinical decision-making and patient care.

The second preference statement queried whether the respondent questioned "the source and content of information" retrieved from the Internet. A

similar pattern emerged, with 5.2% strongly disagreeing and 4.8% disagreeing; 21.2% of the subjects were neutral; 27.7% respondents indicated agreement, and 34.6% strongly agreed that they questioned the resources before use. The response was positive with 62.3% of subjects agreeing that they question the source and content of nontraditional resources.

In this study, there is evidence that the majority of those dental hygienists who retrieve new knowledge in the discipline from the Internet or computerized resources, evaluates that information, as well as questioning the source and content of those resources, prior to incorporation and translation of the new knowledge into clinical practice.

CHAPTER 5

DISCUSSION

This chapter melds the concepts identified in the literature review with the empirical findings from the data analysis. The study findings are discussed relative to each of the research questions. This includes methods of information retrieval of currently licensed dental hygienists who responded to the mail survey. Provided are reported preferences on information-seeking behaviors for new knowledge in the discipline, evidence on which clinicians base their clinical dental hygiene treatment plans for patients in their care. Findings are discussed relative to when the respondents graduated from their entry-level dental hygiene program, either before or after 1990. The 1990 date was set as the point when use of computer resources/virtual tools for information retrieval became a viable component to the dental hygiene curriculum. The distinction of the pre/post 1990 cohort of respondents is discussed for preference of methods of retrieval of the new knowledge in the discipline. Evaluation of retrieved evidence is described, indicating whether the clinician critically examines the nontraditional or virtual resources for validity, reliability and credibility.

Implications of this study provide suggestions for continuing education offerings to practicing dental hygienists in the Commonwealth of Virginia as well

as suggestions for implementation in the dental hygiene education curriculum. The researcher discusses two unexpected findings related to characteristics of the dental hygiene respondents with respect to professional membership and multicultural diversity of those entering the profession.

Information Retrieval and Graduation Pre/Post 1990

Preferred Methods of Information Retrieval

Within the bounds of the study, the three dependent variables (preference for online information retrieval, online continuing education and preference to call a dental hygiene educator) showed a strong relationship with the date of graduation from the respondents' entry-level dental hygiene program (the independent variable). It is noted that those respondents who graduated prior to use of computerized/virtual resources in the curriculum did not indicate they are as likely to use the Internet or other nontraditional information resources to gather information on which to base their clinical decisions for patient care.

Inclusion of nontraditional resource methods in the respondent survey was to assess the ways in which evidence is gathered, be it at point-of-care for critical decisions (medical history review with implications for critical patient decisions) or outside the clinical operatory (new instrumentation concepts for prevention of musculo-skeletal injury to the clinician). Rapid turnover of knowledge in the discipline is inherent with the "information superhighway." How long it takes for this new evidence to reach the clinician is of importance for prevention of harm to patients as well as clinicians. Those clinicians who do not regularly retrieve

information from online resource sites may have to wait for a face-to-face lecture for the knowledge, or receive it from a colleague who is "plugged in" to the nontraditional tools.

Guest (2000) describes the "new paradigm for healthcare professionals" with the description of the Internet as "new electronic tools to improve patient relations and oral healthcare (p. 2)," noting that dental practitioners will continue to encounter "more enlightened consumers" as consequence of public access to healthcare resources on the Web. He concludes with the directive that the dental care provider must keep current in his/her knowledge base, and must include training in the use of the Internet as "part of their 'lifelong learning' portfolio" (p. 7). Within this study, the pre-1990 cohort must experience a paradigm shift to encompass nontraditional resources as an integral tool in their information seeking behaviors.

Internet and Virtual Resource Use

In response to the second research question: "Are recently graduated registered dental hygienists more likely to use the Internet to seek new biomedical or professional information than clinicians who have been practicing longer," the dependent variables from the checklist of information resources in the first section of the survey show no statistically significant relationship with the respondents' graduation era.

Within the study, the comparison of methods used by survey respondents may not be best discriminated by graduation cohort. A suggestion for further

inquiry might be best addressed in terms of other independent variables, such as type of practice opportunity including location and what is entailed in that employment setting. Byrnes et al. (2004) reported use of PubMed (biomedical database) as a tool for practicing evidence-based care and support of clinical decision making. Major barriers to success in that study included connectivity to the Internet, lack of support from information systems and difficulty for the clinical staff to access computers.

Comparison of graduation cohort with online continuing education, professional organization websites, commercial website resources, digital journals, ListServs and professional biomedical clearinghouse use do not present statistical evidence to demonstrate relationship with graduation cohort. From the survey responses we cannot make any inference.

Preference for Traditional or Virtual Resource Use

Based on findings in this study, the third area of inquiry "Is there a difference in preference for retrieval of the new professional knowledge gathered using traditional knowledge sources compared to Internet/computerized resources?" presents some areas for future continuing professional education. This study shows an association between retrieval of the new professional knowledge gathered using traditional resources compared to Internet/computerized resources. Receiving journals at home and attending face-to-face lectures appear to be the preferred traditional methods used by the dental hygiene respondents. While not as frequently reported by the survey

respondents, online continuing education leads the preferred options for receiving new information from the Internet or computerized retrieval methods.

Concepts of evaluation of new information retrieved should be tied into a model for evaluation of the source—be it a traditional or virtual resource. Appendix A provides a rubric for evaluation of online sites: who is the creator, what are their credentials, how complete and valid is the information contained on the site? These same queries should apply to journals, lectures, seminars and at-home study programs providing continuing education in the profession as well. Who are the presenters/providers? What are their credentials? What is the basis (scientific, published evidence) for their presentation? How complete and valid is the evidence they are providing? Providing a model for future practitioners should be a goal of the entry-level dental hygiene curriculum. Offering a model to current practitioners would make them more "savvy" users of new information in the healthcare knowledge base. Being more critical of new knowledge in the discipline would enable them to be more effective decision-makers when providing for patients in their care.

Candy (2000, p. 230) indicates how practitioners must to be able to retrieve new knowledge in their discipline clinical decision making as well as patient education and effectively employ written, electronic and oral communication. What better utilization of the "information superhighway" than to be able to tap into critical information at point-of-care or to be able to research new concepts, theories and techniques from the clinical operatory?

Accessing information in the clinical setting can be critical to decisions in patient care. When updating a patient medical history at each appointment, it is necessary to review the medications the patient is taking. Drug reference textbooks are outdated as they are published. New medications appear in the marketplace daily. Those new drugs are not listed within the pages of the reference texts. The solution to this dilemma is to have access to a valid, credible website, such as Lexi-Comp Clinical Reference Library® (www.crlonline.com) a by-subscription site that is updated weekly, as described in greater detail in Chapter 1. Even websites with public access, such as the PDR Health® (www.pdrhealth.com) site with its comprehensive listing of prescription and over-the-counter drugs, as well as alternative, homeopathic and natural medications, can be invaluable in identifying drug interactions and actions that have potential to cause death.

With increasing diversity in patient demographics, cultural diversity healthcare websites can be accessed to provide a brief summary of patient cultural healthcare beliefs, dietary patterns, and communication styles. Ethnomed® (www.ethnomed.org) was developed through the auspices of University of Washington School of Nursing. The site lists cross-cultural healthcare behaviors of 26 ethnic/cultural groups found in immigrant populations in the United States. Findings from this study of practicing dental hygienists in Virginia indicated an overwhelming majority of female, Caucasian survey respondents. Having access to information on cultural beliefs and healthcare

habits on patients from a different culture is necessary in creating treatment plans, preventive oral health educational strategies and providing optimum oral healthcare services. Increasing the diversity of the entry-level student base (which will be addressed shortly) can aid cultural competency in the learning environment. Even awareness of cultural mores, healthcare habits and decision making can be an outcome from day one in the dental hygiene curriculum. If not addressed while in school, then it should be provided as a continuing professional education topic for practicing clinicians.

The immediacy of information retrieval helps the clinician manage the patient's care in a timely manner. Patient confidence is increased when the clinician provides a learned, knowledgeable answer to the patient's questions immediately—as opposed to waiting until the topic is published in journal article or the subject is part of a continuing education presentation—and then getting back to the patient with a response. Were clinicians to learn to access the Internet for evidence to respond to a patient's queries or clinical needs, they would be more effective healthcare providers.

Of concern with continuing professional education offerings is that the course be acceptable to licensing boards. Certifying organizations, such as Association for Continuing Dental Education and ADA's Continuing Education Recognition Program (CERP) evaluate program offerings and presenter, ensuring the presentation is approved to meet continuing professional education requirements for relicensure. These courses can be face-to-face, interactive,

hands-on clinical offerings, or distance learning programs offered on the Web or though the mail.

The data gathered in this study did not provide evidence that respondents are using, or prefer, the most up-to-date resources for retrieving new information on which to base clinical decisions for their patients' oral health care. Bringing some of the clinicians into the 21st century ways of information management should be a priority of those who provide continuing professional education opportunities. A continuing education program that explores online and computerized information sources, and provides a rubric for critical evaluation of Internet-retrieved information in the discipline would be appropriate. Watkins (1999) indicated that continuing professional development becomes a lifelong activity, building a "portfolio of skills relevant to today's needs and flexible enough to adapt to tomorrow" (p. 61). What better focus of a continuing education program than developing skills flexible enough to adapt to changes in retrieval of new knowledge in the discipline—and its evaluation for use in clinical decision making.

Critical Examination of Retrieved Information

Were the proposed continuing education program described in the previous section to be held in a setting having computers with Internet access, the participants could have a "hands-on" information search, with immediate feedback from course facilitators. Further elaboration on the potential course might encompass putting participants into small groups (maximum 3 learners) to

explore valuable sites to gather new information that could be incorporated into clinical decision making. Critical assessment of the website, its creators, their credentials, currency of information provided and the information content itself, would be integral to the exercise. The objectives of this CE offering would be for the participant to be able to locate and discriminate credible, valid sources of information in the discipline. The goal of the course would be to incorporate nontraditional learning resources into the clinician's repertoire for seeking new scientific evidence on which to base decisions for their patient's clinical care. Ideally, the course would provide a model for the participant to take away from the presentation and bring into their clinical setting. For those participants who are currently "wired" into the Internet, the course could provide new URLs to explore, as well as reinforce the critical assessment of websites and information retrieved.

In this study, there is evidence that the majority of those dental hygienists who retrieve new knowledge in the discipline from the Internet or computerized resources, evaluates that information, as well as questioning the source and content of those resources, prior to incorporation and translation of the new knowledge into clinical practice.

Implications of Study Findings for the Dental Hygiene Curriculum

Considerations for the dental hygiene curriculum would be related to assessing the entering student's computer skills and Internet research behaviors. Of necessity, and perhaps more importantly, would be to provide the students a

model or framework on which to build their evaluation of information received from nontraditional resources.

Critical appraisal is the "ability to assess the validity, reliability, and applicability of published information and to incorporate the results of this assessment into patient management" (Gravois 1995, p. 1028). Covington and Craig (1998) echo the theme of acquisition of information-seeking skills "necessary to access the information and development of analytical skills to evaluate the validity and reliability of that information" (p. 577). Corry (2001) anticipates that "future developments in Internet access will include improved technology. . .personalization or customizing access, collaborative filter and improved information retrieval" (p. 81). Students enter the dental hygiene curriculum with varying levels of skill in computer use and Internet assessment experience. It is one of the outcomes of the educational program to develop the potential of each student to employ critical-thinking skills when processing new information in the discipline. As proscribed by the ADA's definition of the "Core Competencies for the entry-level dental hygienist, the professional must "assume responsibility for the dental hygiene actions and care based on accepted scientific theories and research as well as the accepted standard of care" and "continuously perform self-assessment for life-long learning and professional growth (ADEA 2004)." Evidence-based practice and critical assessment of the new information in the discipline are the benchmark of contemporary dental hygiene practice.

Revisiting a key point, as future practitioners, dental hygiene students develop appropriate information-seeking behaviors in order to have a framework for locating research information (Finley-Zarse et al., 2002, p. 116). Currently, in the dental hygiene education literature, and in practice at Virginia Commonwealth University Division of Dental Hygiene, a rubric is available for that specific purpose. Based on the work of Forrest and Miller (2001), Appendix A displays the format for evaluation of websites and Internet-retrieved information. Within courses directed by the investigator, students must provide this analysis for any sources of reference information used in reports, presentations, and assignments. These web analyses are provided to classmates (on the course BlackBoard® site) for review. When classmates research related topics, based on comments provided on the web analyses, they may chose to revisit reliable, credible sites for information for their assignments. The outcome of these exercises in critical thinking about use of specific websites builds a behavior pattern for the students to carry with them past graduation and licensure. These behaviors are an integral part of evidence-based decision making—a desired outcome of dental hygiene education.

Multicultural Diversity and Entry into Dental Hygiene Education

Admission of more diverse students into the curriculum must occur. There were only three males who responded to this survey. The profession is primarily female, and this gender inequity should be addressed. Likewise, as the patient population demographics reflect the changing cultural background of

contemporary American society, the admission of more culturally and racial diverse students into our professional educational programs should follow suit. From the findings in this study, we note this is happening. The number and percentage of minority dental hygiene graduates has substantially increased since 1990. The reported percentages show an increase in African/American hygienists from 0.9% to 2.9%, Asian/Pacific Island hygienists from 0.9% to 8.7%, and a .09% to 3.8% increase in the category of Hispanic/Latino hygienists. There was a decrease in the percentage (96.5% to 83.7%) of Caucasian hygienists. Entry-level dental hygiene program admission committee members are taking diversity issues into consideration when making decisions on acceptance of students reflecting the changing society we serve.

Membership in the Professional Organization

A surprising finding in this study was self-reported membership in the ADHA. The inclusion of this item in the sociodemographic section was suggested by one of the pilot test expert reviewers. The replies showed only 27.3% of this study's respondents were dues-paying members of the professional organization. When examined for distinction between pre- and post-1990 graduate cohort membership, it was noted that only 33% of the pre-1990 graduates and 29.8% of the post-1990 graduates are members of the national professional association for dental hygienists.

The total number of licensed dental hygienists with a Virginia mailing address from the 2005 Board of Dentistry mailing list was 3,302. Tallying the

membership census for the 2005 VDHA revealed 707 members. When calculated, the percentage of registered dental hygienists with a Virginia mailing address who were members of the professional organization was 21.4%. The VDHA percentage is lower than the survey response. The question of decreasing student involvement needs to be considered, and is discussed below.

Respondents (28%) indicated they search professional organization websites for new knowledge in the discipline. The ADHA website is the primary source of valid, credible and reliable information in the discipline, with the refereed online *Journal of Dental Hygiene* being the leading source for research articles in dental hygiene literature. It begs the question, why are graduates not joining the organization on entry into the profession? Involvement in the Student American Dental Hygiene Association (SADHA) needs to be encouraged during enrollment in the curriculum. Activities should parallel the parent organization (ADHA) for community service, legislative/political activism, leadership and lifelong learning opportunities. Giving back to the profession should be ingrained in each graduate as they enter the "real world." Yet the findings from this study sample infer that we have not made that happen in Virginia. This notion of increasing SADHA experiences and building a model for future professional organization involvement should be modeled at the student level.

Study Limitations

There are several limitations in this study. The first, and foremost, is the self-developed survey instrument used for the study. It was necessary because

there was no existing instrument that was appropriate for use in answering specific questions related to information-seeking behaviors in dental hygiene. In spite of use of expert reviewers for the pilot test, there is a chance key concepts may have been excluded from the survey and the study. The survey itself, being a paper/pencil type would have formatted well in an Internet-based survey. Unfortunately, in order to capture a representative sample of practicing dental hygienists, the mail survey was far superior to capture everyone—not just those connected to the Internet. Only 16% of the survey respondents agreed they would have preferred to take the survey online.

The raffle entry included with the survey may have prompted more subjects to complete and return the survey. Unfortunately, the winner of the raffle drawing did not respond to either email or the notification letter sent though the U.S. Postal Service. The prize of paid registration at the VDHA annual session went unclaimed. The cash value of the prize was sent to the VDHA foundation with stipulation it be used for scholarship for a deserving recipient.

Four research questions were posed, but data was gathered in other areas that could be focus of subsequent studies. A good example might be looking for a relationship between preference for virtual resource use with highest degree completed or practice setting.

Generalizability of study findings is another limitation. Are this same characteristics and preferences likely to occur in randomly selected populations

in other states, or even beyond the United States to practitioners in international settings?

Reprising the study using a qualitative approach, perhaps focus group methodology, might be a suggestion for future research, as will be discussed in the next section.

Future Research

This study has provided points for future investigation. First, continuing professional education opportunities to bring clinicians skills to process new information in the discipline should be offered. Evidence-based practice is the benchmark of contemporary dental hygiene. Those who graduated prior to 1990 may not have a method for conducting professional information retrieval using virtual tools. More recent graduates may be hesitant to use virtual tools or "surf the Web." Providing them with tools and a framework to evaluate the new information retrieved in terms of validity, reliability and credibility would be beneficial to their critical thinking in clinical decision making. The tools and framework would cover not only Internet and computerized resources, but traditional sources as well. Basing clinical decisions on valid scientific evidence is necessary for quality patient care. Providing this learning opportunity in a nonthreatening environment while providing hands-on experience and immediate feedback may be helpful to the participating hygienists.

Approaching the goals of this study from a qualitative perspective might be a future research endeavor. Interviews or a focus group methodology with

participants from different decades of graduates might provide a different perspective on information-seeking behaviors of practicing clinicians. Expanding a quantitative study to include licensed, practicing dental hygienists who reside outside of the Commonwealth of Virginia would see if there were regional differences in information-retrieval behaviors. Limiting the study to membership in the ADHA might present a different viewpoint.

Summary and Conclusions

Behaviors of the licensed dental hygiene practitioner, as described by the ADEA and the ADHA encompass five competencies: Core values (ethics, skills and knowledge integral to the profession), health promotion and disease prevention, community, patient/client care, and professional growth and development. Professional growth, synonymous with life-long learning, addresses "transferable skills. . .in communication, problem-solving and critical thinking" (ADEA, 2004). It is the responsibility of the licensed professional to provide dental hygiene actions and care based on accepted scientific theories and research (evidence-based practice). To do so, the practitioner must be able to access and evaluate new knowledge in the discipline. With the increasing use of the Internet and computerized resources, the practitioner must be able to adapt information retrieval skills into their clinical decision-making behaviors.

This intent of this study was to examine the relationship between information-seeking behaviors, preferences for information retrieval, and graduation from the entry-level dental hygiene program before or after the

introduction of the Internet and non-traditional resources in the curriculum. Other characteristics related to professional growth were queried, including entry-level degree earned, current practice setting, and membership in the professional organization. However, the concept of the pre- and post-1990 graduation era was a key variable. Analyses were conducted to find association between information-seeking behaviors and information retrieval modeling provided in the dental hygiene curriculum. The year 1990 was arbitrarily selected as the "entry point" for Internet use in the dental hygiene education programs. Dental hygiene faculty demonstrated behaviors in gathering evidence from online/computerized sources, and provided framework for evaluating the new biomedical knowledge. This new knowledge was incorporated into existing concepts and theories to formulate patient care. Viewing this through Schön's (1987) reflective practitioner model, when new knowledge (a surprise) is introduced into the decision-making process, the clinician must reflect on that information (reflection in action), synthesize and evaluate it in context of patient assessment, and formulate a care plan for that patient's/client's treatment. Finding success in this process leads to solving the (patient care) problem, and adds the new knowledge into the clinician's repertoire (reflection on action). The study looked at self-reported information-seeking methods, preferences for traditional and nontraditional information retrieval methods, and whether the practitioner critically assessed the source and content of the new knowledge as an integral step in clinical decision making.

To answer the research questions, the researcher surveyed 500 randomly selected actively practicing dental hygienists licensed in the Commonwealth of Virginia. The mail survey instrument developed for this study contained questions on sociodemographic characteristics of respondents, current methods of information retrieval and preferences for receiving new information in the discipline. A 52.7% response rate was realized.

Slightly over half the respondents were in the pre-1990 graduation cohort (52.5%), with 47.5% in the more recently graduated group. The respondents were overwhelmingly female (98.7%). Graduation dates ranged from 1962 to 2005. The majority of the respondents were Caucasian, but reported ethnicity showed indication of a more diverse population entering the profession in recent years. Survey respondents (95.2%) reported they were currently licensed and actively practicing. Membership in the professional organization (ADHA) was claimed by slightly more than a quarter of the subjects, with more than four-fifths of the hygienists indicating they worked in a clinical private practice setting. Almost half of the respondents to this survey indicated their entry-level degree was a baccalaureate, with just over two-fifths receiving an associate's degree and less than 5% graduating with a certificate to begin clinical practice.

Professional journals received at home provided over 90% of the respondents with new knowledge in the field, with one-fifth of the subjects reporting use of printed textbooks for their new discipline-related information. Over four-fifths of the clinicians reported attending lecture presentations, while

less than one-half were part of groups manipulating the information at interactive format continuing education offerings. Just under two-fifths of the respondents attended professional organization meetings to receive new knowledge in the discipline. Nearly half of the hygienists reported using the Internet from both work and home, with only three individuals reporting no convenient access to the Internet. Over three-quarters of the subjects reported going online at least once a day, with only one hygienist not connected at all to the Internet.

Regarding tools for seeking new information, almost four-fifths of the subjects reported agreement with use of current professional journals as their preference. Slightly over one-third of the hygienists preferred to speak to her/his employer/dentist to obtain new information in the field, even though the knowledge is not from a documented, evidence-based source. Interestingly, half of the hygienists reported they would not call a dental hygiene educator to gather new information in the field. Almost three-quarters of the survey participants reported preference for multiple methods of information retrieval. ListServs and biomedical clearinghouses did not receive preference or garner "votes" for popular resources. Viewed negatively as well were online discussion groups, blogs or chat rooms.

Almost two-thirds of the respondents agreed that they assessed the validity of the new information, questioned the sources and content of the new evidence before synthesizing it into their clinical knowledge base to make decisions for patient care. The final attitudinal statement queried the respondents

as to their preference to take the survey online. Less than one-fifth of those who returned the paper copy would have preferred to complete an online survey. For the sake of the study response rate, it was best this instrument was sent through "snail mail."

Reviewing data analyses on graduation era and preferred methods of receiving new information revealed three areas of association. The first is that while clinicians do not prefer to call a dental hygiene educator for new information in the discipline, those who graduated before 1990 were less likely to call than those who graduated after. More important was a distinction with online continuing education/advanced coursework preference and graduation era. Those who graduated after 1990 (the entry of computer utilization in the dental hygiene education program curriculum) were more likely to prefer online activity, while the older graduation cohort did not. The same can be said of use of the Internet for retrieval of new information in the discipline, with the more recent graduates more likely to seek Internet and computerized tools to gain new knowledge on which to base clinical decision making for patient care. This brings up the need for information at point-of-care, to solve dilemmas which arise in the clinical setting. Instantaneous retrieval of information is available to those clinicians who are "Internet-savvy." The most up-to-date information is not readily available in traditional resources, so the clinician who is not "plugged in" to the "Information superhighway" may inadvertently put her/his patient at risk. A continuing education offering to demonstrate use of the Internet to the best

clinical advantage is a suggestion coming from this study. Another benefit for use of Internet is rural settings may not have access to traditional resources, but clinicians in those areas are as close as the nearest computer/modem to access new knowledge in the discipline. Distance is not an impediment to gathering new information to aid in clinical decision making.

From the survey data analysis, there is evidence the majority of those dental hygienists who receive new knowledge in the discipline from nontraditional resources, evaluate that information prior to use in clinical decision making for patient care. A suggestion to enable more practicing dental hygienists to be able to take advantage of the Internet and computerized resources would be to provide hands-on continuing professional instruction for information retrieval. Future study on information seeking behavior would be to replicate the study after continuing education courses had been implemented.

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List of References

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APPENDIX A

VCU ANALYZING INTERNET SOURCES

APPENDIX A
Virginia Commonwealth University
School of Dentistry, Division of Dental Hygiene

Analyzing Internet Sources

Web address:	
Web site title:	
What is the purpose of the Web page?	
What type of information does it contain?	
How complete and accurate is the information?	
How relevant are the links?	
Who is the intended audience?	
Who supports the Web page? Is the site co-sponsored by a commercial organization?	
When was it created? Are there regular updates?	
Is there an author? If so, what are his/her credentials?	
Is contact information included on the page?	
Do the graphics and art serve a function, or are they merely decorative?	
Do icons clearly represent what is intended?	
Are there any problems with downloading information? Too long a wait to completely display page(s)?	
Is there an element of creativity that adds to the document?	
What are the printing capabilities? Is it possible to print only portions of the entire text?	
Is the site easy to navigate? Is the information easy to find?	
Are there links to search engines or a search engine within the Web site?	
Is there any sort of bias evident?	
Other:	

APPENDIX B

VCU IRB APPROVAL MEMO

VCU Memo

Virginia Commonwealth University

[redacted]

DATE: October 23, 2007

TO: John J. Kregel, Ed.D
Special Education and Disablility Policy
Box 842011

FROM: Ann Nichols-Casebolt, PhD [redacted]
Chairperson, VCU IRB Pane
Box 980568

RE: **VCU IRB #: HM11077**
Title: Information Seeking Behaviors on Practicing Dental Hygenists in Virginia

On October 9, 2007, the following research study was ***approved*** by expedited review according to 45 CFR 46.110 Category 7. This approval reflects the revisions received in the Office of Research Subjects Protection on October 9, 2007. This approval includes the following items reviewed by this Panel:

RESEARCH APPLICATION/PROPOSAL: NONE

PROTOCOL: Information seeking behavior of actively practicing dental Hygenists in Virginia, version 5, received 10/9/07

CONSENT/ASSENT:
- One of the conditions set forth in 45 CFR 46 117(c) (1), (2) for waiver of documentation of consent has been met and the IRB Panel has waived documentation of consent.

ADDITIONAL DOCUMENTS:
- Cover Letter, "Dear Dental Hygenist", received 10/9/07
- Reminder Post Card, received 10/9/07

This approval expires on September 30, 2008. Federal Regulations/VCU Policy and Procedures require continuing review prior to continuation of approval past that date. Continuing Review report forms will be mailed to you prior to the scheduled review. The Primary Reviewer assigned to your research study is Elizabeth Ripley, MD. If you have any questions, please contact Dr. Ripley at [redacted] and [redacted] or you may contact Donna Gross, IRB Coordinator, VCU Office of Researc Protecti [redacted] or [redacted]

Attachment – Conditions of Approval

Conditions of Approval:

In order to comply with federal regulations, industry standards, and the terms of this approval, the investigator must *(as applicable)*:

1. Conduct the research as described in and required by the Protocol.

2. Obtain informed consent from all subjects without coercion or undue influence, and provide the potential subject sufficient opportunity to consider whether or not to participate (unless Waiver of Consent is specifically approved or research is exempt).

3. Document informed consent using only the most recently dated consent form bearing the VCU IRB "APPROVED" stamp (unless Waiver of Consent is specifically approved).

4. Provide non-English speaking patients with a translation of the approved Consent Form in the research participant's first language. The Panel must approve the translated version.

5. Obtain prior approval from VCU IRB before implementing any changes whatsoever in the approved protocol or consent form, unless such changes are necessary to protect the safety of human research participants (e.g., permanent/temporary change of PI, addition of performance/collaborative sites, request to include newly incarcerated participants or participants that are wards of the state, addition/deletion of participant groups, etc.). Any departure from these approved documents must be reported to the VCU IRB immediately as an Unanticipated Problem (see #7).

6. Monitor all problems (anticipated and unanticipated) associated with risk to research participants or others.

7. Report Unanticipated Problems (UPs), including protocol deviations, following the VCU IRB requirements and timelines detailed in VCU IRB WPP VIII-7):

8. Obtain prior approval from the VCU IRB before use of any advertisement or other material for recruitment of research participants.

9. Promptly report and/or respond to all inquiries by the VCU IRB concerning the conduct of the approved research when so requested.

10. All protocols that administer acute medical treatment to human research participants must have an emergency preparedness plan. Please refer to VCU guidance on http:/www.research.vcu.edu/irb/guidance.htm.

11. The VCU IRBs operate under the regulatory authorities as described within:
    a) U.S. Department of Health and Human Services Title 45 CFR 46, Subparts A, B, C, and D (for all research, regardless of source of funding) and related guidance documents.
    b) U.S. Food and Drug Administration Chapter I of Title 21 CFR 50 and 56 (for FDA regulated research only) and related guidance documents.
    c) Commonwealth of Virginia Code of Virginia 32.1 Chapter 5.1 Human Research (for all research).

Sample Reminder post card:

Dear Virginia Dental Hygienist:

Two weeks ago a survey was sent to you concerning your information seeking behavior in dental hygiene practice. In order for the findings to be representative, it is very important that your information be included in the survey analysis.

If you have already completed and returned the survey, please accept my sincere gratitude. If not, please do so immediately.

If you did not receive the survey, please call me at [redacted] or email me at [redacted] and I will mail you another survey. Thank you for your participation.

Sincerely,
Joan M. Pellegrini, RDH, MS

APPROVED

[redacted]

[redacted]

Dear Dental Hygienist,

As a licensed dental hygienist and doctoral candidate at Virginia Commonwealth University, I am studying information seeking behaviors of actively practicing dental hygienists in Virginia. Specifically, I am attempting to identify preferences in receiving new information in our discipline. This new information forms a basis for judgment in providing dental hygiene services to patients/clients in our care. I invite you to participate in this study. This study protocol, #HM111077, has been reviewed by the Virginia Commonwealth University Institutional Review Board.

In preparation for this dissertion research, the study has sought, and received endorsement from the Executive Board of the Virginia Dental Hygienists' Association (VDHA).

Your participation is important to help provide improved strategies for continuing education offerings for dental hygienists. I urge you to complete the enclosed survey and return it in the self-addressed, stamped envelope by XXXX. As an incentive to return this survey, a raffle prize will be offered for registration payment for the next VDHA annual session. 500 surveys are being sent out, giving you a 1:500 chance of winning if you return the completed survey.

If you complete and return your survey in the enclosed envelope, you understand that:

- Your participation in this study is voluntary.
- The nature of your participation entails completing the survey that contains questions about your professional background and experience, your preferred method of receiving continuing education in the discipline, and validating that new information in dentistry and dental hygiene.
- As a respondent, you can expect confidentiality. Your survey answers will be separated from your unique code and raffle entry.
- Results of the survey will be shared.
- You may elect to not answer question(s) on the survey that cause you concern.
- The time to complete the survey is approximately XXX.

Please do not hesitate to contact me if you have any questions or concerns about your participation. I can be reached at [redacted] or during the day at [redacted]. If you have any questions about your rights as a participant in this study, you may contact the Office for Research at Virginia Commonwealth University [redacted].

Thank you in advance for your time and commitment to advancing our understanding of twenty-first century information seeking behaviors of Virginia dental hygienists.

Sincerely,

Joan M. Pellegrini, RDH, MS
Doctoral Candidate, VCU School of Education

APPROVED

[redacted]

APPENDIX C

VIRGINIA DENTAL HYGIENISTS' ASSOCIATION ENDORSEMENT

October 20, 2006

[redacted]

Dear Ms. Pellegrini:

The mission of the Virginia Dental Hygienists' Association (VDHA) is to advance the art and science of dental hygiene by ensuring access to quality oral health care, increasing awareness of the cost-effective benefits of prevention, promoting the highest standards of dental hygiene education, licensure, practice and research, and representing and promoting the interests of dental hygiene.

The VDHA would like to commend you for your abstract and survey presentation to the executive board on the "Information Seeking Behaviors of Practicing Virginia Dental Hygienists: How These Healthcare Providers Prefer to Receive Continuing Education in the Profession."

Based on the abstract presented on October 15, 2006, the VDHA would like to endorse your research project. The VDHA does not take responsibility for the outcome of the survey or of the interpretation of the results of the survey. We are proud to offer our support to our colleagues who are working to advance the art and science of dental hygiene. It is our hope that you will share the findings of this project to assist in promoting the highest standards of dental hygiene education and research.

[redacted]

Melanie Bartlam, RDH
VDHA President

APPENDIX D

VIRGINIA DENTAL HYGIENISTS' ASSOCIATION GRANT LETTER

APPENDIX D

Virginia Dental Hygienists' Association Grant Letter

Virginia Dental Hygienists' Association Foundation

January 18, 2007

Dear Joan Pellegrini, RDH, MS,

Congratulations! On behalf of the Virginia Dental Hygienists' Association Foundation, I am pleased to share with you the good news that you have been awarded an Educational Grant of $900.00 to use in seeking survey information from licensed dental hygienists in the state of Virginia.

Your endeavors support our mission and we look forward to having the results presented to our Association. Your research should help the VDHA Foundation to know what venues to offer continuing education curricula to further the knowledge of dental hygienists, in the Commonwealth, after graduation now and in the future. We look forward to having your results in writing and ask that you acknowledge the VDHA Foundation as a resource for your research.

Congratulations on your achievements and we hope that the funds help you to be able to obtain the information that you need for your dissertation research, as you prepare for your PhD in Education at Virginia Commonwealth University.

I have enclosed your check (#3029) for the amount of the grant.

[redacted]

Maureen M. Glick, RDH, BS
Chair VDHA Foundation

APPENDIX E

COVER LETTER

APPENDIX E
COVER LETTER

[redacted]

Dear Dental Hygienist,

As a licensed dental hygienist and doctoral candidate at Virginia Commonwealth University, I am studying information seeking behaviors of actively practicing dental hygienists in Virginia. Specifically, I am attempting to identify preferences in receiving new information in our discipline. This new information forms a basis for judgment in providing dental hygiene services to patients/clients in our care. I invite you to participate in this study. This study protocol, #HM111077, has been reviewed by the Virginia Commonwealth University Institutional Review Board.

In preparation for this dissertion research, the study has sought, and received endorsement from the Executive Board of the Virginia Dental Hygienists' Association (VDHA).

Your participation is important to help provide improved strategies for continuing education offerings for dental hygienists. I urge you to complete the enclosed survey and return it in the self-addressed, stamped envelope by 3 December 2007. As an incentive to return this survey, a raffle prize will be offered for registration payment for the next VDHA annual session. 500 surveys are being sent out, giving you a 1:500 chance of winning if you return the completed survey.

If you complete and return your survey in the enclosed envelope, you understand that:

- Your participation in this study is voluntary.
- The nature of your participation entails completing the survey that contains questions about your professional background and experience, your preferred method of receiving continuing education in the discipline, and validating that new information in dentistry and dental hygiene.
- As a respondent, you can expect confidentiality. Your survey answers will be separated from your unique identifier code and raffle entry.
- Results of the survey will be shared.
- You may elect to not answer question(s) on the survey that cause you concern.
- The time to complete the survey is approximately 8-10 minutes.

Please do not hesitate to contact me if you have any questions or concerns about your participation. I can be reached at [redacted] or during the day at [redacted]. If you have any questions about your rights as a participant in this study, you may contact the Office for Research at Virginia Commonwealth University [redacted].

Thank you in advance for your time and commitment to advancing our understanding of twenty-first century information seeking behaviors of Virginia dental hygienists.

Sincerely,

Joan M. Pellegrini, RDH, MS
Doctoral Candidate, VCU School of Education

APPENDIX F

RAFFLE FORM

Appendix F

Sample Raffle Form

Raffle for Paid Registration Fee for the 2008 Virginia Dental Hygienists' Association Annual Session.

Name _____

Address _____

_____

Email, if applicable: _____

Thank you for your participation.

APPENDIX G

SAMPLE REMINDER POST CARD

Appendix G - Sample Reminder Post Card:

Dear Virginia Dental Hygienist:

Last month a survey was sent to you concerning your information seeking behavior in dental hygiene practice. In order for the findings to be representative, it is very important that your information be included in the survey analysis.

If you have already completed and returned the survey, please accept my sincere gratitude. If not, please do so immediately.

If you did not receive the survey, please call me at [redacted] or email me at [redacted] and I will mail you another survey. Thank you for your participation.

Sincerely,
Joan M. Pellegrini, RDH, MS

APPENDIX H

FINAL SURVEY FORM

Appendix H – Final Survey Form

Identifier Code _____

Information-seeking behaviors of Virginia Dental Hygienists

Section 1: Demographics

1. What is your gender?

_____ Female _____ Male

2. What is your age?

_____ 20-29 _____ 30-39 _____ 40-49

_____ 50-59 _____ 60-69 _____ 70 or above

3. What is your ethnicity? Please check all that apply:

_____ African American (not Hispanic)
_____ Asian/Pacific Islander
_____ Caucasian
_____ Hispanic/Latino
_____ Native American/Alaskan native
_____ Other

4. Are you currently licensed, living or working in the Commonwealth of Virginia?

_____ No

*****If you are not currently residing in Virginia, please STOP and return the survey in enclosed envelope.**

_____ Yes

_____ Year of graduation from DH education program

5. Are you a member of the American Dental Hygienists' Association?

_____ Yes _____ No

6. As a dental hygienist, are you currently (please check all that apply):

_____ Providing patient care in a private practice setting?
_____ Providing patient care in a community/hospital/alternative setting?
_____ Actively employed in education in the dental field?
_____ Actively employed in dental research?
_____ Actively employed in sales related to oral health care products?
_____ Actively employed as an administrator/manager/patient advocate?
_____ Actively employed in another healthcare industry?
_____ Actively employed in another field?
_____ Not currently employed?
_____ On hiatus.

7. What is your entry-level dental hygiene degree?

_____ Certificate
_____ Associate's degree
_____ Baccalaureate degree

8. What is the highest level of education you have attained?

_____ Certificate
_____ Associate's degree
_____ Baccalaureate degree
_____ Master's degree
_____ Doctoral degree
    _____ Ed.D.
    _____ Ph.D.
    _____ other

9. How do you receive new information in dental hygiene? Please check all that apply:

_____ Journals received at home.
_____ Journals at a local library.
_____ Journals at a medical center library.
_____ Printed textbooks.
_____ Face-to-face continuing education programs (lecture only).
_____ Face-to-face continuing education programs (group participation).
_____ Professional organization (national/state/local meetings).
_____ Mail continuing education courses.
_____ Online continuing education courses.
_____ Professional organization website (ADA, ADHA).
_____ Commercial Internet websites or search engines.
_____ Digital/online journals.
_____ Professional dental/dental hygiene clearinghouses.
_____ ListServs or professional dental/dental hygiene sites.
_____ Call a former dental/dental hygiene instructor.
_____ Call a dental/dental hygiene colleague.

10. Do you have convenient access to a computer connected to the Internet

_____ At home?
_____ At work?
_____ Both at home and at work?
_____ At a local library?
_____ No convenient access?

11. How often do you use a computer (for any purpose)?

_____ At least once a day.
_____ At least once a week.
_____ At least once a month.
_____ Rarely.
_____ Not at all.

Section 2: Information seeking behaviors

The Commonwealth of Virginia has mandated fifteen hours of continuing professional education each year in order to maintain current licensure to practice dental hygiene.

Please respond to the following statements related to how you search for up-to- date information that helps you meet those requirements and incorporate new knowledge (new theory, concepts or techniques) into your practice of the profession. New Information designated as "dental hygiene" can include literature and research from the fields of dentistry, medicine and allied health. Indicate the extent you agree or disagree (by circling the response) with the following statements.

Use the following scale to respond to each statement:

Strongly Agree **Agree** **Neutral** **Disagree** **Strongly Disagree**
5 **4** **3** **2** **1**

5	**4**	**3**	**2**	**1**	12.	I prefer reading about new information in dental hygiene from current professional journals that I receive.
5	**4**	**3**	**2**	**1**	13.	I prefer reading biomedical textbooks to obtain new information in dental hygiene.
5	**4**	**3**	**2**	**1**	14.	I prefer to go to a local library to obtain new information in dental hygiene.
5	**4**	**3**	**2**	**1**	15.	I prefer to go to a medical center library to obtain new information in dental hygiene.
5	**4**	**3**	**2**	**1**	16.	I have subscriptions to online professional journals to obtain new information in dental hygiene.
5	**4**	**3**	**2**	**1**	17.	I prefer to contact a (dental hygiene) colleague to obtain new information in dental hygiene.
5	**4**	**3**	**2**	**1**	18.	I prefer to speak to my dentist/employer to obtain new information in dental hygiene.
5	**4**	**3**	**2**	**1**	19.	I prefer to call a dental hygiene educator to obtain new information in dental hygiene.

5	**4**	**3**	**2**	**1**	20.	I prefer to take home study courses by mail to obtain new information in dental hygiene.
5	**4**	**3**	**2**	**1**	21.	I prefer to go to face-to-face continuing education programs to obtain new information in dental hygiene.
5	**4**	**3**	**2**	**1**	22.	I prefer continuing education programs with opportunity for interaction among participants to obtain new knowledge in dental hygiene.
5	**4**	**3**	**2**	**1**	23.	I prefer to take continuing education courses or advanced coursework online.
5	**4**	**3**	**2**	**1**	24.	I prefer to search the Internet to obtain new information in dental hygiene.
5	**4**	**3**	**2**	**1**	25.	I prefer to use a variety of methods to obtain new information in dental hygiene.
5	**4**	**3**	**2**	**1**	26.	If I use the Internet, I prefer to use Google® or a similar commercial search engine to locate and obtain new information in dental hygiene.
5	**4**	**3**	**2**	**1**	27.	If I use the Internet, I prefer to use MEDLINE® or a similar electronic biomedical database engine to locate and obtain new information in dental hygiene.
5	**4**	**3**	**2**	**1**	28.	If I use the Internet, I prefer to obtain information from any website.
5	**4**	**3**	**2**	**1**	29.	If I use the Internet, I prefer to obtain information from professional organization web sites.
5	**4**	**3**	**2**	**1**	30.	If I use the Internet, I prefer to obtain information only from professional (biomedical) refereed web sites.
5	**4**	**3**	**2**	**1**	31.	I prefer to obtain new information in dental hygiene from ListServs.
5	**4**	**3**	**2**	**1**	32.	I prefer to receive e-mail updates from a professional (biomedical) online clearinghouse to obtain new information in dental hygiene.

5	**4**	**3**	**2**	**1**	33.	I prefer to participate in online discussion groups, blogs or chat rooms to discuss new professional information in dental hygiene.
5	**4**	**3**	**2**	**1**	34.	If I retrieve new information in dental hygiene from the Internet, I evaluate the retrieved information before using the data to make clinical decisions.
5	**4**	**3**	**2**	**1**	35.	I question the source and content of information I retrieve from the Internet.
5	**4**	**3**	**2**	**1**	36.	I would have preferred to take this survey online.

Thank you for taking the time and effort to complete this survey.

If you have any comments regarding your feelings on how you obtain new information in the discipline, or would like to know the results of this survey, please contact me.

Joan M. Pellegrini, RDH, MS
PhD Candidate
Virginia Commonwealth University School of Education
[redacted]

APPENDIX I

CONTENT REVIEW FEEDBACK FORM

Appendix I

Content Review Feedback Form

Name _____

Primary Occupation _____
(DH Clinician, Educator, Researcher)

How many years have you practiced your primary occupation _____

How many minutes did it take you to complete the survey _____
minutes

Comments related to Section I: Demographics:

1. Using the following scale, how easy was it to complete section I:
_____

1	2	3	4	5
Very easy	**easy**	**neither easy nor difficult**	**difficult**	**very difficult**

2. Are there items that should be changed in this section to make it easier to complete the survey?

3. Do you think there are items that are too sensitive or inappropriate to include in this section of the survey?

4. Please provide any additional comments on this section:

Comments related to Section II

Scale:

1	2	3	4	5
Very easy	**easy**	**neither easy nor difficult**	**difficult**	**very difficult**

5. On the above scale, how easy was it to complete the Section II?
_____

6. Were the descriptions of the methods of information retrieval understandable? _____ Yes _____ No
If no, how would you change the item?

7. Was the rating scale appropriate? _____ Yes _____ No
If not, how would you change it?

8. Were the statements to be rated clear and concise? _____ Yes _____ No
If not, how would you change it?

9. Were the instructions to complete this Section easy to understand? _____ Yes _____ No

10. Are there any information seeking behaviors that should be added to those in Section II? _____ Yes _____ No

10a. What needs to be added?

10b. Items need to be deleted?

11. Is there anything that could be changed in Section II to make it easier to complete?

12. Please add any additional comments on the survey:

Thank you for your review of the survey. Your assistance is greatly appreciated.

Vita