adha American Dental Hygienists' Association

Journal of Dental Hygiene

The American Dental Hygienists' Association
Special Commemorative Issue

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Journal of Dental Hygiene

SPECIAL COMMEMORATIVE ISSUE

STATEMENT OF PURPOSE

The *Journal of Dental Hygiene* is the refereed, scientific publication of the American Dental Hygienists' Association. It promotes the publication of original research related to the profession, the education, and the practice of dental hygiene. The journal supports the development and dissemination of a dental hygiene body of knowledge through scientific inquiry in basic, applied, and clinical research.

SUBSCRIPTIONS

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SUBMISSIONS

Please submit manuscripts for possible publication in the *Journal of Dental Hygiene* to JoshS@adha.net.

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Special Commemorative Issue

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Rebecca S. Wilder, RDH, MS

How Far We Have Come & The Places We Will Go!

The 100th anniversary of any profession is an important milestone. It is a time to look back and reflect on where we started and how far we have come. It is also a time to consider the future and visualize what our profession should look like 100 years from now. What challenges did our founding members have to endure? What will the next generation of dental hygienists have to encounter? How do we best keep all dental hygienists informed of the current issues and the latest science in our profession? Such is the purpose of this Special Commemorative Issue of the *Journal of Dental Hygiene*.

It has been my absolute privilege to have served the American Dental Hygienists' Association as the Editor-in-Chief of the *Journal of Dental Hygiene* for the last 7 years. During that time we have seen many changes, encountered several challenges and have developed a clear vision for the future of the *Journal*. My challenge as Editor started when I inherited a journal platform that had transitioned solely online from a print version. As technological advances have grown in the last 7 years, so has the *Journal*. We recently transitioned to a new platform bringing a better product to our members. The submissions to the *Journal* have grown each year; last year bringing a record number of original research and scholarly paper submissions. To accommodate authors in a more timely fashion, we will now publish the *Journal* 6 times per year! We are proud of the *Journal of Dental Hygiene*, one of only 3 peer-reviewed, scholarly publications for dental hygienists in the world. But, it has not been without its growing pains…something every publication faces from time to time. Later in this issue you will hear from 3 former Editors of the *Journal* who will share their experiences while leading our great publication.

I am excited to present 7 original manuscripts from several of our leading U.S. dental hygienists. Each of the authors has her own area of expertise that they share in their papers. Content encompasses the history of our profession as well as the vision for the future. I recommend that you read every word as each paper is important to YOUR professional future.

You are also invited to read the papers that were voted the most representative of "How Far We've Come." They are presented in order of how many votes they received.

We wish to thank GlaxoSmithKline for their support of this commemorative issue of the *Journal*. I want to thank Josh Snyder, Staff Editor of the *Journa*l, and Randy Craig, Director of Communications, for their assistance and support of this commemorative issue.

Finally, while in Chicago recently, I had the privilege of viewing every issue of the *Journal* since the beginning of the publication in 1927. Following are excerpts from the first manuscript written in the *Journal* by a dental hygienist, "The Dental Hygienist in the Making," by Ethel Covington, DH.

"In 1923, our American Dental Hygienists' Association was organized with a membership of about one hundred of the eleven hundred dental hygienists then in the United States. And it is not surprising that at the beginning of the 1927, with a membership of about four hundred in our American Association we should so strongly feel the need of communication between all American hygienists that the Journal of the American Dental Hygienists' Association has been launched.

"As an auxiliary branch of dentistry, having limited field of service, we may be compared to any specialized group with the same grave danger of knowing too little about the things to which our work is related.

"While we know the value of specialization, and the dental hygienist is a specialist in that her field is limited to oral hygiene, it should be one of the most important aims of our Journal and our American Dental Hygienists' Association to keep us broadly informed with the greater field of which we are a part, dentistry in its relationship to better health.

"While the dental hygienist has demonstrated that she is a practical thinker, she is also capable of forming visions of the highest ideals of service."

Oh, the places we will go… and I look forward to sharing the journey!

Happy Anniversary, ADHA!

Sincerely,

Rebecca Wilder, RDH, MS
Editor-in-Chief, Journal of Dental Hygiene

Original Manuscript

Denise M. Bowen, RDH, MS

History of Dental Hygiene Research

Abstract: Dental hygiene is defined as the science and practice of the recognition, treatment and prevention of oral diseases. The history of dental hygiene research is considered in the context of the development of the discipline and an emerging infrastructure. Research-related events supporting the growth and maturation of the profession are considered from the early years to the most recent.

The benefits of preventive oral health services provided by dental hygienists have been supported by research, and the practice of dental hygiene has expanded as a result of research findings since its inception 100 years ago. Dental hygienists' engagement in research, however, did not begin until the 1960s as research associates or administrators, primarily with dental researchers as primary investigators. The *Journal of Dental Hygiene (JDH)* has provided information for dental hygiene practice since 1927, and has been the primary venue for dissemination of dental hygiene research since 1945. Graduate education in dental hygiene at the master's degree level and the work of early dental hygiene researchers led to the first conference on dental hygiene research in 1982.

Over 30 years later, dental hygiene has established a meta-paradigm and defined conceptual models, built an initial infrastructure to support research endeavors and contributed much to the development of dental hygiene as a unique discipline. A doctoral degree in the discipline, continued theory-based research, initiatives to foster collaborations between dental hygiene and other researchers and enhanced capabilities to attract funding to support large scale studies are goals that must be attained through the efforts of future researchers to address the needs for additional development in the discipline of dental hygiene. Dental hygiene research supports the growing discipline and its value to society.

Key Words: dental hygiene research, dental hygiene profession, history of dental hygiene

Introduction

Dental hygiene is defined as the science and practice of the recognition, treatment and prevention of oral diseases.[1] The care provided by dental hygienists must be based on knowledge and research findings that support the delivery of the highest quality of dental hygiene care possible. The purpose of the medical, dental, nursing and allied health sciences is to enhance the health of individuals and populations. It is in this regard that dental hygiene practice and science have grown to be inextricably intertwined over the past century (Table I).

A discipline is defined as "a branch of knowledge, typically one studied in higher education."[2] In addition a discipline has the following commonly accepted characteristics: a theoretical body of knowledge that is somewhat distinct and arises from science, a knowledge base that is relevant to some societal need or demand and education in a discipline that produces disciples (graduates or practitioners) who are trained by scholars or educators within the discipline to adhere to specific regulations and guidelines embraced by the discipline.[3,4] These guidelines are based on a body of knowledge, scientific principles and research findings which continually test the assumptions of the practice of that discipline. Dental hygiene has developed several documents that provide the foundation for the discipline. It is in this context that the history of dental hygiene research is discussed in this paper.

The Onset: An Era of Discussion about Science and Dental Hygiene

The inception of the profession of dental hygiene was supported by research conducted nearly 100 years ago. Dr. Alfred C. Fones opened the first school of dental hygiene, developing the concept of prevention specialists called "dental hygienists." Previous attempts to establish formal courses for "dental nurses" had failed, and Fones preferred the term dental hygienist rather than dental nurse because of his commitment to providing preventive interventions and teaching

children oral hygiene for prevention of dental diseases. In 1914, one year after the origin of dental hygiene in 1913, Fones launched a project to collect data to document the effectiveness of these dental hygienists in the schools providing assessments and oral prophylaxes and teaching students about oral hygiene at home as disease prevention measures. The theory was that early education regarding oral hygiene could impact oral health throughout the lifespan. The Fones' Five-Year Demonstration Project, initiated in public schools, provided documentation of the success of dental hygienists in education and dental disease prevention.[5,6] Fones' conceptualization of the dental hygienist as an oral disease prevention specialist provided the initial focus and framework for the discipline and its specialized body of knowledge.

Over 20 years later, Brooker presented a seminal paper to the New York State Dental Hygienists' Association titled, Oral Hygiene as an Exact Science. This article was published in the *Journal of the American Dental Hygienists' Association* (*JADHA*, now *JDH*) in 1926.[7] He presented information grounded in a decade of research that documented the effectiveness of "mouth cleanliness" in the prevention of dental diseases. The question of the health and preventive value of oral hygiene was raised when Brooker asked the audience, "Does hygienic care of the surfaces of the teeth and gums prevent disease, or are you merely cosmeticians and beauticians…" He emphasized how critical it is to have the public's confidence in the effectiveness of dental hygiene care for disease prevention if the dental hygienist was to proceed constructively. Brooker went on to assert that a careful review of the available data at that time demonstrated that the principles underlying dental hygiene services were "as exact in their scientific details as those upon which dentistry is practiced." This tenet suggested the importance of dental hygiene research to the profession, dental hygiene practice and the public. However, research did not become a responsibility of dental hygienists until much later. It is interesting to note that many of today's preventive oral health principles and practices were first described a very long time ago indeed.

In 1940, American Dental Hygienists' Association (ADHA) President Perry emphasized in her address before the same annual meeting in New York 14 years later that it was important to promote an understanding of scientific procedure. However, she went on to say that producing dental hygienists who are scientists was "improbable."[8] Part of the reason for this opinion, of course, was related to the short term of education prescribed for dental hygienists.

Some of the earliest dental hygiene research manuscripts published in *JADHA* in 1945 and 1946 reported results of dental hygiene education studies, although research manuscripts comprised far less than 10% of the *Journal*.[9] The first research article was entitled, Report on the Curricula on Training for Dental Hygienists, by Greenwood, a dentist and chair of a dental hygiene program.[10] Early dental hygiene programs were 8 months to 1 year in length, and the first uniform minimum requirement for programs to be 2 years in length was not established until 1947.[8] The results of this early dental hygiene education research is credited, at least in part, with the establishment of minimum educational standards of 2 years. Advanced education at the graduate level, however, is a requirement for scholarly activity and research in a discipline.

During the years 1955 through 1959, research manuscripts remained less than 10% of all manuscripts in *JADHA*. Opinion papers related to the profession of dental hygiene and dental hygiene education increased over information articles for the first time, however, the focus on practice continued. Dental hygienists had not yet embraced their role in research, and needed to do so to advance the profession of dental hygiene and eventually develop from a field of study to a discipline.

The Early Years of Dental Hygienists' Involvement in Research

The first graduate program was not established until 1960 at Columbia University.[8] Approximately one-third of the curriculum was devoted to research and the remainder of the time was divided equally between education and administration. These initial students were involved in an auxiliary capacity in research projects that were planned with and for them. Kutscher, the dentist coordinator of the graduate program, decided, after the first students had graduated, to revise the research course and activities to allow the master's candidates to plan, conduct and publish their own research projects following "suitable indoctrination."[11] Two other universities followed suit, and by 1965, master's degree programs including research courses and requirements for dental hygienists were established at the University of Iowa and the University of Michigan. Thus, the dental hygienist's engagement in research and advanced education at the master's level were launched as necessary enterprises to

Table I: 100-Year History of Dental Hygiene Research

Year	Point of Interest	Description
1914	Fones' 5–year Demonstration Project is initiated in public schools	• First research results documenting the success of the dental hygienist in education and dental disease prevention
1927	First issue of the Journal of the American Dental Hygienists' Association (JADHA) is published; name is changed to Dental Hygiene in 1972 and Journal of Dental Hygiene in 1988	• Original mission: to link dental hygienists to the latest information related to the professions; almost all articles were anecdotal with an information focus • Current mission: to promote the publication of original research related to the profession, the education, and the practice of dental hygiene. The journal supports the development and dissemination of a dental hygiene body of knowledge through scientific inquiry in basic, applied, and clinical research.
1936	Oral Hygiene as an Exact Science Paper is read before the Annual Convention of the New York Dental Hygienists'' Association	• First known paper focused on principles and scientific support for the services delivered by dental hygienists; paper also published in JADHA
1940	ADHA Presidential Address focuses on the importance of "promoting an understanding the scientific procedure"	• The president also stated in her address, however, "to think of producing scientists is improbable…."
1945	First dental hygiene research article is published in JADHA	• The article presents results from a survey of dental hygiene programs in the United States (n=14)
1955-59	Proportion of JADHA dedicates to manuscripts decreases from 51% in 1927 to 31%	• Opinion manuscripts related to the profession and education increase over information articles for the first time; however, the focus on practice continues. Research manuscripts remain ≤10%
1960	First master's degree program for dental hygienists is established at Columbia University	• Focus is dental hygiene education but program also lays the foundation for becoming one of the first to require research for the advanced degree
1966	The Role of the Dental Hygienist in Dental Research: I-III reports are published in JDH	• Three-fold report on the dental hygienist and research is intended to encourage the dental hygienist to engage in research as a member of the dental and allied health research teams
1968	National Institutes of Health Research Training Grants funds dental hygiene faculty	• Purpose is to fund research, teaching and related activities
1971	The Dental Hygienist in Dental Research is published in JDH	• A dental hygienist author describes the excitement of employment as a research associate
1974	The Forsyth Experiment is completed at the Forsyth Dental Research Institute in Boston, MA	• Findings show improved cost and no loss of quality when restorative dental services are delivered by trained DHs
Mid-1970s	ADHA appoints first Committee on Research	• By 1979, the Committee evolves into the Council on Educational Services and Research, eventually to become the Council on Research (1987 to 1988)

Table I: 100-Year History of Dental Hygiene Research (continued)

Year	Point of Interest	Description
1978	ADHA Foundation (formerly the Educational Trust Foundation) is created to provide activities and programs such as research	• The Foundation eventually will become the Institute for Oral Health in 1985 to continue the former mission but also to expand its scope
1979	ADHA Foundation establishes the first Research Grant Program to fund research conducted by dental hygienists	• Grant Review Committee and guidelines are established; awards range from $100 to 1,000
1980	First research text for, Research Methods for Oral Health Professionals, published by CV Mosby	• Textbook is written by dental hygienist co-authors and published for use by dental hygienists and dentists as an introduction to research methods
1975-81	Proportion of the Journal dedicated to articles increases from 26% in 1975 to 42% in 1981	• 53% of authors are DH; mean percentage of DH authors with master's degrees increases from 12% to 36% • Research manuscripts average 28% of the Journal and are divided 53% experimental and 49% descriptive; reference papers also increase from 12% to 20%
1982	First Conference on Dental Hygiene Research in the world is held in Winnipeg, Manitoba, sponsored by the Working Group on the Practice of Dental Hygiene's Subcommittee on Research and the University of Manitoba.	• Fourteen distinguished researchers and consultants from across Canada and the United States serve as conference leaders to consider the role of research in further development of dental hygiene. Forty-two dental hygienists, representing education, public health, hospital, and private practice settings, register as participants.
1984	First ADHA National Agenda on Dental Hygiene Research Conference is held in Denver, Colorado	• The focus is to encourage participation in research and teach basic research skills; educators were predominant dental hygienists in attendance
1987	Health Manpower Pilot Project (HMPP #139), the Dental Hygiene Independent Practice Prototype, is initiated in California	• To study safety and access to dental hygiene care in unsupervised settings using a planned, systematic approach to alternative health-care methods.
1987	Second ADHA National Conference on Dental Hygiene Research is held at the University of Iowa, Iowa City, Iowa	• Agenda focuses on theory development, a body of knowledge in dental hygiene, the developing discipline, and approaches for building knowledge in the discipline
1988	ADHA publishes Prospectus on Dental Hygiene positioning the dental hygienist as member of the health care team	• Prospectus focuses on the future of dental hygiene and establishes six roles for dental hygienists, including clinician, oral health educator, consumer advocate, administrator/manager and, for the first time, researcher.
1988	Goal of ADHA first Council on Research is established	• "…to manage and support research that will validate the impact of the professional services provided by the dental hygienist, and to establish the theoretical base for dental hygiene practice."

Table I: 100-Year History of Dental Hygiene Research (continued)

Year	Point of Interest	Description
1990	Canadian Dental Hygienists' Association (CDHA) holds a symposium in Edmonton, Alberta on "Clinical Dental Hygiene: Directions for Research, Teaching and Evaluation."	• The purpose of the symposium is to emphasize the relationship among clinical dental hygiene research, education, and dental hygiene practice; to explore the ways to participate in collaborative research; and to investigate a conceptual framework for the dental hygiene profession.
1991	The ADHA-IOH embarks on a development campaign to establish a Research Fund.	• The campaign is successful and earns $150,000. In 1991, it was renamed the John C. Thiel Research Endowment Fund
1991	John Thiel Faculty Research Fellowship Program is established by the ADHA-IOH	• Fellowship is established as a means of specifically supporting the professional advancement of dental hygiene educators pursuing a masters or doctoral degree
1992	ADHA convenes a panel on theory development in dental hygiene	• The panel conceptualizes dental hygiene as the study of preventive oral health care including behaviors to prevent oral diseases and promote overall health, and identifies four major concepts for study in the discipline: health/oral health, dental hygiene actions, the client, the environment and their inter-relationships.
1993	The Human Needs Conceptual Model is proposed for Dental Hygiene	• Purpose is for use as a theoretical framework for research, education and practice
1993	National Center for Dental Hygiene Research is established at Thomas Jefferson University via a grant from Bureau of Health Programs, DHHS	• Through additional BHP, DHHS grants, the National Center develops the DHNet in 1995 and EBNet in 2000, and continues providing interprofessional allied health faculty research training institutes, supporting evidence-based decision making and practice, and hosting global research conferences in dental hygiene. The Center moves to the USC in 1999 continuing its important mission in fostering dental hygiene research.
1993	CDHA holds the fourth annual professional conference, the North American Research Conference: An Exploration into the Future.	• The American Dental Hygienists' Association participates in the development of the conference workshops.
1993	ADHA Council on Research develops first National Research Agenda	• 1993-94 Council on Research develops the ADHA National Research Agenda. White Paper published in the Journal of Dental Hygiene 1994 as a first step to guide research efforts in profession.
1994	ADHA holds the Third Dental Hygiene Research Conference in Minneapolis, Minnesota	• Professional Growth through Research was the title of the conference.
1995	JDH publishes the study validating the first National Dental Hygiene Research Agenda	• National Center for Dental Hygiene Research conducts a study to validate the first agenda; results of Delphi study used to reach consensus were published

Table I: 100-Year History of Dental Hygiene Research (continued)

Year	Point of Interest	Description
1995	International Association of Dental Research (IADR) establishes Oral/ Dental Hygiene Research Group	• IADR later changes name to Oral Hygiene Research Group; the dental hygiene focus remains but is diminished
1995	CDHA's Board Council on Education and Research offers the first research grant/award to members.	• Award is part of CDHA's goal to promote quality dental hygiene research
Mid-1990's	ADHA Research Division is established	• The goal is to broaden ADHA's involvement in a variety of oral health research initiatives. In addition, internal association-related endeavors that rely on research or statistical expertise are supported.
1999	CDHA publishes inaugural edition of Probe Scientific	• Offers a forum for Canadian dental hygienists to publish their own research while also remaining open to publishing international research
2000	Fourth ADHA National Research Conference is held in Washington D.C.	• The Millennium for Dental Hygiene Research Conference participants assisted with updating the ADHA National Dental Hygiene Research Agenda
2002	National Conferences in Dental Hygiene Research in Sweden are initiated	• Held at Dalarna University for doctoral students and doctoral-prepared dental hygienists to present their research findings
2003	CDHA holds its National Dental Hygiene Research Agenda Workshop	• Eleven individuals from across Canada are brought together to develop the first CDHA Dental Hygiene Research Agenda
2003	Dental Practice-Based Research Network is initiated	• National Institute of Dental and Craniofacial Research provides main source of funding for dental and dental hygiene practitioners
2005	ADHA publishes Focus on Advancing the Profession	• Establishes three major aims and several related objectives for dental hygiene research in everyday clinical practice.
2007	JDH publishes the updated National Dental Hygiene Research Agenda	• The National Center for Dental Hygiene Research updates and conducts a second Delphi study to gain consensus on the research agenda. Purpose: to reflect current research priorities aimed at meeting national health objectives and to systematically advance dental hygiene's unique body of knowledge
2009	First North American/Global Dental Hygiene Research Conference sponsored by the National Center for Dental Hygiene Research and Practice, in partnership with ADHA and CDHA in Washington, DC	• Provided an opportunity for 150 dental hygienists' throughout the U.S., Canada and Europe to convene at one of the world's leading research institutions, the National Institutes of Health, to explore commonalities in their research interests, learn from each other about new and ongoing research programs and foster future collaborations.

Table I: 100-Year History of Dental Hygiene Research (continued)

Year	Point of Interest	Description
2011	Second North American/Global Dental Hygiene Research Conference: Inspiration, Collaboration, and Translation is sponsored by the National Center for Dental Hygiene Research and Practice, in partnership with ADHA, and CDHA in Bethesda, Maryland	• Provides an opportunity for over 230 dental hygienists from throughout the world to convene and explore commonalities in their research interests, learn from one another about new and ongoing research programs, and foster future collaborations and gain research experience through hands-on workshops. Conference attendees represent 9 countries, including 35 states in the U.S., Canada, Australia, Denmark, Germany, Great Britain, Italy, Japan, the Netherlands and Sweden.
2011	An International Task Force is formed to plan the first doctoral degree program in dental hygiene	• Support is provided by Idaho State University's Master of Science in Dental Hygiene Program and Division of Health Sciences
2012	The Istituto Stomatologico Toscano, a Research Center on oral hygiene was created in order to coordinate and stimulate activity designed to identify and verify and new procedures and new materials in dental hygiene and to test related clinical activities	• The 1st National Congress on Research in Dental Hygiene was held in Pisa, Italy entitled Non-surgical Periodontal Treatment: How to Conciliate Scientific Evidences and Clinical Practice, as a result of the creation of this institute
2013	JDH celebrates 100 years of dental hygiene	• Began in 1927 as 16 pages with no research; current issue is 55 pages: 75% research manuscripts under leadership of Rebecca Wilder, Editor
2013	Dental Hygiene celebrates 100 years as a profession	• Special supplement on 100 years of dental hygiene research is published in JDH and ADHA Annual Session in Boston is dedicated to celebrating the many accomplishments of dental hygienists since 1913.

establish a body of knowledge essential to becoming a discipline and gaining societal trust.

In 1966, the first articles regarding the role of the dental hygienist in research were authored by the recent graduates and faculty at Columbia University and published in *JADHA*. A 3-part report authored by Kutscher et al regarding the role of the dental hygienist in dental research encouraged dental hygienists involvement in dental and allied research teams and reported about the research program for dental hygienists at that institution.[11,12] By 1968, the National Institutes of Health awarded grants to dental hygiene faculty to support research, teaching and related activities, although most, if not all, of the principle investigators were dentists serving as faculty and administrators in dental hygiene programs. In 1971, an article entitled, *The Hygienist in Dental Research*, was published in *JDH*, where the author described her role working as a member of a dental research team for the previous 6 years.[13] The term dental hygiene research was not yet used, and the role of the dental hygienist in research was described as auxiliary, assistant, co-examiner, site supervisor or administrator, rather than as a dental hygiene researcher, despite the fact that 2 of the dental hygienist authors held master's degrees. These early dental hygiene scholars continued their engagement in research, became independent investigators and fostered others in the process. McClean became the program director for the dental hygiene programs at Columbia University, after being one of the first master's degree graduates. Her dedication to dental hygiene research for many years was important to the advancement of research in the developing discipline.

Fostering Dental Hygiene Research

For the next decade, the advancement of dental hygiene research relied largely on a few dedicated individuals who were involved in studying dental hygiene or dental hygienists and who also participated in fostering dental hygiene research

for the advancement of the profession and the discipline. In the mid-1970s, ADHA appointed its first Committee on Research, initially unfunded and then approved for funding by the ADHA House of Delegates shortly thereafter. The committee's early work involved eliminating the mystique of research in dental hygiene, educating the ADHA membership about the importance of research to a profession and emphasizing the role of the dental hygiene researcher in conducting research to support dental hygiene practice and education. Many questioned the necessity but support was growing.

The profession of dental hygiene was once again impacted by findings of research studies funded by federal agencies and conducted largely by dental educators. Lobene lead The Forsyth Experiment at the Forsyth Dental Research Institute, documenting improved cost and no loss of quality when restorative dental services and local anesthesia were delivered by trained dental hygienists.[14] Another study at the University of Pennsylvania School of Dental Medicine by Schnitsky and funded by the National Institutes of Health found that dental hygienists could be trained as periodontal co-therapists.[15] These studies and others impacted dental hygiene practice, leading to expanded practice acts and delegation of duties. The inter-relationship between practice, education and research was unquestionable.

In 1975, Mashioff presented a paper, entitled *The Future of Dental Hygiene*, to the 52nd Annual Session of the ADHA in Chicago, Illinois. The paper was subsequently published in *JDH* in 1976.[16] Her remarks focused on the emergent roles of the dental hygienist, expanded duty dental auxiliaries (EDDA) and Teaching Expanded Auxiliary Management (TEAM) concepts to dentists, as well as alternative practice settings on the horizon for dental hygienists. Mashioff utilized the findings of EDDA and TEAM research to support change in the dental hygiene profession. She suggested that dental hygiene education programs develop expanded options for dental hygienists and stated, "The hygienists of today must, of necessity, become a doctor of dental hygiene of tomorrow or the 'generalist'…" to meet the rising demands for advanced dental hygiene services. Masinoff also predicted new specialties would emerge for dental hygienists including research, among others. Momentum was building.

In 1978, the ADHA Foundation (now the ADHA Institute for Oral Health) was created to provide funding for the educational and research activities of dental hygienists. A committee was appointed to draft guidelines for grants to support research studies conducted by dental hygienists. The Foundation's first Research Grant Program was initiated in 1979, and an advertisement in Dental Hygiene (formerly *JADHA*) in March of 1980 called for applications from the community of dental hygienists.[17] The goal was to broaden ADHA's involvement in various oral health research initiatives. In addition, internal association-related endeavors that relied on research or statistical expertise were supported.

The fruits of these efforts, as well as the growth in number of graduate programs in dental hygiene, resulted in a greater emphasis on dental hygiene research and publication. In fact, by 1981, research articles had increased to 28% of manuscripts published in *Dental Hygiene*.[18] These papers were almost equally divided between experimental and descriptive. For the first time, most of the authors were dental hygienists (53%), and dental hygiene authors with master's degrees increased to 36%, up from 12% in 1975. The first research textbook for oral health professionals, rather than solely for dentists, was co-authored by Darby and Bowen and published by the CV Mosby Company.[19]

Dental hygiene, as a developing discipline, was realizing the importance of building its unique body of knowledge and establishing its importance to society. The ADHA and master's level graduate programs for dental hygienists and dental hygiene scholars were successfully contributing to an evolving infrastructure for dental hygiene research.

An Emerging Dental Hygiene Research Infrastructure

Forrest, Gitlin and Spolarich have discussed the 5 essential and inter-related elements of a research infrastructure common amongst health professions.[20,21] The elements are:

1. A critical mass of researchers
2. Established priorities for research
3. Communication mechanisms that link researchers and provide access to research findings
4. Funding to support research
5. Demonstrated societal value for research findings and their relationship to the health of the public

The continued efforts of dental hygiene researchers with the support of ADHA and the Canadian Dental Hygienists' Association (CDHA) during the

1980s contributed to a budding infrastructure to support dental hygiene research.

Several national and international research conferences were conducted to connect dental hygienists involved in or interested in research, beginning to build the critical mass of dental hygiene researchers. The first Conference on Dental Hygiene Research was held in Winnipeg, Manitoba in 1982. It was sponsored by the Working Group on the Practice of Dental Hygiene's Subcommittee on Research and the University of Manitoba. Fourteen distinguished researchers and consultants from across Canada and the U.S. served as conference leaders, and 42 dental hygienists, representing education, public health, hospital and private practice settings, attended as participants.[22] The focus of the conference was the importance of a unique body of knowledge in dental hygiene and linking research to practice, education and the health of the public. The underlying goal was to begin to move dental hygiene from a field of study to a discipline by advancing science and practice and providing documentation of the societal value of services provided by dental hygienists. In 1984, ADHA held its first National Agenda on Dental Hygiene Research Conference in Denver, Colorado. The aim was to encourage participation in research and enhance participants' research and dissemination skills, as educators were the predominant group in attendance.[23,24] Three years later, in 1987, the second ADHA National Conference on Dental Hygiene Research was held at the University of Iowa in Iowa City.[25] This conference was directed toward theory development, the developing discipline of dental hygiene and approaches for building knowledge distinctive to the discipline. This program advanced the agendas of the first 2 conferences, however, it was designed to promote the development of theoretical models in dental hygiene, its unique perspective and the potential to conduct dental hygiene research from the perspective of oral wellness, oral health education, disease prevention and health promotion. Clearly, as the speakers pointed out, dental hygiene had relied on borrowed information from other disciplines including nursing, dentistry, social sciences and others, and dental hygiene research had not been conducted within unique dental hygiene conceptual or theoretical frameworks.[4] Bowen, Darby and Walsh, and Dickoff and James suggested that dental hygiene's perspective was sufficiently distinct to guide the development of a unique body of knowledge, however, the challenge would be to develop conceptual frameworks and encourage dental hygiene research within those frameworks and others.[26-29] This process would be necessary to becoming a discipline.

During the same period, beginning in 1987, research findings and the expanding perspective of dental hygiene were, once again, being applied to advance dental hygiene practice. The Health Manpower Project (HMPP#139), The Dental Hygiene Independent Practice Prototype, also known as the California Demonstration Project in Independent Practice, was approved for exemption from restrictions of the dental practice act and funded in California. Pioneering clinical dental hygienists were collecting data in independent practices to support unsupervised dental hygiene practice.[30] Despite several ongoing challenges and a lawsuit by the California Dental Association to block the pilot project, the clinicians collected data for 3 years regarding 1,500 individuals that they had treated without harm. The study documented safety and improved access to dental hygiene care in unsupervised settings using a planned, systematic approach to alternative oral health care methods. It was not until 1998 that the California state law was changed to support Registered Dental Hygienists in Advanced Practice (RDHAPs), based on these research findings and the continuing commitment of these dental hygienists.

ADHA sponsored a conference in 1987 regarding the expanding roles of the dental hygienist as a member of the health care team, rather than solely as a member the oral health care team. Outcomes of that conference and recommendations for the advancement of dental hygiene were published by ADHA in 1988 in a report entitled *Prospectus on Dental Hygiene*, co-authored by Brine et al and members of the ADHA Steering Committee for the Workshops on the Future of Dental Hygiene Practice and Education.[31] The document opened in the preface by stating "All occupations have an obligation to society periodically to assess their value and relevance to society and take whatever actions are indicated to fulfill their societal contract." It is indicated that, although data to document the future of dental hygiene was incomplete, there were sufficient data available to chart a course for the future of the profession. The Steering Committee also emphasized the importance of continued research to document the value of dental hygiene services to the health of the public. Six roles were identified for dental hygienists, including clinician, oral health educator, consumer advocate, administrator/manager and, for the first time, researcher. A goal for minimum entry level educational requirements for dental hygiene also was established as a baccalaureate degree.

Concurrent contributions to the infrastructure for dental hygiene research were being made. In 1988, ADHA established its first Council on Research to manage and support research that would validate the impact of the professional services provided by the dental hygienist, and establish the theoretical base for dental hygiene practice. The work of the Dental Hygiene Research Grant Committee of the ADHA Institute for Oral Health sparked a development campaign to establish a research fund. The successful campaign resulted in a $150,000 endowment and a faculty research fellowship program. Small grants up to $1,000 were available to dental hygiene researchers as seed money for pilot studies. Oral-B Laboratories subsequently initiated a Dental Hygiene Research Grant Program, with awards available up to $5,000. Larger grants require pilot data, therefore, the development of these small but significant grant programs provided a foundation for the availability of funding to support dental hygiene research.

These contributions addressed some of the elements needed for a dental hygiene research infrastructure and fostered a concentrated effort towards theory development in the U.S. and Canada.

Theory Development in Dental Hygiene

Cobban et al summarized theory development in dental hygiene with precise detail in 2 articles published in the *International Journal of Dental Hygiene* (IJDH).[4,32] Although some scholars had been discussing the need for theory development in dental hygiene for nearly a decade, little movement had occurred in that direction until 1990.[33-35] CDHA held a symposium in Edmonton, Alberta entitled, Clinical Dental Hygiene: Directions for Research, Teaching and Evaluation. The purpose of the symposium was to emphasize the relationship among clinical dental hygiene research, education and dental hygiene practice, to explore ways to participate in collaborative research, and to investigate a conceptual framework for the dental hygiene profession. Walsh presented a conceptual model for the discipline of dental hygiene (Figure 1) proposing interdependent relationships between dental hygiene research and practice.[36] This model emphasized the fact that the practice of dental hygiene requires a foundation of science and research findings. Our practice can only be as sound as the research that supports it. Johnson and Bowen supported theory development and the Walsh model, and further suggested that future conceptual models for dental hygiene research include the major concepts of oral health education, oral wellness, health promotion and disease prevention.[37,38]

In 1992, ADHA convened a theory development panel that conceptualized the discipline of dental hygiene as "the art and science of preventive oral health care, including the management of behaviors to prevent oral disease and promote oral health."[39] The panel also identified 4 major concepts for study in the discipline: health/oral health, dental hygiene actions, the client, the environment and their inter-relationships. The paradigm was adopted by the ADHA House of Delegates as the ADHA Framework for Theory Development in 1993.[39]

Darby and Walsh further developed this paradigm and proposed the Human Needs Conceptual Model for dental hygiene in 1993, for use as a theoretical framework for research, education and practice.[40] The model proposes that human beings take actions to meet unmet needs and dental hygienists can provide care to meet those unmet needs. This conceptual model was the first proposed for the discipline of dental hygiene. Since that time, other conceptual models have been proposed and examined through dental hygiene research. The Oral Health Related Quality of Life Conceptual Model by Williams et al proposed that acceptable oral health, function and comfort is integral to acceptable general health.[41] The Client Care Commitment Model proposed by Calley et al suggested relationships between dental hygienists' and client interactions, client motivation, cultural influences and commitment to oral health.[42] All of these models describe a process of care that is both unique and distinct for dental hygiene, yet relatively few research studies have been grounded in theory or conceptual frameworks to date.

Continued Growth and Infrastructure

Major contributions to the infrastructure for dental hygiene research began when the National Center for Dental Hygiene Research was established at Thomas Jefferson University through funding from the United States Bureau of Health Programs, Department of Health and Human Services (BHP, DHHS) in 1993. The Center initially provided infrastructure for dental hygiene research by fostering interprofessional collaborative efforts of dental hygiene researchers and establishing an online communication mechanism to link researchers and provide access to research findings, the DHNet. The Center moved to the University of Southern California (USC) in 1999. Through additional BHP and DHHS grants,

the National Center developed an EBNet in 2000. Today, the Center continues providing interprofessional allied health faculty research training institutes, supporting evidence-based decision making and practice, and hosting global research conferences in dental hygiene.[43]

In 1993, the ADHA Council on Research developed the first ADHA National Research Agenda and published a White Paper in JDH as a first step to guide research efforts in the profession.[44] Forrest et al of the National Center subsequently conducted a study to validate the agenda by conducting a Delphi study to gain consensus of dental hygiene experts. The results of the study were published in JDH in 1995 as a resource for all dental hygiene researchers, faculty and students.[45]

That same year the International Association of Dental Research (IADR) recognized the growing critical mass of dental hygiene researchers and their unique perspective, establishing the Oral/Dental Hygiene Research Group, first chaired by Walsh. The IADR later changed the name to the Oral Hygiene Research Group. Today, the dental hygiene perspective of that group remains, but has diminished.

The 1990s brought additional infrastructure improvements for the developing discipline. Research conferences continued, such as CDHA's North American Research Conference: An Exploration into the Future in Niagara Falls, Ontario, and ADHA's Third National Research Conference, Professional Growth through Research, in Minneapolis. CDHA began offering funding for dental hygiene research and published *Probe Scientific*.[22] Brownstone conducted a qualitative study of the culture in dental hygiene and found increased use of research funding in practice by Canadian dental hygienists.[46]

Unfortunately, despite these improvements in the 1990s, dental hygiene research did not advance to the level hoped; many researchers continued conducting isolated pilot studies rather than theory-based research, and significant funding opportunities remained scarce.

The New Millennium

The first decade of the new millennium brought new research agendas, developed and adopted by both CDHA and ADHA, with the latter validated by the NCDHR.[47-50] In 2002, annual National Conferences in Dental Hygiene Research in Sweden were initiated. The meetings were held at Dalarna University for doctoral students and doctoral-prepared dental hygienists to present their research findings, however, the doctoral degrees were earned in related disciplines, as a doctorate in dental hygiene had not been developed.

In 2003, the first Dental Practice-Based Research Network for dental and dental hygiene practitioners was initiated, primarily through grant funding from the National Institute of Dental and Craniofacial Research.[51] ADHA published *Focus for Advancing the Profession* in 2005, establishing 3 major aims and several related objectives for dental hygiene research in everyday clinical practice.[52] These research-practice linkages were important to bridging the gap between new knowledge and improved client care, however, they did not contribute significantly to advancing dental hygiene as a discipline.

Many individuals that had been involved in dental hygiene research for decades began to ask why. Despite over 30 years of progress in dental hygiene research and related achievements, why has the profession not enjoyed full recognition by society as a unique discipline linking dental hygiene actions in practice with underlying dental hygiene science as the foundation? One of the main stumbling blocks over the years has been the lack of a doctoral degree in dental hygiene. Those scholars who obtain advanced degrees in related disciplines often are lost to those areas of study. Doctoral-prepared dental hygienists who are successful in conducting research related to the dental hygiene theoretical or conceptual models frequently publish their findings in journals outside of the discipline. Funding is elusive for dental hygienists without doctoral degrees and a track record in research. As a result, regardless of adding individuals to the critical mass of dental hygiene researchers, the discipline constantly is battling the loss of some of its scholars. Fortunately, there remains a core of dental hygiene researchers, now spanning the globe, who continue to endeavor to build a stronger infrastructure to support dental hygiene as a discipline. *Dental Hygiene at a Crossroads*, a 2009 report on research in dental hygiene, recommended initiatives to encourage dental hygienists to pursue research-based advanced degrees and to foster collaboration between doctoral candidates and holders of doctoral degrees in dental hygiene and related disciplines.[53] The goal would be the study of oral health-related questions within the framework of dental hygiene. International initiatives would serve to strengthen the opportunities for collaboration and innovation.

A global perspective of dental hygiene research was highlighted when ADHA, CDHA, the National Center for Dental Hygiene Research and Practice and others sponsored the First North American Research Conference in 2009.[54] This conference provided an opportunity for 150 dental hygienists' throughout the U.S., Canada and Europe to convene at one of the world's leading research institutions, the National Institutes of Health, to explore commonalities in their research interests, learn from each other about new and ongoing research programs and foster future collaborations.[55] This successful collaboration lead to the Second North American Global Research Conference in Washington DC in 2011, which provided an opportunity for 230 dental hygienists from throughout the world to convene and explore commonalities in their research interests, learn from one another about new and ongoing research programs and foster future collaborations and gain research experience through hands-on workshops. Conference attendees represented 9 countries, including 35 states in the U.S., Canada, Australia, Denmark, Germany, Great Britain, Italy, Japan, the Netherlands and Sweden.[56,57]

Also in 2011, an international task force was formed to plan the first doctoral degree program in dental hygiene.[58] Gurenlian, with the support of Idaho State University, convened a group of international dental hygiene researchers, scholars and graduate students to begin planning curriculum and competencies for a Doctor of Philosophy (PhD) degree program in dental hygiene.

In 2012, the Istituto Stomatologico Toscano, a research center on oral hygiene was created in order to coordinate and stimulate activity designed to identify and verify new procedures and new materials in dental hygiene and to test related clinical activities. The 1st National Congress on Research in Dental Hygiene was held in Pisa, Italy, entitled Non-surgical Periodontal Treatment: How to Conciliate Scientific Evidences and Clinical Practice, and was a result of the creation of this institute.[59]

The year 2013 precipitates the celebration of 100 years of dental hygiene. As we move forward, dental hygiene investigators are encouraged to:

- Embrace the direction established by former dental hygiene researchers and supporting entities
- Seek doctoral degrees, and embrace the development of a doctoral degree in dental hygiene as soon as possible
- Conduct theory-based research from a dental hygiene prospective
- Develop and test conceptual models to further advance the unique body of knowledge in dental hygiene

Our discipline depends on a strong foundation in science and dental hygiene research findings to advance practice and education. It is our obligation to our clients and to society to develop skilled dental hygiene researchers and to study interventions that lead to improved oral health outcomes. Realization of these goals would also secure our future as a unique discipline of importance to society.

History of the Journal of Dental Hygiene

As noted, JDH has played a significant role in capturing the outcomes of dental hygiene research as well as initiatives to foster it. Since the first issue in 1927, JDH has provided dental hygienists with a link to the latest information related to the profession. As dental hygiene research became a key component of the profession, JDH has endeavored to provide a leading, peer-reviewed scientific publication in the discipline (Table II). The name changed from the Journal of the American Dental Hygienists' Association (JADHA) to Dental Hygiene (J Dent Hyg) in 1972 and then to the Journal of Dental Hygiene (JDH) in 1988, as it remains today.

At the onset, JDH had 16 pages composed primarily of anecdotal stories and no research articles. Of course, the focus was related to dental hygiene practice. "Good dental books" were promoted for just two dollars. Members paid eight cents per copy, although it cost ADHA twice that to publish the journal monthly. In 1934, the ADHA board voted to publish JADHA quarterly with the goal of publishing a self-sustaining journal.[60]

Dental hygienists were not the predominant group of authors of dental hygiene manuscripts. However, they were increasing in proportion to dentists. In 1935, 24% of all authors were dental hygienists and dentist comprised 26% of all authors. Possibly because of the educational credentials of early dental hygienists, research manuscripts comprised less than 10% of the articles published in the journal. The first research manuscript was published in 1945 when dental hygiene educators, predominantly dentists, were trying to document the need for minimum educational standards. Several related articles followed in 1945 and 1946, and the profession realized the importance of research when 2 years was ad-

Table II: History of the Journal of Dental Hygiene

Year	Point of Interest	Description
1927	First issue of the Journal of the American Dental Hygienists' Association (JADHA) is published	• Mission: to link dental hygienists to the latest information related to the professions • 16 pages, primarily anecdotal stories, no research articles • First editor is Dorothy Bryant, 1927-1929
1927-34	JADHA is monthly	• Publication is financially dependent on ADHA • Manuscripts increase with the proportion of manuscripts increasing to 51% of the Journal • Focus is oriented toward dental hygiene practice
1934	JADHA is published quarterly with distribution of 1,000 copies	• Ensures improved financial stability and more relevant content
1935-49	JADHA publication is continued	• Authors remain primarily DH and DDS; DH (24%) and DDS (26%) in 1935, but percentage of DH authors become predominant (DH 46% and DDS 22%) by 1949 • Research publications remain <10%, almost exclusively descriptive • Information articles remain >50%
1945	First research manuscript published in JADHA; research manuscripts related to education increase in 1945 and 1946	• May have an had impact on American Dental Association Council on Dental Education decision to require all programs be at least two years in length in 1947
1949	Revenue increases for JADHA	• A record 9 pages of advertising is sold
1950	First color is used in JADHA	• Color in advertising is suggested by professional oral care company
1955-59	Proportion of JADHA dedicated to manuscripts decreases	• Proportion dedicated to manuscripts decreases from 51% in 1927 to 31% • Opinion manuscripts related to the profession and education increases over information articles; however, the focus on practice continues • Increased focus on educational standards will impact the establishment of accreditation standards for dental hygiene in 1959
1970	Wilma Motley, RDH, became editor	• Motley, as well as Mary Alice Gaston, later become the Journal's editor emeritus
1972	Name changes from JADHA to Dental Hygiene (J Dent Hyg)	• Publication growth occurs during this decade
1975	J Dent Hyg becomes a monthly publication again	• This change is viewed as an opportunity to publish more scientific research articles
1975-81	Proportion of Journal dedicated to articles increases	• Increases from 26% in 1975 to 42% in 1981 • 53% of authors are DH • Mean % of DH authors with master's degrees increased from 12% to 36% • Research manuscripts averaged 28% of the Journal and were divided 53% experimental and 49% descriptive • Reference papers also increased from 12% to 20%
1980	Educational Directions for Dental Auxiliaries is published by ADHA	• Education articles that may have been submitted to Dent Hyg decreases
1986	Access is published by ADHA	• Starts as tabloid and becomes magazine in 1987, allowing J Dent Hyg a greater research and scholarly focus
1988	Name changes from Dental Hygiene to Journal of Dental Hygiene	• Mission remains today as "the premier, peer-reviewed scientific research publication" in the discipline

Table II: History of the Journal of Dental Hygiene (continued)

Year	Point of Interest	Description
1989	JDH wins the Golden Scroll Award from the International College of Dentists	• Awarded to the editor, Olga A.C. Ibsen, RDH, MS, as editor of JDH
1999	JDH is #1 in distribution and indexing coverage of cited journals in dental hygiene literature	• 34% of journal citations from 3 sources of dental hygiene journals are from: JDH, Journal of the American Dental Association (JADA), Journal of Dental Education (JDE) and Journal of Clinical Periodontology
2002	Journal celebrates 75 years	• Manuscript describing history and former editors reflections is published in JDH Winter 2002 edition
2004	JDH is offered fully online for first time	• All full text articles are available online
2011	JDH has most manuscript submissions ever	• Breaks previous record set in 2009
2013	Online publication of JDH is increased to bi-monthly	• JDH is poised to grow and expand as a premier publication of dental hygiene research findings with online access in a variety of formats
2013	JDH celebrates 100 years of dental hygiene	• JDH began in 1927 as 16 pages with no research • Current issue is 55 pages with 75% research manuscripts • Expanded and improved journal is realized under leadership of Rebecca Wilder, RDH, MS, Editor
2013	Dental Hygiene celebrates 100 years as a profession	• Special supplement on 100 years of dental hygiene research is published

opted as the minimum length of study in 1947.[9] Perhaps research studies today comparing the scope of dental hygiene practice, curricular components and the needs of an aging population to those of 1947 would justify an increase in length of study beyond 2 years after 66 years of expansion.

By 1949, dental hygienists did become the predominant group of authors (46%) as the percentage of dentist authors decreased (22%). Most articles (>50%) published in JADHA were information articles, and the few research publications (<10%) were descriptive in nature.[9] A record number of 9 pages of advertising were sold then, with the first color ad printed in 1950.[60] In the 1950s, opinion manuscripts became the most common type, mainly focused on professional and educational standards. By 1959, dental hygiene accreditation standards were established by the American Dental Association's Council on Dental Education. Some believed that the focus on educational standards in JADHA influenced that outcome.[9]

Since 1970, the editors of the Journal have been registered dental hygienists (Table III). A 2003 article by Danner published in JDH celebrated 75 years of the journal, now celebrating 85 years.[61] Interviews with some former editors quoted by the author indicated their common goals of increasing the emphasis on dental hygiene research and advancing the body of knowledge in dental hygiene. Some editors also mentioned their role as mentor of authors in the developing discipline, a challenging undertaking without question.

An analysis of articles published by Boyer and Nielsen in Dental Hygiene from 1975 until 1981 indicated there was a substantial increase in the proportion of the journal devoted to manuscripts. Not only were dental hygienists the majority of authors (51%) but the number who held masters degrees also increased from 12% in 1975 to 36% in 1981. Information papers remained the most common, however, research papers increased over the same time period from 26% to 32%, with about half of them being experimental in nature and the other half being descriptive.[18] These changes support the notion that more advanced education is critical to building a unique body of knowledge in dental hygiene to support practice and the discipline.

ADHA's publication of other periodicals in the mid-1980s further enhanced the ability of JDH to focus more on scholarship and research. In 1986, Access was published as a tabloid for informa-

tion, anecdotes and governmental affairs related to dental hygiene practice. In 1987, Access became a monthly magazine. In 1988, Educational Directions, a journal dedicated to articles related to dental hygiene education provided a venue for advancement of educational research and dissemination of information related to educational standards in dental hygiene. Its publication ceased in 1987, and scholarly papers related to dental hygiene education were once again published in JDH.

JDH has benefitted from the dedication of many highly skilled editors since its inception. Particularly notable are Wilma Motley, RDH and Mary Alice Gaston RDH, MS, who were honored with the title of editor emeritus in 1970 and 2006, respectively. In 1989, when Olga Ibsen was editor, JDH was the recipient of the Golden Scroll Award from the International College of Dentists. This award recognized the most improvement in a dental professional journal.[60] A study by Haaland in 1999 documented that JDH was number one in distribution and indexing coverage of cited journals in the dental hygiene literature, followed by the Journal of Dental Education and the Journal of Clinical Periodontology.[61] In 2009 and 2011, JDH established record numbers of manuscript submissions, and in 2011 JDH transitioned to a fully online format.[62] The first issue of JDH in 2013 was 55 pages in length including a record 75% research manuscripts. An expanded and improved journal has been realized under leadership of Rebecca Wilder, RDH, MS, JDH editor-in-chief since 2006.

The mission of JDH today continues to be providing a scholarly peer-reviewed scientific journal publication in the discipline. There is no doubt that JDH has supported the dissemination of dental hygiene research findings and professionally-related information since the first research article was published in 1945 and will continue to do so in the future.

Conclusion

Dental hygiene celebrates 100 years of providing preventive oral health care services to the public. These services have been supported by research and dental hygiene practice has expanded as a result of research findings since dental hygiene's inception. However, dental hygienists' engagement in research did not begin until the mid-1960s as research associates or administrators, primarily with dental researchers as primary investigators. JDH has provided information for dental hygiene practice and has been the primary venue for dissemination of dental hygiene research since its launch in 1927. Graduate education in dental hygiene at the master's degree level and the work of early dental hygiene researchers eventually lead to the first conference on dental hygiene research in 1982. Over 30 years later, dental hygiene researchers have established a paradigm and defined conceptual models for research, built an initial infrastructure to support future endeavors and contributed much to the development of dental hygiene as a unique discipline. A doctoral degree in the discipline, theory-based research, initiatives to foster interprofessional collaborations between dental hygiene and other researchers and the capability to attract funding are all goals that must be attained through the efforts of future researchers in the developing discipline of dental hygiene.

Ignorance can be deadly. Dental hygiene scholars and researchers know, all too well perhaps, that our futures will be filled with opportunities, gratification, successes and advancements, as well as pitfalls and disappointments. Such is the nature of scientific inquiry required for dental hygiene to continue its growth as a profession and eventually to become a unique discipline.

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Original Manuscript

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Developing a Scholarly Identity and Building a Community of Scholars

Abstract: Progress in the dental hygiene discipline is predicated on the development of a community of scholars who explore questions related to the art and science of dental hygiene and clients in need of oral health care. Graduate dental hygiene education is challenged to develop programs that stimulate and nurture dental hygiene scholars as well as scientists. The need for the development of doctoral dental hygiene education is discussed.

Key Words: Scholarly identity, graduate dental hygiene education, dental hygienists, doctoral dental hygiene education

Introduction

Dental hygiene scholarship development can be thought of as existing on a continuum. One end of the continuum begins in dental hygiene basic preparation programs where the focus is on evaluating research evidence for clinical decision-making and reviewing the literature on a specific topic. This continuum then progresses to increasing higher levels of scholarship development in master's degree programs that prepare learners to conduct at least pilot study-level original research; and in doctoral degree programs that require the conduct of more complex, large-scale original independent research projects. This paper highlights scholarship development in dental hygiene master degree educational programs and the need for dental hygiene doctoral education.

Indeed, graduate learners enrolled in academic dental hygiene master of science degree programs develop and master competencies related to the research process needed for the development of future dental hygiene scientists able to fulfill scholarly expectations in research-intensive universities to meet faculty promotion and tenure requirements. However, to further develop the dental hygiene discipline, dental hygiene scholars are needed in addition to dental hygiene scientists. A basic assumption of this paper, supported by others in the literature, is that there is a difference between a scientist and a scholar.[1] Ibrahim-Meleis points out that scientists systematically pursue answers to questions related to substantive areas of some discipline.[1] Scholars, on the other hand, not only are research scientists, but also have a dedicated and passionate commitment to how their science relates to their discipline's mission, its values and its effects on humanity. In this context, scholars have a sense of the discipline's history, welcome philosophical debate about the discipline and have a life-long commitment to the development of the discipline's knowledge base through focused research programs.[1,2] For example, many dental hygiene scientists often focus on isolated questions that may or may not be directly related to the dental hygiene discipline. In contrast, dental hygiene research scholars envision the dental hygiene discipline as a whole, incorporate the norms and values of the practitioners, and conceptualize theory central to the discipline as the basis for further knowledge development. Although some dental hygiene scientists may interpret this perspective as being insular rather than interdisciplinary, the 2 approaches do not have to be mutually exclusive. Scholars use evidence to support their viewpoint, consider the study of related work of others in their field and elsewhere, and report their own results in the context of those of others in their field and beyond. A key component of scholarship is the dissemination of the findings of one's work through scientific publication.[1] Progress in the development of the discipline of dental hygiene requires a community of passionate dental hygiene scholars to ask and answer questions related to the discipline's whole while reaching across disciplines for assistance and to enhance their ability to bring dental hygiene's unique perspective to benefit the public's oral health.

Normally, in most disciplines, the development of

research scholars occurs at the doctoral level where the learner acquires competencies to perform independent research.[1] Since doctoral education is not yet a reality in dental hygiene, the responsibility for the development of dental hygiene scholars falls to the dental hygiene masters degree programs. These programs are challenged to do so within a limited time frame of 1 to 2 years.

Nevertheless, this paper focuses on the importance of developing a "scholarly identity" and community among master degree-level dental hygiene learners. We posit that doing so is needed to make progress in developing the dental hygiene discipline while at the same time reaching out to experts in other disciplines to assist in the development and implementation of rigorous research studies. Like all disciplines, the dental hygiene discipline needs to continue to grow by asking research questions relevant to the discipline. In fact, progress in our discipline's development is needed in order to enrich the dental hygiene discipline's contribution to interdisciplinary research and to enhance the public's oral health. A scholarly, interdisciplinary approach to dental hygiene research will enable the dental hygiene perspective to influence oral disease prevention and health promotion at national and international levels.

Assumptions:

- Most of the graduate education in dental hygiene focuses on understanding and applying the research process and developing competency among their graduate learners to perform original independent research
- Dental hygiene researchers who have a scholarly identity will have a life-long commitment to the development of the dental hygiene discipline and, as scholars, will use an interdisciplinary approach to rigorous research

Given the above assumptions, the objectives of this article are threefold:

1. To define the term scholarly identity in graduate dental hygiene education
2. To discuss strategies for developing a scholarly identity, including mentors' responsibilities to graduate dental hygiene learners
3. To discuss the need for the development of scholarly doctoral dental hygiene education

Definition of a Scholarly Identity

A scholarly identity is defined in this paper as a dental hygiene research scientist who:

- Has a sense of the dental hygiene discipline as a whole
- Has a life-long commitment to the development of the dental hygiene discipline's knowledge base by asking and answering research questions central to the discipline
- Uses evidence to support one's viewpoint
- Considers the related work of other dental hygiene scholars as well as those of other disciplines
- Reports one's own results in the context of those of others in the field and beyond
- Disseminates the findings of one's work through scientific publication[1]

Strategies for Developing a Scholarly Identity in Dental Hygiene

Developing a scholarly identity is the important work of dental hygiene graduate programs. There are 3 key strategies critical to accomplishing this goal:[1]

1. Coursework
2. Socialization to the culture of dental hygiene scholarship
3. High quality mentored scholarship

Each strategy will be discussed below and, when indicated, the authors will present aspects of the newly established Master of Science in Dental Hygiene degree program at the University of California, San Francisco (UCSF) as one example of how these strategies for developing a scholarly identity have been implemented. The authors recognize there may be variable approaches for achieving the same goal in other programs.

1. Coursework

When identifying strategies for developing a scholarly identity, course work and seminars, especially those related to the research process and different types of research methods and designs, initially come to mind as the most obvious avenues for accomplishing this goal. The research process includes identifying the research problem and different types of research methods and designs, reviewing the literature, specifying a research purpose and study questions/hypotheses, designing the study, collecting data, analyzing and interpreting the data, and disseminating the research results through scientific publication. However, courses that address this process are only tools to be mastered in conjunction with a disciplinary perspective. Equating the development of a scholarly identity only with research methods, statistics and design courses in isolation from the context of the den-

tal hygiene discipline constrains the development of the dental hygiene scholarly identity. At UCSF, faculty have been working on augmenting knowledge gained in research methodology courses with a critical knowledge of the dental hygiene discipline's research priorities in conjunction with learning how interdisciplinary approaches can be used in addressing these priorities central to the dental hygiene discipline.[3] Faculty also include existing published theories that inform the dental hygiene discipline to focus on substance and content.[4,5] The main curriculum objective is to prepare the graduate learners to use interdisciplinary and scientific approaches to address existing and emerging dental hygiene-related problems and to develop an original scholarly research project to study a specific problem of interest to the scholar and the dental hygiene discipline. This approach is designed to ensure not only high quality original research, but also the development of a disciplinary world view among the graduate dental hygiene learners that is more integrated and less fragmented. In doing so, the contribution dental hygiene researchers can make to interdisciplinary research is enhanced. Although developing an original scholarly research project is part of the course work, it will be discussed later in a separate section of this paper on high quality mentored research scholarship.

2. Socialization to the culture of DH scholarship

Masters-level dental hygiene graduate education that inspires the development of a dental hygiene scholarly identity includes professional socialization in addition to coursework. Professional socialization encompasses integrating course work with the norms and values of the discipline's culture that are fundamental to understanding the professional perspective.[1,6,7] In the opinion of the authors, socialization with respect to developing a dental hygiene scholarly identity is more than just learning the skills and behavior of research. Rather, it must include the importance of asking questions central to the dental hygiene perspective as defined in dental hygiene's definition of the discipline and its paradigm concepts (i.e., the Client, the Environment, Health/Oral Health and Dental Actions).[3-5] The process by which individuals are professionally socialized has been linked to a number of personal, situational and organizational factors throughout the lifespan.[8] The graduate learner's early professional socialization in dental hygiene master degree programs to a dental hygiene scholarly identity is of central importance because during their education and training, the values, behaviors and attitudes necessary to assume their professional role are critical to motivating a career in research scholarship. Brim describes socialization as preparing adults for roles so they will know what is expected of them, will meet those expectations and will desire to practice the expected behaviors.[9] In the UCSF master of science degree dental hygiene program, faculty strive to support and nurture a culture that values knowledge development as a way of life, rather than as a means to achieving a degree. Faculty consciously work to create an environment that nurtures the dental hygiene scholarly identity and to communicate to the graduate learner a sense of belonging to a community of dental hygiene scholars and to the larger community of university scholars. This socialization is done mainly through faculty whose role modeling emphasizes that rigorous science is valued. Faculty shares their own scholarly behavior to produce and communicate new knowledge and engage learners in scientific debate and critique of the literature in seminars, while also striving to communicate the respect for knowledge and science in every facet of the program, beginning with the admissions' materials and interviews. In addition, faculty often refer to graduates learners as the "future generation of dental hygiene thought leaders, educators and research scholars" to emphasize these attributes they hope they will aspire to achieve. Other strategies used to build and reinforce the scholarly identity among dental hygiene graduate learners are assigning literature reviews and/or interviews of dental hygiene scholars or scholars of other disciplines about a particular topic of interest and having the graduate learners present their findings as scholarly class presentations.

Finally, graduate learner peer interaction also plays a valuable role in socialization and development of a scholarly identity. Peer relationships encourage growth and risk taking, build confidence in the learner's new scholarly identity, help with problem solving and alleviating the isolation of being a new member to a group. Dialogues in seminars are especially helpful for peer-to-peer support, mentoring and idea sharing in addition to faculty guidance and role modeling.[10] A dental hygiene scholarly identity is not realized unless a whole culture is created to promote and nurture it.[11]

3. High Quality Mentored Scholarship

The development of a dental hygiene scholarly research project is the major objective of graduate dental hygiene education. This scholarly research project, whether it is a thesis or a Capstone Project, is expected to demonstrate the student's ability to independently develop knowledge related to the dental hygiene discipline. Both are documents submitted in support of candidature for the academic masters of science degree, presenting the author's research and findings in writing. The writ-

ten Capstone Project usually is limited to a 12 page manuscript presenting the author's research and findings in a format ready for submission to a scientific journal for publication. The written thesis is a more lengthy document consisting of 5 chapters addressing the Research Problem, the Literature Review, the Methods, the Results and Discussion, respectively, and can be as long as 100 pages or more. These mentored scholarly research projects afford learners the opportunity to study a specific problem of interest that relates to the discipline of dental hygiene.

At UCSF, during the proposal development phase, graduate learners write their original scholarly research proposal and defend it orally and in writing to a committee of 3 university research faculty. This defense, known as the oral qualifying examination, includes a clear research problem statement, a thorough literature review of what is known and unknown about the problem, clear statements of the research questions and/or hypotheses, the proposed research design, data collection methods, and statistical analyses. The defense also includes a statement of research relevance to the dental hygiene discipline and to other disciplines and target audiences. Once the proposal is approved by the Faculty Committee and the UCSF Institutional Review Board, the learners begin the implementation phase of their original scholarly research study by launching their field work. Upon completion of the field work, the learners defend their research and findings orally and in writing to faculty members of their committee. The written component of the scholarly Capstone Project is submitted in the form of a 12 page manuscript suitable for publication in a scientific journal. The approved oral defense and written manuscript comprise the required components of the Capstone Project.[2] Thus, at UCSF, the scholarly Capstone Project is comprised of disseminating results of the fieldwork both in a written scholarly format suitable for scientific publication and in an oral presentation suitable for a scientific meeting. This need for communication of findings to scholarly scientific communities highlights the importance of including scientific writing and oral presentations as a part of the curriculum.

Mentor Responsibilities

Mentors assist in identifying projects and overseeing the related field work. Mentorship, facilitated by a wise and trusted faculty member who guides and supports the graduate learner, is a critical aspect of a graduate dental hygiene program. Although each graduate student has a major mentor to guide their independent work, mentors may need to be "matched and re-matched" according to the needs of the developing scholar researcher.[1] For example, there may be a specific mentor for data collection or for presentation skills. One mentor may not be as well- versed in some areas that the graduate learner's project requires and helping that learner find other mentorship opportunities is another important part of high quality mentorship. This mentorship affords the learner varied opportunities to observe other scholarly role models, their work habits and communication styles.

Finally, a mentor needs to help the graduate learner participate in scholarly activities especially when it comes to written and oral communication. Being able to write for a scientific publication and to address the scholarly community and the public regarding scientific findings are skills the mentor will need to emphasize and offer the student numerous rehearsal opportunities. The mentor's role is not complete until the study or some aspect of it has been published.[1]

The Need for Doctoral Dental Hygiene Education

Given the oral health care challenges facing the nation today, doctoral-prepared dental hygiene scholars, researchers and leaders are needed to bring the dental hygiene discipline's perspective to the interdisciplinary problem-solving table.[12] Challenges, such as oral health disparities, the growing number of elderly with complex medical conditions, the changing needs for different numbers and types of providers to help address problems creates a need for dental hygiene capacity building to prepare academic leaders, scholars, researchers and educators with interdisciplinary research, and interprofessional educational experience and expertise, all support the need for doctoral dental hygiene education.

Indeed, oral health disparities are a major multifactorial challenge. Factors such as the current structure of the oral health care delivery system, mal-distribution of providers, lack of diversity among providers, restrictive regulatory statutes, geographic, educational and cultural barriers, oral health literacy, and financing of care are issues contributing to the problem.[13-15] In 2003, the Surgeon General released *A National Call to Action to Promote Oral Health*, highlighting that oral health is essential to health and wellbeing at every stage of life and urging the public, health professionals and policymakers to improve efforts to increase the affordability and accessibility of oral health care to the underserved.[14] The report urged partnerships at local, state and national levels to engage in programs to promote oral health and disease pre-

vention. Doctoral-prepared dental hygiene leaders and scholars are needed to help create effective evidence-based, interdisciplinary strategies to help solve these problems and to improve access to oral health care for all.

Other challenges to effective oral health care and dental hygiene education relate to the increasing evidence of the oral health-systemic connection,[16] and the growing number of elderly with chronic conditions that make collaborative coordinated health care management essential.[14] Inter-professional education has been defined as bringing students from various health care professions together to evaluate and treat clients in a team-based environment. Through this process dental hygiene students learn to function as a member of an inter-professional team and to carry such knowledge, skills, and values into practice.[17] Doctoral-prepared leadership in dental hygiene is needed to help establish academic guidelines and policies for integrating inter-professional components into dental hygiene education.

Moreover, the prevalence of managed care has led to changing needs for different numbers and types of providers. Expansion of the scope of practice and related changes in billing and payment rights create for some providers, such as dental hygienists, opportunities to redefine the boundaries between professions that deliver similar services and to train an interdisciplinary workforce.[14] Capacity building is needed for doctoral-prepared leaders, educators, scholars and researchers in dental hygiene to participate in interdisciplinary research, health care workforce discussions and to address innovation in educational programs required.

For all the above reasons, the development of doctoral dental hygiene programs is critical to help address the oral health challenges of our nation and elsewhere.[18] Dental hygiene doctoral programs would provide graduate learners with time to develop the skills needed to help confront contemporary challenges. For example, doctoral dental hygiene programs would offer the opportunity for dental hygiene graduate learners to extend their scholarly research skills, and to write research grants for funding to test innovative strategies to prevent oral disease and promote oral health. Funding from grant writing is key to conducting large-scale independent research. Experience in writing grants could be accomplished either by working with a mentor who is seeking research grant funding and actively participating in and supporting that effort, by encouraging and mentoring graduate learners to seek funding for their own independent research or by engaging in both strategies.[19] These doctoral activities would help graduate learners understand the grant writing process rather than fear it.

Most importantly, doctoral dental hygiene programs would provide time because of their length (3 to 5 years) for the graduate learners to become well-versed in a wide range of theories and research methodologies while at the same time allowing them to develop an in depth expertise in a specific theory and methodology to solve a problem of interest. Doctoral dental hygiene programs also would provide time for graduate learners to participate in residencies and on various interdisciplinary research projects of senior faculty. All of these mentored experiences would provide breadth and depth for the developing dental hygiene scholarly identity that is ongoing throughout one's entire scholarly journey. Indeed, doctoral education in dental hygiene would enhance the dental hygiene scholars' ability to meet faculty research and tenure requirements in research intensive universities.

To date, faculty in master level dental hygiene programs have made a herculean effort to squeeze the skills and experiences needed to prepare their learners for independent research into 1 or 2 years. This untenable situation needs to be changed in order for the discipline of dental hygiene to progress and make a significant contribution to interdisciplinary efforts to solve current oral health care issues. To further develop the dental hygiene discipline, dental hygienists who have the potential to become future dental hygiene scholars and scientists are entitled to a realistic academic experience similar to that received by doctoral students in other disciplines as they pursue their journey toward a scholarly future.

Conclusion

Dental hygienists' engagement in scholarship is a life-long enterprise that involves building a research program related to the dental hygiene discipline to promote oral health and oral disease prevention for all. Doctoral education in dental hygiene is the essential next step for progress in the discipline as dental hygiene enters its next hundred years. This type of advanced education will allow dental hygiene scholarly researchers to gain the skills, expertise, and interdisciplinary experience to help solve the many oral health challenges facing our nation and the world.

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Original Manuscript

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Advancing the Profession through Doctoral Education

Abstract: Doctoral education in dental hygiene is necessary to create a cadre of dental hygiene researchers and scholars, and to develop educators who will expand the body of knowledge for the profession. Dental hygienists with advanced degrees will require skill sets that parallel those of other professionals if they are to function productively as credible, equal members of interprofessional teams. Doctorally-prepared dental hygienists will be working as leaders, administrators and researchers, and will be influential in creating models that increase access to care, developing collaborative health care teams and improving health outcomes. The doctorate of philosophy is the terminal graduate degree for any discipline, and is the pinnacle for the profession. This paper explores the development of doctoral degrees for dental hygiene, and encourages educators to develop models for graduate programs based upon considerations presented here.

Keywords: doctoral education, graduate education, leadership, scholarship, research

Introduction

Dental hygiene was predicated on the notion that oral disease can and should be prevented. Over the course of the first 100 years of the profession, entry level education has focused on technical skill development to remove deposits that contribute to oral disease, and to teach clients how to prevent caries and periodontal diseases. Refinement and advancement of clinical skills continues to be a mainstay of dental hygiene education.

Since the 1980s, greater emphasis has been placed on the development of the discipline of dental hygiene through research, scholarship and advanced education. Six roles for dental hygiene were identified during a series of education and practice workshops: clinician, researcher, educator, administrator/manager, advocate and public health.[1] The American Dental Hygienists' Association (ADHA) responded to this initiative by creating documents that provided direction in how to approach scholarship and professionalization.[1,2]

During the early 1990s, the first National Dental Hygiene Research Agenda was created and validated.[3] Over the next 10 years, several refinements in the agenda were made to reflect the evolving nature of the contribution of research to the growth of the profession.[4,5]

In 2005, the ADHA published "Dental Hygiene: Focus on Advancing the Profession."[6] Within this document, the profession recognized that dental hygiene scholars were needed to lead the development of theory, and the acquisition and dissemination of knowledge unique to dental hygiene. Likewise, a shortage of dental hygiene faculty was recognized as a serious constraint for the continued progress of the profession. An aim recommended within this report was to create a doctoral degree program in dental hygiene. Recommendations were to:[6]

- Develop curricular models for both professional (doctor of science in dental hygiene) and academic (doctor of philosophy) doctoral programs in dental hygiene
- Conduct educators' workshops at professional meetings to promote the development of doctoral programs in dental hygiene
- Publish curricular models for dental hygiene professional journals

In addition, the International Federation of Dental Hygienists conducted a workshop for the House of Delegates members during their 2010 meeting in Edinburgh, Scotland. At that time, it was identified that advanced education universal to the international community was desirable.[7]

To date, curricular considerations for a doctoral degree program in dental hygiene have been pro-

Table I: Comparison of Doctoral Degree Options in Dental Hygiene

Characteristics	EdD in Dental Hygiene	DrSc in Dental Hygiene	PhD in Dental Hygiene
Roles	Creating and implementing models for interprofessional education	Improving the delivery of quality oral health care services and outcomes across populations	Discovering, testing and disseminating new knowledge
Curricular considerations	Courses in educational leadership, change strategies, educational policy and governance, issues and trends in higher education, instructional design and technology	Courses in global health advocacy, models of care, inter-professional systems, outcomes assessment, cultural diversity, health care technology	Courses in the development of a scholarly identity: advanced research designs, scientific writing, grantsmanship, inquiry and theory development, and dissertation and dissemination of research
Contributions to Profession	Cadre of educators to fill faculty shortages in academic institutions, and support dental hygiene entry level, degree completion and graduate programs	Cadre of clinicians to create systems to improve oral health outcomes working within inter-professional teams without supervision	Cadre of researchers and scholars who will propose, test and advance theories unique to the discipline

posed.[8,9] Workshops on doctoral dental hygiene education were offered at the 2012 American Dental Education Association Annual Session confirming the interest in the creation of doctoral programs.[10] Proponents of doctoral education support the development and implementation of a doctoral curriculum within the next several years that focuses on research, scholarship and global health advocacy.

Degree Options

Doctoral education in dental hygiene is designed to create a cadre of dental hygiene researchers and scholars, and to develop educators who will expand the body of knowledge for this dynamic profession. In considering the opportunities within this advanced education, the authors propose the pursuit and development of 3 types of doctoral degrees: the doctorate of education for those who wish to advance the education of dental hygienists and other health professionals, the doctorate of clinical science for those who wish to provide advanced clinical programs in a variety of health care delivery models or systems and the doctorate of philosophy for those who are interested in expanding the research dimension of the profession. A comparison of these 3 degree options appears in Table I.

Vision for Programs

In the next 100 years of dental hygiene, doctoral education for this discipline will expand based on the interest of hygienists to work in capacities beyond, yet including, research and academia. Table II offers career options for dental hygienists with this advanced education. From a practical standpoint, the reality is such that if dental hygienists want to assume these leadership positions, they will be required to hold a doctorate for consideration for employment. Further, there will be limited opportunities for promotion (or promotion and tenure in academic settings) without this advanced degree.

Table II: Examples of Career Options for Doctoral–Prepared Dental Hygienists

Position	Description
Leadership	• Director of state or federal health care agency • Head of state health department • Owner of an interprofessional practice • Executive Director of professional or health care organization • Dean of College or University • Head of a foundation or philanthropic organization
Research	• Head of Corporate Research and Development division • Academic bench or field researcher • Researcher employed by federal agency
Health Care Administration	• Health officer for school district • Director for health care management organization • Insurance officer for third party payers • Hospital administrator for acute and/or long-term care facilities

Skills Needed

Anticipating that dental hygienists with doctoral degrees will be working in interprofessional environments as leaders, administrators and researchers, additional skill sets are needed beyond clinical and technological areas. Expertise in business, administration and management, and grantsmanship are examples of areas that need to be fully developed. More importantly, these doctoral candidates will need to learn the arts of forecasting, decision-making, critical thinking and negotiation as visionaries for the profession.

Program Considerations

Educators are encouraged to develop models for these graduate programs. Considerations include academic home of the program, delivery of courses (in-class, hybrid, online), support for international students, degree requirements, recruitment of faculty, development of dissertation committees and inter-institutional agreements and relationships for collaborative teaching to maximize limited resources. Program feasibility issues include funding, student recruitment, sustainability and approval of appropriate agencies and boards. Practical considerations include ensuring that the program can be completed in a reasonable and timely manner, students perceive a measure of success from the program and that the program is affordable and accessible.

Justification

The challenge of creating doctoral degrees lies in the ability of dental hygiene educators to create the systems to support this advanced education. The desire has been known within the profession for 30 years. However, other health care providers who perceive dental hygienists to be "teeth cleaners" will not comprehend the creation of or need for these doctoral programs. Dental hygienists need to expand their skill sets to parallel those of other professionals if they are to function productively as credible, equal members of interprofessional teams. A terminal degree at the master's level is insufficient to support dental hygienists in the settings projected in Table II.

While it is important to advance the status of the profession itself, it is also important to acknowledge the inherent value of attaining a doctoral degree for one's own personal and professional achievement. The personal desire for advanced knowledge and skills also supports the professionalization of dental hygiene.

Conclusion

While dental hygiene should be applauded for the significant growth in the number of dental hygienists with doctoral degrees, it must be recognized that these individuals have been forced to obtain degrees outside of their own discipline. The current health care environment lends itself well to the creation of doctoral degrees in this discipline, and raising the core of existing dental hygiene professionals to meet the ever increasing number of opportunities in health care. The legislative and educational climate facilitates creating models that increase access to care, developing collaborative health care teams and improving health outcomes. Dental hygienists with advanced degrees can be considered for expanded roles in multiple arenas wherein they were previously ineligible due to their limited experience and education.

As we move forward in this process of designing doctoral degrees, it must be pointed out that it is the doctorate of philosophy that will be the pinnacle for the profession and is the terminal graduate degree for any discipline, including medicine and dentistry. The authors advocate this particular degree as the starting point for the creation of doctoral education so that dental hygienists achieve the same playing field and opportunities as other professions for research funding and post-doctoral education.

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Original Manuscript

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Keeping Current: A Commitment to Patient Care Excellence through Evidence Based Practice

Abstract: The desire to improve the oral health of clients begins with the hygienist's commitment to keeping current with useful scientific knowledge. The challenge is mastering the skills to discriminate between the many claims and what actually has been shown to be effective. One approach is through evidence-based decision-making (EBDM), which helps practitioners find relevant clinical evidence when it is needed for treatment decisions and for answering client questions. The purpose of this article is to discuss EBDM and its use in practice, potential challenges, future developments and resources that will assist in keeping current.

Keywords: Evidence-based Decision-Making, Evidence-based Practice, Cochrane, PubMed, pre-appraised evidence, Clinical Decision Support

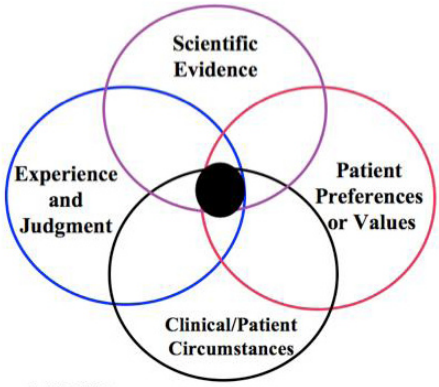
Introduction

The desire to improve the oral health of clients must start with the hygienist's commitment to keeping current with useful scientific knowledge. Most dental hygienists struggle with keeping up with the onslaught of information touting the latest innovations in oral health care. The challenge is separating the many claims from what actually has been shown to be effective in patient care. One approach is through evidence-based decision making (EBDM), which is specifically designed to help practitioners find relevant clinical evidence when it is needed to help make treatment decisions and to answer client questions.

What is Evidence-Based Decision Making?

EBDM is defined as "the integration of best research evidence with our clinical expertise and our patient's unique values and circumstances."[1] Thus, optimal decisions are made when all components are considered (Figure 1). EBDM is not unique to any specific health discipline and focuses on the decision-making process, which is why it is referred to here as EBDM or evidence-based practice (EBP) rather than evidence-based dentistry or evidence-based dental hygiene.

Figure 1: Evidence-Based Decision Making



Milestones in the Evolution of EBDM

1. The Birth of Evidence Based Medicine – McMaster University, Ontario Canada

In 1981, David Sackett, along with a group of clinical epidemiologists at McMaster University, published articles advising clinicians how to read clinical journals.[2] The group proposed the term "critical appraisal" and recognized its value in using the approach of identifying the best evidence to solve patient problems. This approach to medical care represented a fundamental change of practice and warranted a new term that would capture this difference. In 1990, Gordon Guyatt proposed the term "evidence-based medicine" (EBM).[3] The approach took hold and began to spread to other health care disciplines. In 2007, the development of EBM by researchers at McMaster University was recognized as one of the 15 greatest medical breakthroughs since 1840.[4] Table I provides a summary of the milestones in the evolution of EBDM.

Table I: The milestones in the evolution of EBDM

Year	Point of Interest	Description
1972	Archie Cochrane writes Effectiveness & Efficiency: Random Reflections on Health Services.	• Acknowledgement of the medical professions lack of evidence behind many of the commonly accepted health care interventions at the time. Promoted the use of scientific evidence to evaluate health services.
1979	Archie Cochrane publishes an essay in which he states, "It is surely a great criticism of our profession that we have not organized a critical summary... of all relevant randomized controlled trials."	• Move towards gathering and organizing the research related to a specific topic and developing systematic reviews. Cochrane's call for an organized database of RCTs served as an impetus for the formation of the Cochrane Collaboration.
1981	Canadian Medical Association Journal (CMAJ) publishes a series of articles by David Sackett on how to read clinical journals.3	• David Sackett, MD, at McMaster University, Ontario, Canada suggests bringing critical appraisal to the bedside, changing the philosophy of medical practice so that it is based on knowledge and understanding of the literature supporting clinical decisions.
1990 to 1991	Gordon Guyatt coins the term "Evidence-Based Medicine" and uses it in a publication, the ACP Journal Club.4	• Gordon Guyatt, MD, at McMaster University uses the term "Evidence-Based Medicine" to represent the fundamental change of medical practice initiated by his mentor, David Sackett.
1993 to 2000	JAMA publishes a series of articles, Users' Guides to the Medical Literature.	• Gordon Guyatt and the EBM Working Group expand the Sackett CMAJ 1981 series and produce a series of 32 papers on 25 topics ,describing different types of medical questions and the study designs that may answer them.
1992 to 1993	First Cochrane Centre opens in Oxford, UK	• The first Center becomes registered. Renamed the UK Cochrane Centre in 1993; the first of 52 Centers located around the world.
1993	Canadian Cochrane Centre opens	• The Canadian Center becomes registered
1993	First Cochrane Center in the U.S. opens in Baltimore	• Baltimore Center moves to New England and then becomes the United States Cochrane Center in 2002
1993	Formal launch of the Cochrane Collaboration in Oxford, UK	• A collaboration of Cochrane Centers is formally established
1993	NLM begins to identify clinical trials in MEDLINE using Cochrane Collaboration information	• National Library of Medicine agrees to re-tag clinical trials using information from the Cochrane Collaboration
1994	Cochrane Oral Health Group established	• The Cochrane Oral Health Group is one of the first groups to register and is currently located at the University of Manchester.
1998	Evidence Based Dentistry journal established	• Published by Nature, http://www.nature.com/ebd/index.html
1999	National Center for Dental Hygiene Research receives EBDM grant and establish the EBDM website, www.usc.edu/ebnet	• Jane L Forrest and Syrene Miller receive HRSA, BHP, DHHS Grant to train interdisciplinary teams in EBDM and how to integrate it into Dental Hygiene curricula.
2001	Journal of Dental Hygiene publishes the White Paper on the EBDM Model for Dental Hygiene Education, Research & Practice	• Jane L Forrest receives contract from ADHA to prepare the White Paper on Evidence Based Decision Making for dental hygiene.
2001	American Dental Association adopts definition of Evidence-Based Dentistry	• ADA definition: Evidence-based dentistry (EBD) is an approach to oral health care that requires the judicious integration of systematic assessments of clinically relevant scientific evidence, relating to the patient's oral and medical condition and history, with the dentist's clinical expertise and the patient's treatment needs and preferences.

Table I: The milestones in the evolution of EBDM (continued)

Year	Point of Interest	Description
2001	Journal of Evidence Based Dental Practice launches its first issue	• Published by Elsevier, http://www.jebdp.com/
2002	JAMA publishes the book, Users' Guides to the Medical Literature, A Manual for EB Clinical Practice.	• The JAMA journal series is edited to serve as the basis for the book, and expands it to include understanding sources of bias, how to better teach EBM, and key concepts in applying research to patient problems.
2003	1st International Conference on Evidence-Based Dentistry for dental professionals	• Sponsored by The Journal of Evidence-Based Dental Practice, editor Michael G Newman, Mosby, Elsevier and the Task Force On Design and Analysis
2005	2nd International Conference on Evidence-Based Dentistry for dental professionals	• Sponsored by The Journal of Evidence-Based Dental Practice, editor Michael G Newman, Mosby, Elsevier
2007	ADA Establishes Center for Evidence Based Dentistry	• Center develops resources to help dentists integrate clinically relevant scientific evidence at the point of care. The Center facilitates access to the best available scientific information related to oral health care, and develops evidence-based resources for use in clinical practice.
2007	ADHA establishes Policy on Evidence Based Practice	• The practice of EB DH requires the integration of individual clinical expertise and client preferences with the best available external clinical evidence from systematic research. 1-07
2007	EBM recognized as one of the 15 greatest medical breakthroughs since 1840.	• British Medical Journal publishes Medical Milestones 2007 identifying EBM by researchers at McMaster University as one of the 15 greatest medical breakthroughs since 1840.
2008 to Present	1st EBD Champions Conference to train dental practitioners held in 2008 and now is an annual program, which also includes opportunities for dental hygienists to attend	• The goal of the Champion's Program is to develop a network of dentists/hygienists that will serve as a resource to their local communities by promoting the application of an evidence-based approach to patient treatment and prevention of disease. Sponsored by the ADA, and initially with support from the Journal of Evidence-Based Dental Practice/Elsevier and P&G.
2008	3rd International Conference on EBD	• Sponsored by the Journal of Evidence-Based Dental Practice (JEBDP), in partnership with the American Dental Association and P&G.
2009	ADA Center for Evidence Based Dentistry Website	• Provides systematically assessed evidence as tools and resources to support clinical decisions. Sections include Systematic Reviews & Summaries, ADA Clinical Recommendations and Resources.
2009	Evidence-Based Decision Making: A Translational Guide for Dental Professionals	• Textbook for use in dental hygiene and dental education programs, as well as in private practice. Discusses the concepts and skills needed for EB Practice through the use of cases, application activities and quizzes. Jane L Forrest, Syrene Miller, Pam Overman & Michael Newman authors.
2009	ADA/Forsyth Course on EBD	• The ADA Center for Evidence-Based Dentistry collaborates with The Forsyth Institute (Cambridge, MA) to offer a one-week intensive course on evidence-based dentistry (EBD).
2013	ADA CODA Standards for Accrediting Dental and Dental Hygiene Programs	• Implementation of new CODA standards requiring critical thinking, problem solving and EB patient care
2013	Cochrane Collaboration Celebrates 20 years	
2013	Dental Hygiene Celebrates 100 Years as a Profession	

2. The Cochrane Collaboration – Advocacy for Using Evidence

Concurrently, another approach contributing to EBP was developing in England based on the work of Archie Cochrane, a British epidemiologist, who advocated for the use of randomized controlled trials (RCTs) as a means of reliably informing health care practice.[5] Later, after realizing that reading independent RCTs might provide conflicting information, he promoted organizing a database of RCTs and synthesizing their findings around specific health conditions.[6] This eventually led to the development of the Cochrane Collaboration, a world-wide independent, not-for-profit organization comprised of 52 review groups, making it the largest organization committed to preparing systematic reviews to facilitate medical decision-making. These systematic reviews (and meta-analyses), known as Cochrane Reviews, are published online in The Cochrane Library.

The Cochrane Oral Health Group is one of the 52 review groups. Since 1994, the Oral Health Group has published 132 systematic reviews and is investigating 66 new protocols.7 Many of the 132 reviews support the preventive and therapeutic care provided by dental hygienists, and therefore Cochrane Reviews are a very important resource for keeping current. Also, the impact of the Oral Health Group's publications puts it in the top 3 journals of dentistry, behind the Journal of Clinical Periodontology and the Journal of Dental Research.[7]

3. Tools to Tame PubMed

Since 1997, PubMed has provided free access to the MEDLINE, the largest scientific database, and the number of citations has steadily increased to over 22 million. As the peer reviewed literature has been digitally stored and made accessible, its growth has made it nearly impossible for practitioners in every field to keep current. Fortunately, PubMed has recognized this problem and has developed evidence-based short-cuts called filters to help retrieve different article types, such as those based on study designs. This, in turn, allows the user to be very efficient in searching for Systematic Reviews (SRs) and Meta-Analyses (MAs) and Practice Guidelines (PGs), the highest levels of evidence.

In addition to doing a traditional PubMed search, a valuable feature for busy professionals is PubMed Clinical Queries, which directly uses evidence-based filters. For example, typing in the search terms on the Clinical Queries page automatically finds citations for SRs, MAs, reviews of clinical trials, evidence-based medicine, consensus development conferences and PGs. Thus, both PubMed search mechanisms allow for searching electronically across hundreds of journals at one time and being able to filter the results to the highest levels of clinically relevant evidence. In addition, PubMed has a mechanism that allows the user to receive email notifications when new articles are published on a specific topic of interest making it more convenient to stay current on that topic.

4. CODA Adopts EBP Accreditation Standards for Dental Hygiene

Another evidence-based practice milestone is reflected in the CODA Accreditation Standards for Dental Hygiene Programs requiring students to master the skills required for EBDM.[8] Graduating dental hygienists must be competent in providing patient-centered treatment and evidence-based care in a manner minimizing risk and optimizing oral health (Standard 2-17,).[8] This has implications for both the curriculum and faculty development. EBDM will require much greater emphasis placed on research in an already jam-packed curriculum and translating classroom learning into application on the clinic floor.

Using Evidence in Practice

The EBDM movement has come very far in a relatively short time, however, the challenge for all health care practitioners, including dental hygienists, is to integrate EBDM into clinical practice. For example, how would one respond to a client who questions how adequate an oral cancer screening was performed since neither of the adjunctive devices that she saw on a popular daytime TV show were used? Or, how would one respond to clients who refuse to have radiographs taken because a report on the evening news discussed a possible association between dental x-rays and Meningiomas? Finally, how does one respond to a client who has always taken an antibiotic prior to treatment and now questions why he no longer needs to be premedicated? Knowing how to answer these questions requires skills in:

1. Efficiently finding the most current scientific information
2. Understanding the research design, the data/findings, and the level of evidence that was obtained
3. Knowing how to present this information in a way that the client understands it and can make an informed decision

While EBDM is now incorporated into dental hygiene education, this is a fairly recent occurrence. Many will still be unfamiliar with the skills to practice EBDM.

Table II: Pre-Appraised Evidence Resources

Level 6 Clinical Decision Support Systems: Interactive Drug Databases	
ClinicalKey, Elsevier	http://www.clinicalkey.com
Lexi-Comp, Inc. Comprehensive drug database; Interactions	http://www.lexi.com
Natural Standard – Integrative Medicine with Evidence Based Grading system	http://www.naturalstandard.com/
UpToDate	http://www.uptodate.com
Level 5 Summaries: Clinical Practice Guidelines	
American Academy of Pediatric Dentistry (AAPD)	http://www.aapd.org/media/policies.asp
American Academy of Periodontology	http://www.perio.org/resources-products/posppr2.html
ADA Clinical Recommendations	http://ebd.ada.org/ClinicalRecommendations.aspx
ADHA, Position Papers and Consensus Statements	http://www.adha.org/profissues/index.html
American Heart Association	http://my.americanheart.org/professional/Statements-Guidelines/Statements-Guidelines_UCM_316885_SubHomePage.jsp
Centers for Disease Control and Prevention	http://www.cdc.gov/OralHealth/guidelines.htm
PubMed (Article type - Limit to Practice Guideline)	http://pubmed.gov
Scottish Intercollegiate Guidelines Network	http://www.sign.ac.uk/guidelines/index.html
The evidence-based dental library	http://www.ebdlibrary.com
Level 4 Synopses of Systematic Reviews: Critically appraised Systematic Reviews	
ADA Center for Evidence-based Dentistry (Critical Summary)	http://ebd.ada.org/SystematicReviews.aspx
Database of Abstracts of Reviews of Effects (DARE)	http://www.crd.york.ac.uk/crdweb/SearchPage.asp
PubMed (Look for Comments on Systematic Reviews)	http://pubmed.gov
Evidence Based Dentistry journal	http://www.nature.com/ebd/index.html
Journal of Evidence-Based Dental Practice	http://www.jebdp.com
Level 3 Systematic Reviews:	
ADA Center for Evidence-based Dentistry	http://ebd.ada.org/SystematicReviews.aspx
Cochrane Database of Systematic Reviews	http://www.thecochranelibrary.com
PubMed (Article type filter - Limit to Systematic Review)	http://pubmed.gov
Evidence Based Dentistry journal	http://www.nature.com/ebd/index.html
Journal of Evidence-Based Dental Practice	http://www.jebdp.com
Level 2 Synopses of Individual Studies: Critically Appraised RCTs	
Database of Abstracts of Reviews of Effects (DARE)	http://www.crd.york.ac.uk/crdweb/SearchPage.asp
PubMed (Limit to RCT or Clinical Trial. Look for Comments)	http://pubmed.gov
Evidence Based Dentistry	http://www.nature.com/ebd/index.html
Journal of Evidence-Based Dental Practice	http://www.jebdp.com
Level 1 Original Studies: Individual Research Studies (Original studies and not pre-appraised)	
PubMed (Article type filter - Limit to RCT or Clinical Trial)	http://pubmed.gov
Journal Publications i.e. JDH, IFDH Journal, dental specialty groups, etc.	http://www.adha.org/publications/index.html http://jada.ada.org/ http://elsevier.com

Table IV: Strategies for Getting Started on Integrating Evidence Based Decision Making

1. Read articles on EBDM and/or complete online CE courses that provide an overview EBDM and how to search PubMed.
   a. A 2-part series in JEBDP explains EBDM and the skills needed to use an EBDM approach.
      - Forrest JL, Miller SA. Translating Evidence Based Decision Making into Practice: EBDM Concepts and Finding the Evidence. J of Evidence-Based Dental Practice, June 2009; 9(2):59-72.
      - Miller SA, Forrest JL. Translating evidence-based decision making into practice: appraising and applying the evidence. Journal of Evidence-Based Dental Practice, 2009;9(4):164-182.
   b. Complete 2 online continuing education courses on EBDM and Searching the Literature Using PubMed:
      - Forrest JL. Evidence-Based Decision Making: Introduction and Formulating Good Clinical Questions. Listed under Electives, http://www.dentalcare.com/en-US/home.aspx
      - Forrest JL, Miller SA. Strategies for Searching the Literature Using PubMed. Listed under Electives, http://www.dentalcare.com/en-US/home.aspx

2. Complete the PubMed Tutorial. Short YouTube videos explain different aspects of PubMed, which helps in taking full advantage of the databases: http://www.nlm.nih.gov/bsd/disted/pubmedtutorial/

3. Review research designs and levels of evidence. Provides graphical display of designs and explanations.
   a. Guide to Research Methods, the Evidence Pyramid http://library.downstate.edu/EBM2/2100.htm

4. Begin listing patient problems or questions and apply the EBDM process.
   a. Could be related to new technology, drug therapies, dosing regimens, techniques or products; use of materials, equipment or instruments for new situations; or for cases in which there is an inadequate response to therapy.
   b. Follow steps for online searching to answer the questions
   c. Evaluate the evidence found:
      - What level of evidence was found?
      - Was it what you expected?
      - Did you apply it to your decision-making? If not, why not?
      - What were the patient outcomes?
   d. Evaluate the process:
      - Was the PICO process followed?
      - Were MeSH terms used?
      - Which search strategy was used and which one was more efficient?

Mastering the skills of EBDM can help dental hygienists identify the best evidence to solve patient problems. However, other challenges may be encountered. Even when a search yields a citation that seems perfect to answer a clinical question, much of the scientific literature is not available for free. Partnering with an academic institution may assist with access to full text. Once the best evidence is found, translating the findings into clinical practice is another potential barrier. One of our human traits is to hold cognitive biases. When new evidence goes against current beliefs, we find ways to discount that evidence. When there is conflicting evidence or uncertainty, we tend to stick with what we have always done. Academic institutions are wrestling with these barriers as they work to make their educational programs models of evidence based practice. EBDM is evolving and improving to help clinicians overcome these barriers.

Future Developments to Support Clinical Decision Making

A recent development in EBDM is clinical decision support (CDS). CDS systems have their greatest potential at the point-of-care, i.e., chairside, using an electronic dental record integrated with a large patient database and algorithms that help sort and present evidence-based recommendations. These types of systems are more advanced in medicine, where as patient-specific information is entered, individual patient characteristics are automatically linked to the current best evidence that matches his or her specific circumstances. This can assist the

Table III: Skills and Abilities Needed to Apply an Evidence-Based Decision-Making Process[1]

1. Convert information needs and problems into clinical questions so that they can be answered.
2. Conduct a computerized search with maximum efficiency for finding the best external evidence with which to answer the question.
3. Critically appraise the evidence for its validity and usefulness (clinical applicability).
4. Apply the results of the appraisal, or evidence, in clinical practice.
5. Evaluate the process and your performance.

clinician by suggesting appropriate care or warning about adverse effects.[9]

CDS systems provide clinicians with knowledge and person-specific information (such as computerized alerts and reminders) rather than general guidelines.[10] "The goal of CDS is to provide the right information, to the right person, in the right format, through the right channel, at the right point in workflow to improve health and health care decisions and outcomes."[11] In dental hygiene, the best CDS are drug databases, which can be accessed chairside over the internet by computer and mobile devices. By linking to one of several drug database websites, detailed information about a particular drug and drug interactions can be obtained. As with all patient information, one must be careful when using personal/mobile devices so that confidentiality is maintained to prevent any HIPAA violations of protected patient information.

The infrastructure to support EBDM at the point of care is evolving. However, until electronic patient records are fully integrated with a CDS system, evidence resources can be accessed via the internet. Table II presents examples of resources that support CDS. Levels 2 through 6 provide access to preappraised evidence, which means that the research evidence has undergone a filtering process to include only those studies that are of higher quality, and they are regularly updated so that the evidence accessed through these resources is current.[12]

Getting Started

Recognizing that clinicians have time constraints and yet want to provide the best possible care to their patients, an evidence-based approach provides an effective strategy for keeping current. It also requires understanding new concepts and developing new skills (Table III). Many of the resources listed in Table IV can assist in learning these concepts and skills, and are free. For example, the PubMed tutorial presents information on its key features in short segments, some of which are YouTube videos. The online CE course on "Strategies for Searching the Literature Using PubMed" walks the user step-by-step through how to conduct a traditional and Clinical Queries search. For those who have not had a research design course or who need a refresher, the Guide to Research Methods, the Evidence Pyramid provides a graphical display and explanation of research designs and levels of evidence.

Understanding evidence-based methodology and distinctions between different types of research allows clinicians to better judge the validity and relevance of reported findings. Being able to search electronically across hundreds of journals at the same time using PubMed overcomes the challenge of finding relevant evidence when it is needed to make a well-informed decision. Ideally, accessing new research that is valid, easy to read and preappraised will make keeping current the norm for practice, and in the future, further development of CDS will help clinicians implement EBDM in real time by linking electronic patient records with evidence based resources.

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Original Manuscript

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Interprofessional Collaboration: If Not Now, When?

Abstract: Interprofessional collaboration (IPC) is a driving force behind state-of-the art health care delivery. Health care experts, governmental bodies, health professions organizations and academicians support the need for collaborative models. Dental hygienists possess unique qualities that can enhance a collaborative team. As preventive therapists, health educators and holistic providers, they are positioned to contribute richly and meaningfully to team models. Health care reform, overwhelming oral health needs and growing associations between oral and systemic wellness add to the dental hygienist's relevance in collaborative arrangements. Dental hygiene clinical and educational models that speak to collaboration are operational in many U.S. states and the future bodes well for their continued growth.

Keywords: interprofessional education, interprofessional collaboration, advanced dental hygiene practice models, Interprofessional education collaborative (IPEC)

Introduction

Interprofessional collaboration is a term that is gaining recognition and momentum. Although definitions vary, interprofessional collaboration is seen as an approach to health care that creates a positive and helping environment to provide care and advise patients. It has been called a "partnership between a team of health providers and a client in a participatory collaborative and coordinated approach to shared decision making around health and social issues."[1] Elements of collaborative practice include responsibility, accountability, coordination, communication, cooperation, assertiveness, autonomy, mutual trust and respect.[2]

Success with interprofessional collaboration is contingent upon interprofessional education (IPE). In essence, interprofessional collaboration cannot be realized IPE. IPE has been defined as "members or students of two or more professions associated with health or social care, engaged in learning with, from and about each other."[3,4] IPE facilitates the sharing of skills and knowledge between professions, thereby promoting a better understanding, shared values and respect for the roles of other health care professionals.[4,5] IPE affords students the opportunity to place value on working within interprofessional teams before they begin to practice.[6]

Team-based practice has been a mantra in health care delivery for decades, however, little has been done to normalize, embolden or translate it into patient care delivery and outcomes. Persistent problems plaguing health care delivery systems remain. The state of health care requires broad brush strokes to move from crisis, to reform, to effectiveness. As early as 1978, the Institute of Medicine (IOM) raised the question of teamwork and asked "how should we educate students and health professionals in order that they might work in teams?"[7] The IOM Report on Dental Education highlighted the relevance and necessity of teamwork, but specifically focused on oral health professions education.[8] The report encouraged dental education to break down barriers to avoid professional silos and to adopt a more liberal stance regarding the scope of practice for allied health professionals. Although the report initially met with some positive response, for the most part, it did not result in dedicated change.

A recent hallmark document, the Lancet report, reiterated the problems elucidated in the 1970s. The report described professional education as "fragmented, outdated, and static" with "curricula that produce ill-equipped graduates … a mismatch of competencies to patient and population needs; poor teamwork; narrow technical focus without broader contextual understanding; episodic encounters rather than continuous care; predominant hospital orientation at the expense of primary care; quantitative and qualitative imbalances in the professional labor market; and weak leadership to improve health-system performance."[9]

Interprofessional education and collaboration are viewed as possible antidotes to the persistent problems in U.S. health care delivery.[8-11] The "so-called tribalism of the professions—i.e., the tendency of the various professions to act in isolation from or even in competition with each other" – is identified as a key reason that change has floundered.[9] A consortium of leaders in the U.S. representing a diverse group of health professions' organizations met to address some of the current health care problems with interprofessional collaboration and IPE as the focus. Their concerted efforts culminated in a consensus statement with recommendations for how health professions' curricula could be redirected to attain interprofessionalism in education and practice.[10] The American Dental Education Association represented oral

health professionals in this interprofessional collaboration. The document developed entitled "Core Competencies for Interprofessional Collaborative Practice" (IPEC) provides a roadmap for developing and implementing IPE into academic programs.[10] The four key domains of IPE address teamwork, communication, professional responsibilities and ethics and values. Within each domain, specific competencies for incorporation into community, clinical and didactic learning experiences were developed. The ultimate goal of the initiative is to bring more collaborative practice to health care delivery.

The advanced dental hygiene practitioner, as a partner in a collaborative model, offers a viable option for bringing oral health to the forefront.[12-14] Several dental hygiene advanced therapy models are operational while others are in a developmental stage.[15] Ideally, the dental hygienist serving in a collaborative capacity should possess the requisite knowledge, skill set and critical thinking capabilities for practice in stand-alone delivery settings such as rural clinics, community health centers, long term care facilities, in assisted living arrangements and hospitals. The advanced dental therapist educational model enables dental hygienists to meet these requirements. The Advanced Dental Therapists in Minnesota are an example of advanced practitioners who deliver care to diverse underserved groups who might otherwise not receive dental services.[13] Many of these groups require the oversight of a collaborative team. Interdisciplinary dialogue, patient care, consults and referrals naturally evolve from collaborative practices. The advanced practice dental hygienist is positioned to collaborate with health professionals from multiple disciplines such as nutritionists, nurses, physicians and social workers. Innovative dental hygiene practice models are inherently collaborative.

An environment that welcomes the advanced dental therapist or practitioner collaborative model considers financial, socioeconomic, political and demographic variables.[16] Usage of an advanced dental hygiene practitioner could reduce third party costs and provider salaries. Since prevention is a key piece of the collaborative model, long term costs for health care could decline if extensive curative measures could be curtailed.[8-11] A decline in the number of dentists also predicates the need for a larger scope of practice for dental hygienists.[15-17] In instances where cost-effectiveness is crucial, a facility may want to hire a dental hygienist rather than a dentist. The advanced dental therapist could use teledentistry for immediate dental consultation, should the need arise during patient treatment. Further, access problems could be addressed by providing care to underserved population groups. With health care reform's expected increase in patients eligible for oral health services, the presence of an advanced therapist could be essential.[18,19] Public health issues, populations requiring immediate attention, and existing, yet inefficient, health care delivery systems serve as platforms for collaboration.[8-12,14] With the growing recognition that oral health is pivotal to systemic health,[20] dental hygienists can assess patients' oral well-being and triage with nursing professionals (e.g., nurse practitioners), physicians and social workers to treat the elderly in hospitals, long term care facilities and in assisted living arrangements. Dental hygienists can address the impact that oral concerns have on patients' nutritional well-being, self-esteem and systemic disease (e.g., pneumonia). The geriatric epidemics of obesity, high blood pressure and diabetes are conditions that dental hygienists can screen for and address.

From a public health population perspective, dental hygienists working in collaborative models can reach a diversity of patients including the underserved pediatric population and hospital in-patients. As oral health preventive specialists, dental hygienists can reduce chronic childhood oral disease. Young children and toddlers suffering from early childhood caries require the attention of a team of providers. Compromised nutrition retards normal growth and untreated dental caries subjects children to needless pain. Dental hygienists can work side-by-side with pediatric dentists, pediatricians and social workers. In hospital environments, dental hygienists can triage with oncologists, nephrologists, nurses and doctors of obstetrics and gynecology as they deliver prophylaxes and offer cancer patients palliative options for oral comfort, ensure that patients receive prophylactic oral care prior to dialysis and educate new mothers about proper oral health for themselves, their fetuses and infants.

Rural states that encompass large geographic areas with limited numbers of dental providers offer an environment amenable to advanced practice, and broadened scopes of practice for dental hygienists do exist.[14] In states where there is a more limited scope of dental hygiene practice, alternative models affording collaboration still must be considered. Building on the advanced dental therapist model, interdisciplinary specialty tracks can be developed. Dental hygienists could be educated as geriatric dental nurses who specialize in the treatment of the elderly and hold a certificate in gerontology. Advanced certifications and degrees enrich practitioners' medical knowledge. In constituencies where practice acts constrain the services dental hygienists provide, perhaps co-therapy practice with physicians and nurse practitioners is warranted. If supervision is the legal term used, dentists need not be the sole supervisors, particularly in collaborative practices.

An advanced education is a major ingredient for professional accountability, respect and successful collaboration. Educationally-based collaborative models must adhere to high standards. Advanced dental therapists should hold at least a baccalaureate degree with graduate education most desirable.[12,14] To move forward, the

dental hygiene profession needs to seek partners outside of dentistry to provide support and collaboration. As health care providers continue to recognize the importance of oral health, dental hygiene will move beyond professional tribalism and be a true collaborative partner. Astute providers also recognize that prevention is the key to optimal oral and systemic health and is a means to lower health expenditures. Dental hygienists' preventive orientation and knowledge regarding the oral systemic link enhances their contributions in the collaborative setting. The IPEC report states that when "professional teams work collaboratively, they value one another's perspectives and contributions, they understand and appreciate true teamwork, they communicate effectively, and share an ethical code that is premised on just and high quality care."[10] Dental hygienists, as members of a collaborative team, have the dedication, knowledge base and desire to fulfill these expectations.

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Original Manuscript

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The Intersection of Education and Technology at the Century Mark

Abstract: Since the inception of dental hygiene in 1913, we have witnessed the tremendous evolution of the profession. Within the past couple two decades a significant game changer has been technology. The ability to expand access to education through technology has resulted in an increasing number of dental hygienists seeking advanced degrees and gaining new skills and certifications. The evidence shows that dental hygienists are using their advanced education to address lack of access to oral health care services. The profession should remain focused on advocating for the increased education of the dental hygienist, by finding solutions to barriers that presently prevent the realization of this ultimate advancement.

Keywords: dental hygiene, dental hygiene education, technology, access to care

Introduction

A Historical Perspective

Dental hygiene has been practiced throughout the ages. Several years ago it was reported that two molar teeth of a Neanderthal were found to have grooves formed by the passage of a pointed object, which suggests the use of a small stick or grass stalks for cleaning the mouth.[1,2] In 1844, the *American Journal of Dental Science* carried an editorial titled "Dental Hygiene."[3] Many dentists in the United States throughout the 1800s and early 1900s began to experiment with dental hygiene, researching the effect of dental hygiene on their patients and lecturing on this evolving science. Dr. Alfred Civilian Fones actually attended a few lectures on this new concept before becoming this preventive science's most famous advocate.[3,4]

After implementing dental hygiene into his dental practice for years, Fones educated the first dental hygienist, Irene Newman. She went on to treat patients in Dr. Fones' practice. In 1913, he started the Fones School of Dental Hygiene by recruiting experienced professors and experts in medicine, basic science, public health and dentistry from Yale University, Harvard University, Columbia University and the University of Pennsylvania.[5,6] Fones' original school actually continues to educate dental hygienists today at the University of Bridgeport in Bridgeport, Connecticut (Figures 1, 2).

Fones is credited for writing the first textbook in dental hygiene entitled *Mouth Hygiene* and the first textbook on dental hygiene for dental schools entitled *Preventive Dentistry*.[7,8] Since publication of these first textbooks and initiation of coursework, dental hygiene education has evolved. Although dental hygiene education originally began as a 1-year program, in 1919, the University of Minnesota began a 2-year program. By 1939 the University of Michigan offered a baccalaureate degree program in dental hygiene, followed by the establishment of Master's degree programs at the University of Michigan, Columbia University and the University of Iowa during the 1960s.[9]

The American Dental Association established a Council of Dental Education to oversee education programs in dentistry and dental hygiene in 1937, and within the next decade required all dental hygiene programs to be at least 2 years in length with a detailed curriculum standard, followed by the accreditation standards that went into effect in the early 1950s.[9] In 1962, the National Dental Hygiene Board Examination was developed. All states eventually adopted the national accreditation standards and board examination, with the exception of Alabama.[10]

From the beginning, Fones saw dental hygiene as a distinct profession and thought it should be positioned within dental public health, as opposed to being offered only in private dental practices. His far-sighted plan for dental hygiene included the provision of education and treatment outside of the dental office and emphasized the utilization of dental hygienists as outreach workers, who would bring patients in need of restorative dental care to private dental practices.[3,5]

Figure 1: Fones School of Dental Hygiene (early 1900s)

Figure 2: Fones School of Dental Hygiene Today

Table I provides further examples of Dr. Fones' vision for dental hygiene.

In many ways today we see dental hygiene returning to its roots per se, and Fones' original vision. The utilization of dental hygienists in school-based health centers is increasingly being practiced across the country to help improve access to and use of dental preventive care. In response to the National Call for Action, the American Dental Hygienists' Association has adopted the creation of a dental hygiene mid-level oral health provider to provide not only preventive services, but also much needed restorative dental care to underserved populations.[11] This model has already been established in Minnesota and is being discussed as a possibility in several other states.[12]

The American Dental Hygienists' Association's environmental scan entitled Dental Hygiene at the Crossroads of Change[13] focused on the premise that although many dental hygienists will work as they always have, some will be drawn to become pioneers in moving the profession to new places and seeking additional mechanisms to promote oral health. The report further suggested that although the job market would continue to be competitive for dental hygienists, that new opportunities would emerge for dental hygienists in nontraditional settings and that expanding access to oral health care may also be an influence on the dental hygiene job market.[13] In order for dental hygienists to embark on new career opportunities it will be necessary that advanced educational opportunities be provided that equip them with the skills and competencies required for success.

Dental Hygiene and the Influence of Technology

Since the release of the landmark Surgeon General's Report on Oral Health in 2000 there has been much attention given to expanding access to oral health care services.[14] This manuscript draws reader's attention to another issue, that of expanding access to education for dental hygienists, and by expanding access to education we ultimately are able to expanded access to care. One cannot pick up a newspaper, check email or follow the internet without reading something about distance and online education. The Babson Survey Research Group published their tenth annual report on the state of online learning in U.S. higher education.[15] Their research has documented a decade of increased online enrollments that has far exceeded general enrollment in higher education. Their 2013 report documents that 32% of college students, or a total of 6.7 million students, report taking at least 1 online course, an all-time high. Dental hygiene education has responded to the issue of expanding access to education through the development of distance and online learning. In 1999 the first degree completion program went to online delivery at the University of Missouri-Kansas City, followed in 2000 by their graduate degree program.[16] The ability to utilize technology to increase access to higher education has been a game changer around the world, but specific to dental hygiene education, distance education has provided the opportunity for individuals desiring to advance their degree, but unable to move, a way for meeting their goals. Today there are 44 online degree completion programs and 16 online graduate programs in dental hygiene education.[17] As we continue to work on solutions for expanding access to oral health care services, distance and online education is finding a role in assisting dental hygienists to obtain additional education and certification for expanding their scopes of practice. For example, the University of Missouri-Kansas City Division of Dental Hygiene has offered an online dental public health course since 2006, which is specifically aimed at preparing dental hygienists to work in expanded roles and is the result of legislative changes in the dental practice act.[18] This course assists practicing dental hygienists in obtaining an Ex-

Table I: Thoughts from the Writings of Dr. Alfred Fones, Founder of Dental Hygiene, Compared with the U.S. Surgeon General's Report on Oral Health 2000

Recommendations from U.S. Surgeon General's Oral Health in America Report 2000	Excerpts from Mouth Hygiene textbook of Dental Hygiene, Editions 1–4, 1916 to 1934
Change perceptions regarding oral health and ideas so that oral health becomes an accepted component of general health.	• Since the days of Hippocrates, it has been known that infections of dental origin may be accompanied by serious systemic symptoms. The work of the dental hygienist is most important in the prevention of the systemic infection through the avenue of the mouth.
Accelerate the building of the science and evidence base and apply science effectively to improve oral health.	• It is no longer a theory that the service of the dental hygienist will better the mouth health and general health of all whom she is permitted to serve. • The research field in preventive dentistry is gradually widening into a study of constitutional causes that are believed to have an influence on the general health, and consequently on dental health.
Build an effective health infrastructure that meets the oral health needs of all Americans and integrates oral health effectively into general health.	• Hundreds of millions of dollars in public and private funds are expended to restore the sick to health, but only a relatively small portion of this amount is spent to maintain the health of well people, even though it is definitely known that the most common physical defects and illnesses are preventable. • It is not the intention to in any way belittle the efforts being made to aid the sick and needy, nor should such efforts be decreased. The vital point is that we have not commenced to cover the possibilities of true prevention.
Remove known barriers between people and oral health services.	• The dental hygienist was created from the realization that mouth hygiene was a necessity and that the average dental practitioner could not give sufficient time to it and that the toothbrush alone would never produce it. • The present need of the dental profession in solving the public health problem of mouth hygiene is an immense corps of women workers, educated and trained as dental hygienists, and therefore competent to enter public schools, dental offices, infirmaries, public clinics, sanitariums, factories, and other private corporations, to care for the mouths of the millions who need this educational service.
Use public-private partnerships to improve the oral health of those who still suffer disproportionately from oral disease.	• The actual results secured by dental hygienists in private and public services, particularly in public schools, affords incontrovertible proof of the value of the dental hygienists. Those who may still be skeptical are finding it difficult indeed to suggest other means by which similar good results can be accomplished for large groups of people. • The future of the dental hygienist in public schools work must be determined on a basis of cooperation between the dental profession and the educational authorities. • The Fones's hygienists who were completing their course in 1917, when war was declared, had the unique experience of completing exams and cleanings and supplying each soldier with a toothbrush and individual instruction in the care of the mouth.

tended Care Permit in the state of Kansas. With recent legislative changes in 2012, the development of an additional course has been approved by the Kansas Dental Board for further expansion of the dental hygiene scope of practice in the state which will include simple restorative procedures. There is no doubt that technology has greatly influenced access to dental hygiene education, however, regulation has not kept

pace with technology and so the next challenge will be finding ways to overcome regulatory inhibitors.

Accreditation of Dental Hygiene Educational Programs

The accreditation process for dental hygiene education has historically been administered through the Commission on Dental Accreditation (CODA). CODA's website states that they are recognized by the U.S. Department of Education to accredit dental and dental-related education programs. It can be argued that the same body accrediting different professions, e.g. dentistry vs. dental hygiene, creates an environment where a conflict of interest exists. For example, one can easily see how a conflict of interest could exist when it comes to expanding educational opportunities for dental hygiene. In a market driven environment where dentistry could perceive direct competition from dental hygienists with expanded education and scopes of practice, control of regulation by the same body that regulates dental education could prevent forward movement for dental hygiene. Over a century ago, Fones actually traveled to many state dental associations and boards to promote the use of dental hygienists.[5,6] Although dentistry served as an advocate for dental hygiene in many ways, including the employment of dental hygienists, practice restrictions existed.[19] In hindsight, it may have been beneficial for him to also meet with leaders of schools, hospitals, industry and other potential agencies to help promote the use of dental hygienists in these settings.

Dental Hygiene Scope of Practice and Regulations

National response to reports on the lack of access to oral health care services has resulted in the revision of practice acts in many states across the country to expand the dental hygienists' scope of practice, yet there is much work to be done. For example, a recent report by the Pew Foundation found that 35 states and the District of Columbia do not have sealant programs in a majority of high-need schools, even though strong evidence exists that sealants prevent decay.[20] Dental hygienists could be instrumental in providing these programs as well as in promoting oral health in many settings regardless of income levels and social settings.

Additionally, lack of self-regulation prevents or creates a difficult environment for dental hygiene to take bold and innovative steps to expand the practice of dental hygiene through legislative initiatives much like those taken in Minnesota with the advent of the Advanced Dental Therapist educational model.[12] Regulation in general in the U.S. has a long and interesting history and provides context to the current environment in dental hygiene. As early as 1898 a U.S. Supreme Court decision authorizing states to set their own requirements for licensure of physicians has had far reaching implications for all health care professions.[21] Today, "states' rights" has resulted in a system of regulation that differs from state to state and an environment where 50 different legislatures must find their own unique solutions to educational requirements for the licensure and scopes of practice for health care professionals in their respective states. It is therefore easy to see why the issue of expanding the scope of practice for dental hygienist requires a dedicated and herculean effort.

Advancing the Future of Dental Hygiene

Dental hygienists have achieved so much over the past 100 years and owe such gratitude to those who have worked diligently to ensure that dental hygiene remains a critical player in the delivery of oral health care services. It is interesting to contemplate what will be accomplished over the next 100 years and who will be the new "pioneers" that propel the professional forward. With this in mind, the authors believe a recent publication by Jim Collins can provide guidance. In his book, *Great by Choice*, he explores how some companies have managed to thrive in times of uncertainty and chaos.[22] Uncertainty and chaos certainly describe the environment in which we find dental hygiene and dental hygiene education today in the early part of the 21st century. He starts out by stating, "We cannot predict the future. But we can create it."[22] The authors of this article believe that creating the future should be the focus of all of our efforts, a focus on advancing the future of dental hygiene and dental hygiene education. Collin's 9 years of research resulted in the emergence of 3 characteristics, or core behaviors that helped to define successful companies: discipline, empirical creativity and productive paranoia. We believe these characteristics/core behaviors have application for the future of dental hygiene. We have outlined examples of how dental hygiene has taken on this endeavor, e.g., through the use of technology we have been able to expand access to dental hygiene education.

First, is the characteristic of discipline defined as consistency of action. Consistency of action includes consistency with values, consistency with long-term goals, consistency with performance standards, consistency of method and consistency over time. True discipline requires the independence of mind to reject pressures to conform in ways incompatible with values, performance standards and long-term aspirations. Dental hygiene must "stay the course" when it comes to defining what our role will be in the years ahead. Public health forms the foundation of the profession and we must continue to keep our focus on the role of patient advocacy and extending dental hygiene

services to serve all citizens regardless of income level or social environment.

The second characteristic that emerged is empirical creativity, defined as relying upon direct observation, conducting practical experiments and/or engaging directly with evidence rather than relying upon opinion, whim, conventional wisdom, authority or untested ideas. In other words, having a deeper empirical foundation for decision making and action resulted in greater confidence while at the same time bounding or delineating risk for those companies Collins defined as "Great by Choice." Dental hygiene must continue to both study existing research and engage in ongoing research that will provide the foundation for good decision-making.

Finally, the third characteristic that emerged is productive paranoia, described as the maintenance of hypervigilance in good times as well as bad. The outcome of this characteristic is behavior that results in turning hypervigilance into preparation and action. Collins found that successful companies did not worry so much about protecting what they have, but rather about creating and building something truly great, something bigger than themselves. We must continue to focus on how dental hygiene fits into an interdisciplinary health care system recognizing that what has worked to date may not be the answer to the future. We must be willing to let the "sacred cows" go in an effort to build something even greater for future generations.

Conclusion

It is clear that accreditation and regulatory barriers will be areas in which dental hygiene will require discipline to ensure that we remain engaged in advocating for change. Gauging our actions on empirical evidence, e.g., lack of access to care, must be our guiding light. Working with private and public partners to continue to advocate for those segments of the population least able to advocate for themselves will be critical to ensuring that dental hygiene maintains a vital role in the solution to access to oral health care services. Finally, remaining vigilant to the changes around us, while at the same time dedicating ourselves to building educational programs that meet the needs of society first, and the needs of the profession second, will prepare us for our role in the 21st century and beyond.

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Original Manuscript

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Public Policy and Legislation for Oral Health: A Convergence of Opportunities

Abstract: The first surgeon general's report regarding oral health, Oral Health in America, called for a national effort to improve oral health among Americans and raised awareness of the importance of oral health; however, many Americans continue to experience poor oral health and are unable to access oral health care. Renewed national interest in oral health and access to oral health care through recent public policy documents and legislation presents a convergence of opportunities for the dental hygiene profession to continue to serve as a strong voice for the prevention of oral disease and the promotion of oral health for all segments of the population.

Keywords: public policy, legislation, access to care, oral health disparities

Introduction

Over a decade ago, the first-ever surgeon general's report, *Oral Health in America*, identified an oral health crisis throughout the country and termed it a "silent epidemic" of untreated dental and oral diseases. This report called for a national effort to improve oral health among Americans.[1] Building on this report, in 2003, a National Call to Action to Promote Oral Health urged that "oral health promotion, disease prevention and oral health care have a presence in all health policy agendas set at local, state and national levels."[2] These reports played significant roles in raising awareness of the importance of oral health, however, many Americans continue to experience poor oral health and are unable to access oral health care.

The critical issue of oral disease has recently returned to the attention of policy makers, health care providers and the public through initiatives designed to study and address oral health disparities, access to oral care and the prevention of oral disease. As preventive oral health professionals these initiatives provide an unprecedented opportunity for dental hygienists to contribute as frontline advocates of oral disease prevention and the promotion of oral health.

Recent National Attention Drawn to Oral Health Issues

While oral health is integral to overall health it had not been identified as a national priority. In recent years, a chronology of events has drawn national attention to oral health issues. In 2007, the death of twelve-year old Deamonte Driver, who died after bacteria from an abscessed tooth spread to his brain, garnered national attention.[3] Since Driver's death, policy changes have been enacted by Congress to improve dental coverage for children. In 2009 the President signed into law the Children's Health Insurance Program Reauthorization Act that, for the first time, addressed children's oral health and dental care.[4]

In 2010, the Department of Health and Human Services launched Healthy People 2020, its 10-year agenda for improving the Nation's health. For the first time, Healthy People, which is in its fourth iteration, identified oral health in its list of 12 leading health indicators (LHIs), intended to communicate a high priority health issue. The LHI for oral health will focus on the actions that can be taken toward the goal to "increase the proportion of children, adolescents, and adults who used the oral health care system in the past 12 months." The agenda includes a set of 17 evidence-based oral health objectives. Several of the objectives address prevention of oral disease including increasing the proportion of: low-income children and adolescents who received any preventive dental services during the past year, school-based health centers, local health departments and Federally Qualified Health Centers with an oral health component, children and adolescents who have received dental sealants on their molar teeth, the U.S. population served by community water systems with optimally fluoride water, and the proportion of adults who receive preventive interventions in the dental office.[5]

Signed into law in 2010, a goal of the Patient Protection and Affordable Care Act is to increase the rate of health insurance coverage for Americans and reduce the overall costs of health care. The act contains a number of provisions that provide the potential to improve oral health. An important provision is the requirement that qualified health plans sold in health insurance exchanges must cover a set of essential health benefits that includes oral health benefits for children. The legislation also contains provisions which have the potential for improving oral health including, among others, the creation of a 5-year national public health campaign for prevention of oral disease, the expansion of school-based dental sealant programs

and school based health clinics, the development of demonstration projects for the training of alternative dental health care providers to support underserved communities, and the development of cooperative agreements with the Centers for Disease Control and Prevention to improve the oral health infrastructure of states and territories.[6]

In 2011, the Institute of Medicine released 2 reports. These reports, Advancing Oral Health in America and Improving Access to Oral Health Care for Vulnerable and Underserved Populations, provide a clear direction for ensuring that every American, and especially vulnerable children and families, has access to oral care. Among the changes envisioned by these reports which effect practitioners are: an integrated delivery system that provides quality oral health care to vulnerable and underserved people, the development of oral health literacy initiatives aimed at individuals, communities and health care professionals, the creation of a diverse workforce that is competent and authorized to serve vulnerable and underserved populations across the life cycle, the amendment of existing state laws, including dental practice acts to maximize access to oral health care, the development of a core set of competencies for non-dental health professionals, the promotion and monitoring of both clinical and community evidence-based preventive services in oral health, and an increase in the diversity and improvement of the cultural competence of the workforce providing oral care.[7,8]

Implications for the Dental Hygiene Profession

The Basic Beliefs stated in the ADHA Code of Ethics guide the practice of dental hygiene and states: "The services we provide contribute to the health and well-being of society; our education and licensure qualify us to serve the public by preventing and treating oral disease and helping individuals achieve and maintain optimal health; individuals have intrinsic worth, are responsible for their own health, and are entitled to make choices regarding their health; dental hygiene care is an essential component of overall health care and we function interdependently with other health care providers; all people should have access to health care, including oral health care; and, we are individually responsible for our actions and the quality of care we provide."[9] Each of these beliefs is closely aligned with national initiatives and legislation centered on access to care for vulnerable and underserved populations and for the prevention of oral disease.

Two operative words, opportunity – implying a set of circumstances that makes it possible to act, and proactive - taking the initiative by acting rather than reacting, can guide the dental hygiene profession in responding to the attention being given to oral health in this country. Potential approaches for each dental hygiene professional to consider include:

- Becoming a driving force in developing and supporting community-wide public education programs to provide culturally competent information on oral diseases, effective preventive interventions, and how to access oral care
- Working to amend existing state laws, including practice acts, to maximize access to oral health care
- Embracing and participating in the national public health campaign for prevention of oral disease
- Increasing recruitment efforts of students into dental hygiene programs from under-represented populations
- Promoting school- based sealant and health clinics
- Initiating research on oral health disparities, best practices in oral health care and ways to change: oral health behaviors, the provision of oral health care in non-traditional settings, oral health literacy, public health policy, alternative models of delivery and supporting the NDHRA's research initiatives on health promotion/disease prevention, health services research, professional education and development and clinical dental hygiene care
- Assisting in the development of a core set of oral health competencies for nondental health care professionals
- Participating in interprofessional approaches to the prevention and treatment of oral disease

As a professional organization representing dental hygiene, the ADHA has long been involved in advocacy efforts with policy makers, stakeholders, the public and others to promote state and federal policies that increase the availability and improve access to oral health care. The renewed national interest in oral health and access to oral health care presents a convergence of opportunities for the dental hygiene profession to continue to serve as a strong voice for the prevention of oral disease and the promotion of oral health for all segments of the population.

Mary C. George, RHS, MEd, is an Associate Professor Emeritus, the University of North Carolina at Chapel Hill School of Dentistry.

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Guest Editorial

Olga A. C. Ibsen RDH, BS, MS, FAADH
Editor, Journal of Dental Hygiene, 1986 to 1990

ADHA's Refereed Publications in the 1980s

The motivation for my first publication came from my faculty members. As a dental hygiene student at the State University of New York-Farmingdale, I published a paper titled, "Revision of Dental Practice Acts." I then went on to Columbia University for my BS and MS Degrees under the direction of the late Patricia McLean, a past president of ADHA. Membership in ADHA was not a choice - you HAD to be actively involved! Phebe Blitz, RDH, and I were classmates at the time and we co-founded the Westchester Dental Hygienists' Association which is still one of the most active components in the country.

Leadership, mentoring and motivation is what has shaped our "body of knowledge" through the years. Imagine a world without internet, email, computers or smartphones. Without these modern devices, communication in general would easily be perceived today as an insurmountable challenge. Our Journal editors, authors and staff met these challenges and produced outstanding publications which all documented our history and the development of our profession.

During my tenure as Editor of both *Educational Directions* and *Dental Hygiene* (which became the *Journal of Dental Hygiene*), the late Wilma Motley, Editor Emeritus was my role model and mentor. She provided the foundation on which we would build our profession. The review process was definitely a process, but the Editorial Review Board and Editor served as mentors, assisting authors in the publication process.

We truly had outstanding publications and in October 1989, the International College of Dentists (ICD), USA Section, awarded the *Journal of Dental Hygiene* "The Golden Scroll Award." This was a significant accomplishment to be recognized for the most change in a refereed publication by the ICD.

Educational Directions was a quarterly publication that was active for 11 years. I served as Editor from 1982 to 1988 when it merged with the *Journal of Dental Hygiene*. The manuscripts in *Educational Directions* were specifically helpful to educators since topics included content on curriculum, administration, teaching methods and professional development. Examples of titles published are *Dental Hygiene Educators: A Report of Credentials* by D.E. Wayman, *Value of the Terminal Degree in Dental Hygiene-One Educator's Opinion*, by Michele Darby and *Perceived Differences Between Two Year and Baccalaureate Degree Dental Hygiene Programs* by Rigolizzo (Gurenlian) and Forrest. We constantly evaluated ourselves, the educational process and researched higher learning opportunities. In 1983 and 1986 the entire issues of *Educational Directions* featured content from the University of Maryland and Old Dominion University, respectively. These two schools and their faculty contributed tremendously to the "body of knowledge" which defined our profession.

In 1988, *Dental Hygiene* became the *Journal of Dental Hygiene* with a new cover and layout design! We received 80 to 95 manuscripts per year. Topics addressed clinical practice, expanding roles and timely research. Book reviews were part of every publication. In the October 1988 issue, Clinical Periodontology for the Dental Hygienist, 1st Edition by Carranza and Perry, WB Saunders, 1986, was reviewed and published. The text cost $21.95! How times have changed.

Our professional growth as a profession continues to be documented in our publications. Rebecca S. Wilder BSDH, MS is an invaluable leader, mentor and professional. We are fortunate to have her lead us into the next 100 years!

A Timeline of Journal of Dental Hygiene Editors

Dorothy Bryant – 1927 to 1929
Margaret H. Jeffreys – 1930 to 1939
Mary Owen Wilhelm – 1939 to 1945
Shirley Easley Webster – 1946 to 1948
Rebekah Fisk – 1948
Isabell V. Kendrick – 1949 to 1951
Belle Fiedler – 1952 to 1962
Lucille Klein – 1962 to 1968
D. Jeanne (Bedore) Collins – 1968 to 1970
Wilma Motley – 1970 to 1981
Michele Darby – 1981 to 1982
Diane Huntley – 1983 to 1985
Olga A. C. Ibsen – 1986 to 1990
Nancy Sisty-LePeau – 1991 to 1997
Mary Alice Gaston – 1997 to 2006
Rebecca S. Wilder - 2006 to Present

Guest Editorial

Nancy Sisty-LePeau, RDH, MS, MA
Editor, Journal of Dental Hygiene, 1991 to 1997

Journal of Dental Hygiene, 1991 to 1997

The majority of my dental hygiene career was spent teaching baccalaureate and master's degree students at the University of Iowa. The faculty and graduate students conducted research and often published their work in the *Journal of Dental Hygiene*. Faculty assigned readings from the *Journal* and students understood that it was the place to find the most current and reliable scientific information on dental hygiene education and practice. My educational, teaching, and publication experiences motivated me to apply for the Editorial Director position of the *Journal* in 1991.

I consider the American Dental Hygienists' Association's commitment to publish a refereed journal containing original, scientific research very significant for the professionalization of dental hygiene. The opportunity for dental hygiene faculty, graduate students and practitioners to conduct research on dental hygiene theory, education and practice and to publish it in their professional journal advances our field and contributes to the credibility of its practitioners. This professional development of dental hygiene can be reviewed and documented over time by looking at the number and types of scholarly research articles published in the *Journal* by dental hygienists. Additionally, dental hygiene practitioners can keep up with the scientific and practice changes that guide and improve their provision of care by reading their professional journal.

During my tenure as editor between 1991 and 1997, editorials and research articles focused on accountability of the profession in establishing authority and control over its own services and actions. Emphasis also was placed on developing and applying our own code of ethics that established specific principles and standards of conduct and practice. These ethical principles as well as evidenced-based care led to best practices and improved standards of care.

In 1992, the purpose of the *Journal* was modified to include a clear statement that it was a refereed and scientific publication. In January of 1993, the *Journal* content was redirected to focus exclusively on new knowledge that contributed to the theory and practice of dental hygiene through original research, literature reviews, and theoretical articles. Research with clinical implications for dental hygiene practice in a variety of settings was stressed. Some of the dental hygiene practice issues of the time found in the research articles included: dental hygiene assessment and treatment planning, infection control procedures, occupational hazards, ergonomics, HIV/AIDS, pain control, pit and fissure sealants, special population groups, and alternative practice settings. Educational and professional issues included: quality assurance, self-regulation, independent practice, career recruitment and retention, a national dental hygiene research agenda, a theoretical framework for dental hygiene, and electronic information services.

During this period changes were made in the look and format of the *Journal* to bring it more in line with other research journals. Titles of articles were listed on the cover, structured abstracts were added with keywords to assist in indexing, the research funding source was listed on the front page, and authors were encouraged to apply the results of their research to dental hygiene education, practice and research. Abstracts of original student research from dental hygiene programs were added. In addition, the *Journal* included periodic guest editorials and opinion papers from leading practitioners, educators and researchers. The title of Editorial Director for the *Journal* was changed to Editor to align with designations in most scientific journals. The *Journal* was included in the Index to Dental Literature, Medline and PubMed, and the Cumulative Index to Nursing and Allied Health (CINAHL) was added in 1994.

Another important change in the *Journal* was a reduction in the number of issues published yearly. In 1991 through 1992, nine issues were published. Due to budgetary constraints and the costs of publishing three ADHA publications, the *Journal* was reduced to six issues per year in 1993.

For a period of time, the number of articles submitted to the *Journal* declined, especially those related to dental hygiene education and literature reviews. Dental hygiene baccalaureate and master's degree program closures and budgetary constraints leading to reductions in the number of full-time faculty contributed to the decline. During 1996 and 1997 submissions markedly increased.

My *Journal* connections as a consumer, member of the editorial review board, author and editor were extremely educational, stimulating and rewarding throughout my dental hygiene career. The quality of the content of the *Journal* during my tenure can be attributed to the scholarly research efforts of the authors, the outstanding expertise and dedication of the editorial review board and the commitment to excellence by the ADHA editorial staff. I consider it a privilege to have collaborated with all of these contributors.

Guest Editorial

Mary Alice Gaston, RDH, MS
Editor, Journal of Dental Hygiene, 1997 to 2004

Dental Hygiene's Unique Treasure

The American Dental Hygienists' Association (ADHA) supports the advancement of dental hygienists and the profession of dental hygiene through its numerous publications. The oldest of these is the *Journal of Dental Hygiene (JDH)*, the dental hygiene profession's unique peer-reviewed research journal. Although a variety of scholarly papers of interest to dental hygiene professionals are published in *JDH*, its primary purpose is to publish and disseminate reports of original research conducted by dental hygienists.

The manner in which the ADHA has effectively fulfilled its information dissemination responsibilities is well documented in historical dental hygiene documents and publications. These records reveal that from its very beginning ADHA leaders understood that dental hygienists needed a way to share practice related information, especially new information. In response to that perceived need, ADHA in its first year of operation began publishing its own journal for dental hygienists. Thus, the forerunner of the *JDH* was born. The practice of reading each issue of *JDH* began for me when as a first year dental hygiene student such readings were required. Those first reading requirements soon developed into a lifelong practice.

Dental hygienists throughout the world now recognize the important role *JDH* has played in the advancement of their profession, and in their individual professional development. The *JDH* as we know it today evolved from simply fulfilling an information sharing task into its current recognition as a respected research journal. Because ADHA now uses other publications and communication methods for information dissemination, *JDH* appropriately focuses on publishing original research and other scholarly reports of importance to dental hygienists. A host of individuals are involved in publishing *JDH* and we are indebted to each for their contribution to the publication process.

In my ten-year experience as *JDH* editor, I found the manuscript review process highly supportive of authors, especially those new to publishing. Members of the *JDH* Manuscript Review Board are busy experienced researchers and authors who each year assume volunteer appointments to participate in the manuscript review process. Each one is committed to maintaining the integrity of the review process and of the Journal. Even so, they graciously assume responsibility for mentoring dental hygienist authors who may need a little extra guidance or encouragement. With rare exception, authors interpret reviewer comments and questions as helpful to them in revising and perfecting their manuscript before its final acceptance. I even developed a more critical eye for research design, methods and materials as a result of the observations, questions, and suggestions of reviewers. In that regard, *JDH* had a profound effect on my personal professional experience.

Because of that experience, I more fully understand the foundational role of *JDH* in the development of the dental hygiene profession. Fortunately for all concerned, *JDH* continues to influence the education, practice and scholarly pursuits of dental hygienists throughout the world. Although other publishing options are now available to dental hygienists, *JDH* continues to be a most desirable choice for the publication of research reports of particular relevance to dental hygiene education and practice. I do not envision that changing in the future.

I treasure my memories of the time I spent as *JDH* editor. Moreover, I will forever be grateful for the opportunity extended to me to share in the evolution of this unique dental hygiene treasure.

How Far We've Come

The Journal of Dental Hygiene has a rich history, one that has not only established a quality body of research for the dental hygiene profession, but one that has also chronicled the many historic events the profession has experienced. When compiling this commemorative issue, it became apparent that we had to include some of the unique pieces of literature the Journal has published. And what better way to share this information than by having ADHA members select and vote on the content found within this issue.

Journal staff spent weeks poring through all 87 volumes to find the articles and manuscripts that best illustrated how far the profession has advanced over the last 100 years. After much deliberation, a total of 11 manuscripts were selected. These manuscripts were placed online and ADHA members were asked to vote for the manuscript they felt highlighted just how far we've come.

The top 3 winning entries are included over the next 11 pages, starting with the manuscript that received the most votes. They cover a broad range of topics, and illustrate just how comprehensive the Journal has been over the past 86 years.

The Journal of Dental Hygiene staff would like to thank all of the members who participated in this contest, and who helped to make this commemorative issue one that truly celebrates 100 years of dental hygiene. Here's to 100 more!

- JDH Staff

Can Dental Hygiene Become A Developing Profession?

Pauline Brine, RDH, MPH

Abstract: If dental hygiene is to survive in university settings, faculty must demonstrate scholarship and research productivity comparable to other university faculty. Academicians who have advanced theoretical preparation in either the biological or social sciences and the research skills will be required to develop new combinations of dental hygiene knowledge and practice. Through their research efforts, a body of knowledge "unique" to dental hygiene could be developed. Only then would the direction of dental hygiene be influenced by internal, rather than external, pressures.

Introduction

Nursing, considered a "developing profession" in university settings, has recognized the need to promote the advancement of academic education. The number of nursing programs at the doctoral level increased from four in 1964 to nine in 1975 with 20 additional programs in the planning stage. During the same time period, master's level programs increased from 48 to 89, and at the bachelor's level, from 188 to 314. Unequivocal and meritorious progress toward achieving the educational preparation needed for eligibility of nursing faculty in the scholarly academic community is reflected in these statistics.

The most recent action taken by the American Nurses' Association is the strongest indication of nursing's commitment to educational advancement. At its annual meeting, action taken by ANA's 1978 House of Delegates stated that by 1985 the minimum preparation for entering into professional nursing practice would be the baccalaureate degree in nursing and that national guidelines for implementation should be identified and reported back to ANA membership by 1980. The mechanism for implementation does not include transfer of associate degree graduates into existing bachelor's programs or the promotion of the career ladder concept from the licensed practical nurse to registered nurse - a concept that within the last decade has been endorsed by nursing. In taking this bold stance, the nursing profession has wisely recognized that the development of a cadre of scholars requires transferring the preparation of nurses into four-year college and university environments. This will raise the quality of educational programs to a level more nearly equal to other professions, thus insuring the provision of the strong knowledge base possible.

As in every discipline, the status of the profession and its contributions to society are based on the quality of the knowledge base and the productivity of the community of scholars. Dental hygiene educators and those in leadership positions in ADHA need to consider moving into the arena of "developing professions."

If dental hygiene is to survive in the university setting, faculty must establish credibility. Dental hygiene faculty must be prepared to meet the same academic qualifications and promotion criteria as their colleagues in other fields. Since one of the major functions of universities is to promote the advancement of knowledge through research, dental hygiene faculty must demonstrate scholarship in this area of a quality comparable to other university faculty. Assurance of scholarship and research of comparable quality will require dental hygiene educators prepared at the doctoral level.

Dental Hygiene Educational Development

Dental hygiene educators in the university system of higher education are becoming increasingly aware of the problems that exist due to the emphasis on technical-level education in dental hygiene. This difference between academic and technical-level education becomes a problem when 1) considering qualifications and expectations of dental hygiene faculty in university settings; 2) recruiting dental hygiene students for graduate programs in dental hygiene; and 3) identifying curricular content to advance new knowledge in dental hygiene. These three factors are interrelated and will determine whether dental hygiene has the resources to develop into a true profession. As in nursing, this potential will only occur with the development of a "community of scholars." Academicians will be required to analyze and critically evaluate the theory and practice of dental hygiene and to develop new combinations of knowledge, skills, and values in dental hygiene through research. In addition, they will have to possess the knowledge, interest, and desire to pursue scholarly research in the biological and social sciences, for new knowledge will be generated from these fields of study. Through faculty's research efforts, a body of knowledge " unique" to dental hygiene would be developed. With an expanding knowledge base, dental hygiene would become accountable among health professionals for decision-making and would function in a significantly different manner from the present boundaries of dental hygiene practice.

Master's Programs

Similarly, master's degree programs in dental hygiene will have to focus on providing students advanced scientific knowledge, especially in the biological and social sciences and with basic research skills. From these

fields of study, new combinations of knowledge can be generated to provide the contextual perspective from which new aspects of professional practice can develop.

When master of science degree programs in dental hygiene were established, emphasis was placed on preparation for teaching careers. This was a logical educational direction, for at that time dental hygiene was experiencing an acute shortage of educators. These early curricula focused primarily on instructional methodologies and on teaching the clinical technology of dental hygiene. Until recently, only one of these programs included a thesis as a degree requirement. Furthermore, few graduates of these programs qualified for admission into doctoral programs in the biological sciences because of lack of in-depth theoretical knowledge.

Faculty and Undergraduate Preparation

The level of in-depth knowledge in master's degree dental hygiene programs is directly related to the educational preparation of the dental hygiene graduate faculty. Again, dental hygiene cannot be recognized as a subject suitable for university study if it continues to ignore the acceptable level of educational preparation required for graduate program faculty. The main criterion for including a subject within a university program is that the subject requires a considerable body of theoretical knowledge.

Unlike other graduate fields of study, the highest educational level obtained by most dental hygiene faculty teaching in master's level dental hygiene programs is the master's degree. Of the five Master of Science programs in dental hygiene, only two dental hygienist teachers hold doctorates; one in oral biology, the other in higher education and administration. It is apparent that a lack of faculty qualified to strengthen the knowledge base in dental hygiene affects the quality and level of instruction provided in a graduate dental hygiene program.

Dental hygiene faculty qualifications at the master's level must be strengthened and additional master's level programs must be promoted. In contrast to nursing, the number of master's level dental hygiene programs has remained constant. In 1965, two graduate programs (Columbia University and University of Michigan) offered the Master of Science degree in dental hygiene and in 1975, only five did (Columbia University, University of Michigan, University of Iowa, University of Kansas City in Missouri and Old Dominion University). In contrast, 48 master's degree programs in nursing existed in 1965, and by 1975, 89 were in progress. The need to increase the number of master's level programs is basic to the professional advancement of dental hygiene. If dental hygiene is to be recognized as a collegiate program of study, then dental hygiene faculty must have the minimum academic preparation expected and generally required for undergraduate teaching. Also, if dental hygienists are to be employed in higher-level decision-making positions, they must possess academic credentials comparable to those who work in similar capacities in other fields.

Since recruitment of master's level students is restricted to dental hygiene graduates of bachelor's degree programs, the level of undergraduate preparation becomes a critical factor in the framework for developing future scholars. If undergraduate study is restricted to survey or technical level coursework, excluding basic-knowledge courses, then graduate study in the sciences will be limited. Graduate programs will be diluted or void of the content required for scientific inquiry. Repetition and perpetuation of advanced education becomes self-defeating if its ultimate goal is to develop a core of scholars who can expand the boundaries of dental hygiene knowledge and practice.

Status of Dental Hygiene Programs

At this time it is questionable if the dental hygiene profession possesses a sufficient theoretical base to warrant study in four-year colleges and universities. The questionable status of four-year dental hygiene programs is further compounded by the fact that dental hygiene, unlike other occupations, provides little, if any, professional recognition for the bachelor's degree graduate. Al though there are two levels of education, there is only one level of practice. It can be said with some certainty that dental hygiene practitioners can achieve that status through a greater diversity of post-high school educational programs than almost any other professional, as dental hygiene programs are found in four different educational institutions. An incongruity exists in that an individual can achieve dental hygiene practitioner status from any one of four settings, each of which has significantly different goals, objectives, and environments in the milieu of higher education. This diversity of educational levels serving dental hygiene creates a fundamental flaw in the system, which does greatest damage to baccalaureate dental hygiene.

As long as dental hygiene graduates of two-year programs are afforded the same professional responsibilities and financial rewards as graduates of baccalaureate dental hygiene programs, the incentive to pursue advanced study is stifled. The promotion of such an undergraduate educational system is as self-destructive as the promotion of graduate programs that are diluted or void of content required for scientific inquiry. Potential graduate students of dental hygiene find intellectual opportunities in professions that recognize and reward advanced education. Dental hygiene must begin to recognize and advance career opportunities at the doctoral, master's, and bachelor's levels. Unless dental hygiene values the advanced educational preparation of its members, it cannot expect to receive such recognition from others. It is difficult, if not impossible, to identify educational content that belongs to dental hygiene. Dentistry has delegated specific functions to dental hygiene and any extension of knowledge or skill has come from dentistry. Unfortunately, because dental hygiene has not discovered or generated new knowledge, it continues to depend on dentistry. Dental hygiene not only finds it difficult to identify content "unique to dental hygiene," but also encounters a problem when attempting to identify the subject matter as "upper division" or "lower division" study. If the educational emphasis is to be directed toward a more restricted knowledge base, dental hygiene goals must be defined in terms of technical performance criteria. However, if the educational emphasis is to prepare hygienists for entry into broader decision-making career roles and graduate programs of study, the nature of education must be concept formation in the biological and/or social sciences.

Conclusion

The need to provide students with marketable skills beyond the technical ones required for clinical dental hygiene practice is apparent. National predictions of future employment patterns speak of rapidly changing job markets, phasing out of known traditional occupations, career transformation, and second career level training. These factors strongly suggest the need for dental hygiene to de-emphasize applied skill learning at the undergraduate level and to increase curricular emphasis on the acquisition of basic or foundational knowledge. This would enable graduates to adapt to broader managerial and facilitating roles in the initiation and provision of dental health care.

Ironically, moving in to the arena of a "developing profession" will require higher risk-taking and selfless commitment than perhaps dental hygiene is willing to make. As is true with high-risk occupations, the esteem, satisfaction and rewards are great but the chance for survival is uncertain. Some dental hygiene professionals will elect to maintain the status quo, some will consider the chance too costly and will blame others for dental hygiene's demise, and some will accept the challenge with bold optimism, for the arena of a "developing profession" is more fulfilling than one quietly slipping into obsolescence.

The Origin and History of the Dental Hygienists

Alfred C. Fones, DDS

Read before the Section on Mouth Hygiene, Preventive Dentistry and Public Health at the 7th International Dental Congress Philadelphia, Pa., August 24, 1926.

Introduction

A search has been made in the American dental periodical literature to trace the development of dental prophylaxis as a part of the practice of dentistry, and carried out by the dentist, and the development of dental prophylaxis as an auxiliary branch of dentistry, practiced by lay women, trained for this purpose and limited to this specialty.

The first dental periodical in this country, the American Journal of Dental Science, was published in 1839, and as early as 1844 it carried an editorial under the caption "Dental Hygiene." The author, who was undoubtedly one of the three editors, Chapin Harris, Edward Maynard or Amos Wescott, deplores that so much attention is given to therapeutics, mechanical dentistry and surgery, and "the hygiene of the teeth almost wholly neglected." The editorial says in part, "Certainly there is no part of the physical organism to which prevention of disease can be more successfully or effectually applied than to those organs (the teeth). The hygienic treatment recommended by L. S. Parmly for the teeth is the most successful that has ever been instituted. It consists in cleaning the teeth regularly four or five times a day with waxed floss silk. Every dentist should be provided with an abundant supply and should furnish every one of his patients with it, and such other material as may be necessary to enable him to keep his teeth thoroughly clean." Mention was made that the American Society of Dental Surgeons was to issue correct information through tracts or pamphlets "to promote dental hygiene." Thus, in the first stages of the dental hygiene movement, the responsibility for maintaining a clean mouth was put entirely on the patient.

In 1865, under the same title, "Dental Hygiene," Henry S. Chase advanced the idea that the diet, especially during the prenatal period, was the most important factor in dental hygiene. He made no mention of cleanliness in relation to the teeth.

The first paper to be entitled "Prophylaxis or the Prevention of Dental Decay was written by Pros. Andrew McLain of New Orleans Dental College, and published in 1870. This author had an appreciation of diet, especially prenatal, and of mouth sanitation as carried out by the patient. In the literature of this period, quite frequent references were found to the dietary as an important factor in relation to diseases of the teeth and gums, but it was not until 1879 that any stress was laid on the cleaning of the teeth as carried out by the dentist. In an able article by G. A. Mills of Brooklyn on "How to Keep the Teeth Clean and Healthful," the cleaning and polishing of the teeth is strongly urged, and this was practiced by the author, although he did not offer any special system for accomplishing his results. The first reference made to that now indispensable instrument, the explorer, was found in Dr. Mills' paper.

M. L. Rhein of New York City, in an article entitled "Oral Hygiene," brought his prophylactic toothbrush to the attention of the profession in May, 1884, and advocated that the dentist should make a pupil of his patient and teach him how to brush his teeth effectively. Dr. Rhein claims to have been the first to have used the adjective, prophylactic, but reference was found to a work by Arthur of Baltimore in 1871 advocating "prophylactic measures as preventive of decay." Likewise, D.D. Smith of Philadelphia claimed to have first applied the term prophylaxis in dentistry, but reference has already been cited to the use of this word in McLain's paper of 1870.

It is not my intent to trace the earliest use of these terms in dentistry, but I deemed it interesting to report their first appearance in the literature reviewed. During the late eighties, considerable interest was developing in dental hygiene, the term being then applied mostly to the necessity for effort on the part of the public to maintain clean mouths. The South was especially active in this matter of public education, and, in 1887, the Alabama Dental Association advocated "a public lecturer on Dental Hygiene," and adopted the following resolution:

WHEREAS, the rapid strides that are being made by our profession in all its branches impose on us the additional duties of making known to the people in some practical way the advantage to be derived from instruction in Dental Hygiene;

Resolved, That the time is now at hand when a practical lecturer should be employed, and instructed to visit our schools, both public and private, and deliver lectures of a plain and simple character to the pupils, instructing them in the proper care for the teeth. The resolution was referred to the Southern Dental Association in 1888, and a committee was appointed to look into the matter.

One of the most comprehensive outlines of prophylaxis, and one that conforms almost identically with our views today, was advanced in 1890 by Charles B. Atkinson of New York City. The introduction to this paper, "Prophylaxis in the Field of the Dental Surgeon," is quoted as follows:

Prophylaxis presents four closely related and two attendant aspects for consideration.

1. Prevention, properly a broad effort of education to teach to avoid.
2. Diet, a means of preparation of the system to assist prevention.
3. Hygiene, a regulation of circumstances closely governing (prevention).
4. Regimen, ruling of use of system, food, article and circumstance under the instruction of the preceding aspects; add to these operative and medicinal interference in the progress of disordered and diseased conditions, and the breadth of prophylaxis is before us.

Dr. Atkinson undoubtedly had visualized the scope of prophylaxis and ably outlined it, although a perusal of his paper did not disclose an appreciation of the necessity for the treatment of prophylaxis, as we apply this phrase today.

In the early nineties, much was written on various phases of this subject, but it remained for D.D. Smith of Philadelphia, with his forceful and convincing arguments and demonstrations, to impress the dental profession thoroughly with the importance of the dental prophylactic treatment. Dr. Smith states in one of his papers that, in 1894, he started the surface treatments for the prevention of decay and the general betterment of mouth health for the members of his family and a few selected patients. After four years of this service, he was so impressed with the results that he gave a talk entitled "Prophylaxis in Dentistry," February 15, 1898, before the Washington City Dental Society, and, in October of the same year, elaborated the talk into a paper of the same title read before the Northeastern Dental Society at Hartford, Connecticut.

His paper was so well received that he was invited to appear again before that society at Holyoke, Mass., in 1899. At this time, he had been increasing the number of patients under this form of treatment and, in the year of 1900, gave two exhibits of his patients. From this time on, he presented this subject before numerous societies, and held ten or twelve exhibits in his office for the benefit of large groups of dentists.

In the extensive material reviewed on the subject of dental prophylaxis, it/ was the consensus of opinion that D.D. Smith was truly the father of dental prophylaxis. Although other men had made the effort to impress the dental profession with the importance of mouth cleanliness, he was the first to evolve

a definite system of dental prophylaxis and offer his technic to the profession, and to show clinical evidence through his exhibits of patients, of the beneficial results of his system. To quote Dr. Smith in this regard, "The discovery and enunciation of the important fact that enforced and systematic change in the environment of the teeth will prevent decay, and carry with it many other beneficial results, is new, new in essence, new in conception, and new in its elaboration; and results wholly from clinical investigation, and experimentation." It will be noted that, for the prevention of dental caries, Dr. Smith stressed only the environment of the teeth. He did not concede that nutrition or other hygienic factors that govern the health of the body as a whole were influential in the susceptibility or immunity to dental caries. His teachings still form the basis of our knowledge regarding the operative technic of dental prophylaxis, and he justly deserves great credit for this. In the light of .our present-day knowledge, the true prevention of dental disease covers a wider field than operative procedures for extreme cleanliness, although these measures must play an important role.

In tracing the history of dental prophylaxis as an auxiliary branch of dentistry, practiced by lay women trained for this purpose and limited to this specialty, it was thought apropos to mention briefly the development of the idea of utilizing women in dentistry. In 1866, James Truman of Philadelphia, in an address before a dental graduating class, took for part of his theme the admission of women into dentistry through the then closed doors of dental colleges. The suggestion was so at variance with the accepted thought and practice of this period that the idea aroused amusement, and even indignation. By 1869, however, two women had been admitted and graduated from two separate dental colleges, and Dr. Truman made bold to offer a resolution before the American Dental Association that women should be admitted to full membership in subordinate associations, but the resolution was unanimously tabled at once.

N. W. Kingsley, in 1884, wrote a very complimentary paper called "Woman—Her Position in Dentistry." He advocated the acceptance of women as assistants to dentists, to help at the chair: and he said, "When she becomes familiar with the details of practice, she will perform all operations required upon deciduous teeth, including fillings with any of the plastics, she will take entire charge of the regulating cases, and that branch of practice, so dreaded by all because of the apparent waste of time, in the rearrangement of splints, becomes in her hands a valuable source of income. In short, it is impossible to enumerate in detail the acquirements she will come to possess." He did not mention cleaning especially. Probably this was considered too unimportant. He did not believe women were suited to become graduate dentists because "They are inexact and not inventive."

Only very meager references could be found to women in dentistry previous to 1900, and not many printed records were located to show that women were generally employed in dental offices to any great extent. The search for the first suggestion of training lay women to aid the dentist in cleaning and polishing of the teeth as a separate specialty in a dental office has brought to light the work of C. M. Wright of Cincinnati, Ohio, a man of high standing and long experience in our profession. In January, 1902, Dr. Wright presented a paper before the Odontological Society in Cincinnati entitled "A Plea for a Sub-Specialty in Dentistry," and it is to be regretted that his paper cannot be given in full. A considerable part is quoted as follows:

1. The practitioners of this separate and yet most important part of dentistry are to be women, — women of education and refinement, — who are seeking a field for work of an honorable and useful kind among people of culture.
2. The dental colleges are to offer opportunities for this partial and separate training. The course to consist of lectures on the Anatomy of the Teeth and Gums, Special Pathology, and Physiology, and a special clinical training in prophylactic therapeutics.
3. Upon the completion of this special course, which shall require one session or one year of study, and practice under instruction in the college infirmary, and after presenting satisfactory evidence of proficiency in the polishing of teeth and caring for the mouth, the college shall grant a certificate of competence to the graduate of this course.
4. With this training and the dental college certificate, these ladies may be employed by dentists for this special work, or may practice at parlors of their own, or at the homes of patients, the dentists using their influence and recommending the new specialists, just as physicians and surgeons recommend and insist upon the services of the trained nurse or the masseuse.

This is but an outline of a scheme, the details of which seem easy of arrangement. Dr. Wright says, further:

I think every one of you will agree with me that there could be no more valuable service in oral hygiene than just such a class of specialists would afford. About twenty-five years ago, in Basel, Switzerland, I mapped out a scheme for a new specialty in dentistry for a woman of education who applied to me for advice. She wished to earn a living, yet did not desire or feel able to enter into the full work of an accomplished Doctor of Dental Surgery. I then planned for her the kind of work which shall form the subject of my talk this evening. She did not follow my suggestions and fit herself for this specialty, because it was not feasible at that time and place, but this circumstance did not effect my opinion of the excellence of the idea.

The time has arrived when I believe we should make it possible for and encourage just such applicants to enlist in this field of useful service. Ten years ago I explained the same scheme to another lady who sought advice about entering the profession of dentistry. This lady was convinced by my picturesque and enthusiastic advocacy of the "Specialty within a specialty," but as there appeared no opportunity for acquiring the education necessary for the practice of the vocation, she was compelled to abandon the plan.

The recent papers by Dr. D.D. Smith of Philadelphia, on the prophylactic value of a certain dental operation, — namely, the expert polishing of the human teeth, beginning with the children and having regular and frequent appointments and systematic attention in this one direction and continuing it possibly throughout life, — has appealed to me so forcibly that I have felt that suggestions on "A Sub-Specialty in Dentistry," devoted to the polishing of the teeth and the massage of the gums, might be apropos.

We have given ourselves over to restoration and have been content to advise tooth brushes, sanatol, or vegetol to our patients, leaving the responsibility of real prophylaxis with them. We may not be able to change our modes and habits of practice, but we can, by this method and with the hearty cooperation of the dental colleges in affording the educational equipment necessary for the cultivation of this field of special practice, revolutionize dentistry — place it upon a still higher plane. The operation suggested is more directly in the line of preventive medicine, with all that this implies, than any other in the scope of prophylaxis that I can think of, such as boiled drinking-water, ventilation, sanitary plumbing, physical exercise, diet and bathing. Imagine a room full of children, as they are now in any school, public or private, in regard to surgically clean mouths, and the same children after a thorough polishing of their teeth. Here is an opportunity for missionary work. Enthusiasm on the part of the operator and patient could easily be stimulated and health and morals be vastly improved. Ten years of such effort on the part of our profession would do more for the human family than all the tooth-pastes and powders ever invented, or all the tracts for the people ever published, for the responsibility would be removed from the patient and placed where it belongs — on the practitioner of this art of oral hygiene, these sub-specialists.

We have set the men on pedestals who have been able to cut out a carious spot on a tooth, extend and form a cavity so that a clean surface of gold

may take the place of enamel and protect one part of a single tooth from a single disease; shall we not commend and honor the specialist who patiently and regularly operates for the prevention of this and other diseases by intelligent and systematic care of the entire mouth? This is a fundamental idea of dentistry, agreed by all and yet neglected.

With our present exact knowledge of etiology and our increasing familiarity with the wide-reaching effects of oral sepsis, are we not ready for the establishment and hearty endorsement of trained specialists who will devote their entire time to this one branch of prevention? From personal observation among refined people in America and Europe, I believe that success will follow the efforts of the colleges and the profession in this direction, for we shall be supplying an awakening demand for just such service. Later, in 1902, when some fears had been expressed that a partially educated sub-specialist would drift into illegal practice of dentistry, Dr. Wright, in a paper entitled "Preventive Dentistry," answered these objections:

The fact that the partially educated dental profession does not trespass on the private domain of the physician and also that these women must be largely dependent upon the recognition and recommendation of the dentist for their employment, seems to me a barrier against invasion, and a protection against infringement. Then we are supposed to be controlled by state laws regulating practice and a modification of these laws might be adopted that, while permitting these specialists to practice would also control and limit them as we are controlled and limited. It seems to me the women practitioners of this well defined sub-specialty would gladly remain within the scope of their privileges.

Dr. Wright repeatedly presented his plan at various gatherings of dentists. It seems remarkable that a man should have had, in this early period, such a comprehensive view of this field of service for women and its value to dentistry and the public. It shows that Dr. Wright had given previously years of careful thought to this subject and had even visualized its possibilities for good among the children in our public schools. He also had an appreciation of the necessity for intelligent legislation for the regulation of her practice. Unquestionably, Dr. Wright must be given credit as the first one to have visualized properly the dental hygienist as we know her today.

In August of the same year (1902) F. W. Low of Buffalo, N.Y., inspired by D.D. Smith with the thought of systematic polishing of the teeth, brought forth his suggestion of the "Odontocure." Dr. Low said: "I read a little paper before the City Dental Society in Buffalo in which I advocated a new profession — that of odontocure — a girl with an orange wood stick, some pumice, and possibly a flannel rag, who shall go from house to house." He advocated polishing the teeth in this way every two weeks, and suggested that possibly 50 cents would be the charge.

It is apparent that he was so impressed with the universal need for clean and polished teeth that he desired the service to be available to everyone in a convenient and inexpensive way. The next record in dental literature is a paper by M.L. Rhein of New York City, entitled "The Dental Nurse." This was presented to the Section on Stomatology of the American Medical Association, May 5, 1903, and practically the same paper was read again before the New York State Dental Society, May 13, 1903. Dr. Rhein had, for many years previous to his presentation of these papers, an appreciation of the great value of mouth hygiene, and the suggestion of the name "dental nurse" coming from one so prominent in the profession, and experienced in dental prophylaxis, gave the cause the impetus it so much needed.

The following extract from Dr. Rhein's paper will show clearly his great interest in this matter. In discussing the reasons why prophylaxis was neglected, he pointed out that the repair of existing lesions in tooth structure and the adjacent tissue takes up all the time of the man with the average practice, and says further:

The difficulty of receiving commensurate pay for the hours of time required in faithfully carrying out the treatment by prophylaxis brings up the question of expediency. It is true that Dr. Smith of Philadelphia claims to personally give his patients this treatment at regular intervals. If an effort were made to follow out this method in an average practice there would be time left for nothing else. It certainly is the consensus of professional opinion that the busy practitioner cannot give up his valuable time for this tedious, monotonous and irksome labor, however important it may be for the salvation of the human teeth. A small number of us have tried to solve this important problem by employing an assistant to attend to this department. In the judgment of your essayist, who has tried this method for twelve years, it has failed to satisfactorily solve the problem.

The employment, in a private office, of a graduate to make a specialty of this work is very likely the best remedy we have had at our disposal up to the present time. The greatest objection to this plan is the inability to retain a graduate possessing ordinary ambition and talent a very great length of time in this position. In discussing this subject with prominent men it has been generally conceded that far better results could be obtained if suitable female assistants, not graduates, were especially trained and employed for this work.

In view of the high esteem held for the work of the trained nurse, it appears remarkable that the sphere of her usefulness has not long since been extended to our own specialty. It would be an easy matter to add to the training schools for nurses a department for dental nurses. Applicants for admission to such a course would be required to pass a satisfactory preliminary examination. Outside of the general didactic instruction which they would receive, they would obtain additional instruction in regard to the oral cavity, etc., from a dental member of the school's faculty. They would also receive their manual training under the same supervision, and in the hospital material they would find ample opportunity for perfecting their working technique.

Having graduated from the training school, it would be in keeping with our other laws to compel the nurses to pass a state board examination. The passing successfully of such an examination would then entitle them to be registered as trained dental nurses. Being so registered, they would be able to practice their profession in private life. By that is not meant the fact that they would be licensed to go around indiscriminately, cleansing the mouths of people. Their license to practice dental nursing should mean that they are permitted to cleanse, polish and medicate the dental territory only under the prescription of the patient's attending dentist.

In conclusion I might say that there are three important reasons why the plan above outlined for the introduction of dental nurses should meet with your approval:

First. It will tend materially toward the public good. Second. It will open to womankind a new vocation second to none in desirability. Third. It will materially aid the stomatologist in the quality of his results.

This plan of Dr. Rhein's was so well received that the Section on Stomatology of the American Medical Association unanimously adopted a resolution commending it, with the hopes that it would lead to action being taken by the proper agencies to amend the dental laws to legalize the employment of dental nurses. In the New York State Dental Society, after much favorable discussion, and little unfavorable comment, F.T. Van Woert of Brooklyn offered the following resolution: "Resolved, that the New York State Dental Society do hereby recommend the Legislative Committee to use their best endeavors to have the dental law amended in conformity with the views expressed in the paper on 'Trained Dental Nurses.'" The motion to adopt this resolution was put and unanimously carried. Thus it is that through Dr. Rhein's efforts, and with the support of many prominent dentists, notably Thaddeus P. Hyatt, R. Ottolengui, F.T. Van Woert, William Jarvie, John J. Hart and others, the New York State Society was the first to attempt to legalize the dental nurse. Although the movement had the backing of many of the foremost dentists in the state, the

dental law was not thus amended until 1916.

The record of my activities is next in order. My thoughts were directed to prophylaxis by D.D. Smith in a paper and clinic on this subject before the Northeastern Dental Association in the fall of 1899, and through Levi Taylor of Hartford, one of Smith's first converts and most enthusiastic followers, I was thrice invited to Dr. Smith's office to attend his exhibits of patients. Returning from my first visit to these exhibits with Dr. William Jarvie of Brooklyn, I commented on the inordinate amount of time that such a system as Dr. Smith's would require in dental practice, and suggested that it might be possible to train a woman specially to perform this operation. Dr. Jarvie agreed with the idea, and he lived to see the dental hygienist movement well under way. Before his death, he confirmed by letter his recollection of our conversation in 1900.

It is interesting to note the similarity of thought of so many dentists who were inspired by D.D. Smith to a realization of their responsibility to practice dental prophylaxis, but recognized at once their ultimate inability to devote a sufficient amount of their time to this branch of preventive dentistry. The suggestion as to training women to perform prophylactic treatments seems to have been advanced by Drs. Wright, Low, Rhein and me, and possibly others, independently, and no one seems to have received the inspiration for his idea from the others. It was, no doubt, a strong argument for the great practicability of the thought, that it should occur almost simultaneously to several different individuals, who were alike inspired with a deep desire to see dental prophylaxis made a feasible part of the office routine.

It was not until 1905 that, having evolved in 1901 a system of prophylactic treatments for use in my own office, I found it no longer feasible to carry on these treatments without aid, and I undertook the instruction of my office assistant, Mrs. Irene Newman. She began prophylactic work for the patients in February, 1906, and has been in continuous practice in the same office for twenty years. As far as we know, Mrs. Newman was the first lay woman to practice dental prophylaxis.

In 1907, the Connecticut dental law was amended to make it unlawful for dentists to employ unlicensed assistants for operative work in their offices. As chairman of the Legislative Committee of the Connecticut Dental Association, I advocated a clause to the effect that this amendment should not prevent dentists from employing assistants for the "so-called operation of cleaning teeth." This clause, being then adopted, was the first provision ever made in a dental law to legalize the prophylactic treatment when performed by an operator who was not a graduate dentist, but specially trained for and limited to such work.

My interest in this subject led me to accept the appointment of lecturer on dental prophylaxis at the New York College of Dental and Oral Surgery, in 1907, and to appear before many society meetings with papers and clinics on my technic. I was so enthused by the beneficient results secured through dental hygiene in my own practice that, beginning in 1909, I inaugurated a campaign to secure similar prophylactic service for Bridgeport, Conn., school children, in contradistinction to relief and repair dental clinics.

It took four years of strenuous effort to convince the city officials, but finally, in 1913, $5,000 was appropriated to the board of education to conduct the first demonstration of the value of an educational and preventive dental clinic. It at once became necessary to train a number of women to carry on the demonstration. I determined to enlist the aid of professional men and to train a number of women in my office building, where there were excellent facilities for such a course. As early as 1911, in analyzing the special type of services that these women were to perform, I felt that the name dental nurse was a misnomer, and I tried to think of a name to designate these health workers that would not create an association in the mind with the treatment of diseases. The name "dental hygienist" was finally evolved and has been generally accepted.

Thus it was that, in September, 1913, an announcement was issued of the first course for dental hygienists at Bridgeport, Conn., reading in part:

In the last few years, there has been a great demand for women as hygienists and prophylactic operators in dental offices, for it is a well known fact that at least 80 percent of dental diseases can be prevented by following a system of treatment and cleanliness. There is also now developing a demand for these women in public institutions, such as schools, hospitals, and sanitoriums. At the present time, there is no standard educational courses for dental hygienists. The demand for these women throughout the country is sufficiently large to warrant a course of lectures to be given by men who are authorities in their various specialties, these lectures to be printed in book form. With the possibility that this movement will be a powerful aid in the prevention of disease, these educators have agreed to give their services gratis. After the lecture course, there will be six weeks of practical training in dental prophylaxis. A nominal fee of twenty dollars will be charged to partly cover this expense.

The men who so generously agreed to aid this cause were: Raymond C. Osburn, Ph.D., professor in Barnard College, Columbia University, New York City; Alexander M. Prince, M.D., instructor in medicine and physiology Medical Department, Yale University; L.F. Rettger, Ph.D., assistant professor of bacteriology, Sheffield Scientific School, Yale University; R.H. W. Strang, M.D., D.D.S., Bridgeport, Conn.; George M. Mackee, M.D., instructor in dermatology, College of Physicians and Surgeons, New York

City; Edward. C. Kirk, Sc.D., D.D.S., dean of Dental Department, University of Pennsylvania, Philadelphia, Pa.; Eugene H. Smith, D.M.D., dean of Dental Department, Harvard University; M.L. Rhein, M.D., D.D.S., New York City; R.G. Hutchinson, Jr., D.D.S., New York City, R. Ottolengui, M.D.S., New York City, editor, Items of Interest; Charles. M. Turner, M.D., D.D.S., professor of mechanical dentistry and metallurgy, School of Dentistry, University of Pennsylvania; Russell H. Chittenden, Ph.D., L.L.D., Sc.D., director of Sheffield Scientific School of Yale University; M.I. Scharnberg, M.D., D.D.S., New York City; Herman E.S. Chayes, D.D.S., New York City; C. Ward Crampton, M.D., hygienist and director of physical training, Public School System, New York City; Prof. Irving Fisher of Yale University, chairman of Committee on One Hundred on National Hgyiene; William G. Anderson, professor and director of Yale University gymnasium; Thaddeus P. Hyatt, D. D.S., New York City.

Their lectures were later compiled into the book, "Mouth Hygiene, the First Text Book for Dental Hgyienists," compiled and edited by me, with R.H.W. Strang of Bridgeport, Conn., and E. C. Kirk of Philadelphia, Pa., associate editors. Nov. 17, 1913, thirty-three women, including school teachers, trained nurses, experienced dental assistants and the wives of three practicing dentists, began the course, and June 5, 1914, twenty-seven were graduated as dental hygienists. This group of women, coming as they did from various parts of Connecticut, organized on their graduation, June, 1914, the Connecticut Dental Hygienists' Association. This, the first state association of dental hygienists, has held an annual convention since 1915, and had grown to 135 members in 1926.

In the fall of 1914, ten enthusiastic hygienists began their pioneer work in the Bridgeport, Conn., public schools. This demonstration directed by me, with the help and advice of a local committee of most cooperative dentists, was planned on a five-year basis, so that the large group of the same children progressing from the first to the fifth grade could follow the dental hygiene program over that period, and could be used for statistical purposes and be compared with the fifth grade control class, which had no mouth hygiene program. The gratifying results of this demonstration have frequently been published in detail, and the success of the dental hygienist in the first educational and preventive dental service for school children is now a matter of record.

In 1915, an appropriation for additional dental hygienists for the Bridgeport public schools, and a persistent demand from other sources for these trained women, necessitated the second dental hygiene course and a third and last course was held in 1916, at which time organized institutions took up the train-

ing of dental hygienists. A total of ninety-seven hygienists were trained in the three Fones courses. The field of service of hygienists was extended beyond private dental offices and the public schools, when, in 1915, a graduate of the Fones course was installed as a resident hygienist in the New Haven Hospital, and again, in 1917, when a hygienist was employed to provide prophylactic treatments in the industrial dental clinic for the employes of the Yale & Towne Lock Company of Stamford.

The Fones hygienists who were completing their course in 1917, when war was declared, had the unique experience of working in May of that year for the national guardsmen who were mobilized in Bridgeport, and graduate hygienists in this vicinity continued to carry out the same program for the drafted men, utilizing the equipment of the training school. After the cleaning and examination of the teeth, each soldier was supplied with a toothbrush and given individual instruction in the care of the mouth. They were then referred to the local dentists who had responded to our appeal for operative work for these men. This was several weeks previous to the organization of the Preparedness League of American Dentists, and, as far as we know, was the first organized effort to provide dental service for our soldiers. The hygienists cleaned the teeth of 600 soldiers.

In 1915, the increasing number of hygienists in Connecticut, and the possibilities of the future growth of this profession, prompted me to draw up and urge the adoption of an amendment to the Connecticut dental law to regulate the practice of these auxiliary workers. This, having been adopted, legally prescribed for the first time the field of operation of the dental hygienist, and served as a precedent to the majority of the states that subsequently adopted similar clauses. The original dental hygienist practice act is quoted as follows:

Any registered or licensed dentist may employ women assistants, who shall be known as dental hygienists. Such dental hygienists may remove lime deposits, accretions, and stains from the exposed surfaces of the teeth and directly beneath the free margin of the gums, but shall not perform any other operation on the teeth or mouth or on any diseased tissues of the mouth. They may operate in the office of any registered or licensed dentist, or in any public or private institution under the general supervision of a registered or licensed dentist. The dental commission (state board of dental examiners) may revoke the license of any registered or licensed dentist who shall permit any dental hygienist, operating under his supervision, to perform any operation other than that permitted under the provisions of this section.

It is worthy to note that, during these early events, there was never at any time any organized opposition to the dental hygienists from the dentists of Connecticut. The spirit of cooperation was everywhere felt, which accounts in a great measure for the fact that Connecticut was the first state in the country to make a rapid advancement in this movement.

In Massachusetts, as early as 1910, an amendment to the dental law permitting the practice of the dental nurse, was introduced into the legislature, but it was defeated. There were dentists in Massachusetts who desired to utilize the services of a woman in their private offices as early as 1902. Dr. Wright, in one of his papers, spoke especially of S.A. Hopkins of Boston, but the threats of the dental commissioners to prosecute whoever attempted to use a prophylactic operator, other than a dentist, were so effectual as to prevent it. There were many strong advocates for the dental hygienist, notably W.P. Cooke, Carl R. Lindstrom, George H. Payne, Charles M. Proctor, Eugene H. Smith, LeRoy M.S. Miner and others, who kept this matter before the profession until, in 1915, the dental law was amended to permit the use of these auxiliary workers.

In New York, this matter was agitated, as stated previously, from 1903 until the passage of the dental hygienist amendment in 1916. Shortly after the legalizing of the dental hygienist in Massachusetts and New York, three training schools were organized in these states. The New York School of Dental Hygiene was founded by Louise C. Ball, who secured a grant of $2,500 from the Rockefeller Foundation, and with the aid of several dentists, physicians and teachers conducted a preliminary summer course through Hunter College in 1916. In the fall, the school became an organized part of the Vanderbilt Clinic of Columbia University. The course was a full academic year in length and required "evidence of attendance for one year in a high school" for admission to the class. This was the first university course for dental hygienists, and has been in continuous service since 1916. It is now conducted by the College of Dentistry of Columbia University.

In 1916, shortly after the New York school was founded, a similar school was established in the Rochester Dental Dispensary at Rochester N.Y., under the direction of Harvey J. Burkhart, and another at the Forsyth Dental Infirmary for Children at Boston, Mass., under the direction of Harold DeWitt Cross. These schools have since become a part of the School of Medicine and Dentistry of the University of Rochester, and of the Dental School of Tufts College, respectively.

From the time of the establishment of the first training schools, the dental hygienist movement has made rapid progress. At the present time there are ten schools; Training School for Dental Hygienists, University of California, San Francisco, Calif.; Courses in Oral Hygiene, School of Dentistry, University of Pennsylvania, Philadelphia, Pa.; School of Oral Hygienists, Temple University, Philadelphia, Pa.; School of Dental Hygiene, Marquette University, Milwaukee, Wis.; Dental Hygienist School, Northwestern University, Chicago, Ill.; School of Dental Hygiene, College of Dental Surgery, University of Michigan, Ann Arbor, Mich.; School for Dental Nurses, University of Minnesota, Minneapolis, Minn.; School of Oral Hygiene, Columbia University, New York City; School for Dental Hygienists, University of Rochester and Rochester Dental Dispensary, Rochester, N.Y.; and Forsyth-Tufts Training School for Dental Hygienists, Boston, Mass.

The dental laws in the following twenty-six states have been amended to regulate the practice of dental hygienists: Alabama, Arkansas, California, Colorado, Connecticut, District of Columbia, Iowa, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Mississippi, New Hampshire, New York, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Vermont, Washington, West Virginia, Wisconsin, and Wyoming, and the Territory of Hawaii.

In the majority of these states, the hygienists have organized into local or state societies. The dental hygienists of California were instrumental in bringing the matter of organizing a national dental hygienists' association to the attention of the Officials of the American Dental Association at a meeting in Los Angeles, Calif., in July, 1922. A resolution was presented and met with the approval of the Board of Trustees, and Sept. 12, 1923, the American Dental Hygienists' Association was formed, in Cleveland, Ohio. The first officers chosen to serve in this new organization were Mrs. Hubert W. Hart, Bridgeport, Conn., president; Miss Edith Hardy, Rochester, N.Y., president-elect; Miss Evelyn C. Schmidt, Boston, Mass., Miss Emma Ditzell, Harrisburg, Pa., and Miss Ethel Covington of Denver, Colo., vice-presidents; Miss Helen Hilbish, Cleveland, Ohio, treasurer, and Miss Alma W. Platt, San Francisco, Calif., general secretary.

The American Dental Hygienists' Association is sponsored by the American Dental Association, and has held its convention in conjunction with the annual Session of the American Dental Association. It is estimated that there are approximately 2,000 dental hygienists in the United' States at present, with the number increasing yearly, as the various training schools graduate their classes.

Without doubt the work of these auxiliary practitioners of educational and preventive dental service constitutes one of the greatest contributions of dentistry to the public's health during the past twenty years, in which time the dental hygienist movement has developed to its present importance.

The Forsyth Experiment in Training of Advanced Skills Hygienists

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Abstract: A curriculum for teaching restorative procedures to dental hygienists has been developed. It was found that with the hygienist's knowledge of basic sciences only 12 weeks of additional didactic and preclinical training was needed for her to master cavity preparation and placement of filling materials which are in a plastic state at the time of insertion. During the 13 weeks of internship which followed completion of the preclinical training, the advanced skills hygienists performed high quality restorative work and achieved a reasonable level of productivity. After an additional 12 weeks of practice, the mean productivity was five surfaces per operative hour and approached the productivity of experienced staff dentists, six surfaces per working hour. The study demonstrated conclusively that the advanced skills hygienist is capable of providing high quality restorative dentistry while working under the direct and immediate supervision of the dentist.

The cost of the additional training was calculated at $2,300. Projections were also made of productivity and income potential. It was concluded utilization of this type of auxiliaries may provide high quality dental care to more people while containing, if not in fact decreasing, the cost of restorative services.

Introduction

The rationale for the educational experiment reported in this paper is that a significant increase in the individual dentist's capacity to provide quality treatment for more people at the lowest possible cost may be achieved by greater utilization of trained auxiliaries.

Extension of duties of dental hygienists is not a new idea. In 1949 the Forsyth Dental Center, with the assistance of a grant from the Children's Bureau of the United States Public Health Service, embarked upon an extensive educational experiment to liberate the dentist by training New Zealand-type dental nurses. However, the concept was premature, and the project was abandoned under pressure from organized dentistry.

In hindsight, two crucial mistakes which helped accelerate the demise of the 1949 project can be readily identified. First, the dental profession was not made aware of the purposes of the program prior to its inception. Second, the educational experiment was incorporated into the ongoing programs, of the dental hygiene school. This provoked the criticism, possibly justifiable, that these students upon graduation would not be qualified for licensure to practice dental hygiene since their course was quite different from that approved by the Council on Dental Education. Although the experiment ended after one year, it lasted long enough for several young women to demonstrate considerable proficiency in cavity preparation and restoration. These favorable preliminary observations facilitated approval of the present project by the Forsyth trustees in 1965.

Subsequently, several other experimental programs have been initiated, training hygienists to perform other than reversible procedures while working under the direct supervision of a dentist. At the University of Iowa, dental hygiene students are being taught aspects of both restorative dentistry and periodontal therapy. At the University of Pennsylvania, instruction in expanded duties is given in the field of periodontal therapy. The University of Kentucky has already graduated hygienists with advanced skills in restorative dentistry. The Forsyth project is also in the field of restorative dentistry and has centered on cavity preparations and restoration. The study was designed specifically to provide data on the following aspects of advanced training: 1) time required for the training of advanced skills hygienists, 2) the productivity of the trainees under clinical conditions, and 3) the financial impact of such auxiliaries in dentistry.

Selection of Trainees

After a number of different populations of hygienists had been considered, a group of ten graduates who in June 1971 had completed two-year hygiene programs were selected for training as advanced skills hygienists. Selection was completed by September 1971, but because of delays in the construction and equipping of the new educational and clinical facilities, instruction was not started until March 1972. Therefore, when the instruction in advanced skills began, all trainees had accumulated seven months of experience as conventional hygienists working in private practices.

Prior to their selection, consideration had given to developing an in-depth psychological profile for each candidate through the use a battery of personality and aptitude tests. However, the consulting psychologist advised against this since the number of trainees to be selected was small and it appeared that the best predictor for success in this experimental program would be an assessment of each candidates commitment to complete all phases of the program. Consequently, past performance in hygiene school, as reflected in the candidate's overall grade point average, was used as the basis for selection. Also, the candidates were interviewed in an attempt to assess their resolve to complete the program. All those selected were licensed by the state of Massachusetts, but they came from three different schools of dental hygiene - Bristol Community College, Fones School for Dental Hygienists, and Forsyth School for Dental Hygienists – and thus possessed different educational backgrounds.

Educational Facilities

Interference with the activities of the undergraduate school for dental hygienists was avoided through the construction of new facilities. A new clinic was designed to serve multiple functions in instruction during preclinical training and during the clinical internship phase and as a patient treatment facility for the study of dental care delivery. The advanced skills hygienists received their preclinical and clinical training in the rotunda (Figure 1), which has ten completely equipped operatories. This design provides direct supervision of the trainees by the instructional staff, since the partitions between operatories do not obscure the view of individual operatories regardless of where an instructor is located (Figure 2). The operatories are open at the central end, providing easy access for distribution of instruments and supplies. The peripheral areas of the Rotunda house a dental laboratory and provide facilities for radiology (including automatic developing equipment), examination and diagnosis and sterilization. Operatories 1, 2, and 3 (Figure 1) are used for blind evaluations of cavity preparations and finished restorations by outside examiners; this is part of a continuous monitoring of the quality of services provided by the advanced skills hygienists. These three operatories also provide isolation when necessary for surgical procedures or for patients who may be difficult to manage.

A television laboratory makes possible the monitoring and recording of teams in operation so that a team may study its own operating procedures to determine how the ability of the team to deliver care effectively can be improved.

Curriculum

The instructional staff, which included two full-time and two half-time instructor-dentists, with the part-time help of educators and instructional

designers, was charged with the responsibility for development of the new curriculum. As part of the preparation for this task, the curricula of the following programs were studied to obtain background information: the Royal Canadian Dental Corps program for advanced training of auxiliary personnel (1,2); the New Zealand Dental Nurse program (3); the program of the New Cross School for Dental Auxiliaries (4); the University of Alabama program (5) of expanded functions for dental auxiliaries; and the program of the Forsyth School for Dental Hygienists (Table I).

Since the major objective or the experiment was to train dental hygienists to perform selected restorative procedures, including the use of local anesthesia when indicated, the curriculum contents of the New Zealand Dental Nurse and the New Cross School for Dental Auxiliaries programs were studied in depth and contrasted with the curriculum for the Forsyth School for Dental Hygienists - a typical curriculum of an American two-year dental hygiene school. It was apparent that the hygienist had the oral biology background necessary for the performance of restorative dental procedures (Table II). After careful analysis of these programs it was estimated that a maximum of 47 weeks would be required for completion of the training which included 1,396 hours of preclinical and clinical instruction and practice (Table III). This time estimate compared favorably with the portion of the New Zealand and New Cross School curricula devoted to restorative dentistry. It also compared favorably with J11e time devoted to simple restorative procedures in a typical American four-year dental school (Table IV). However, the data in Table III show that in actuality less time was required achieve the stated objectives. For instance, it had been estimated that 184 hours would be required for lectures, demonstrations and laboratory exercises in restorative dentistry to provide an adequate basis for clinical practice, which only 129 hours actually were used for these purposes. The estimated time for preclinical manikin practice was 296 hours, but only 172 hours were used. Subsequently, 76 hours (Table III) of projected instruction time which had not been needed was used in teaching extensive cavity preparations, cusp reductions, and pin placement. Instruction in these procedures had not been anticipated during preparations of the curriculum. With regard to clinical practice, the original estimate was that 896 hours would be necessary to develop clinical competence and reasonable operating speed. Based on the accomplishments during the pre-clinical phase of instruction, this figure was revised downward to 516 hours. However, it was found that only 360 hours of clinical practice were necessary to demonstrate competency. Thus the total instructional time turned out to be 25 weeks, instead of the projected 47 weeks.

Lectures, demonstrations, and seminars were used for the didactic part of the training. The exercises in cavity preparation and restoration were specified in terms of performance objectives based on task analyses of the procedures. The trainees progressed from Class I through Class II, MOD, Class III, and Class V to Class IV cavity preparations and restorations. The preclinical training was carried out with a new manikin training aid developed by the U.S. Public Health Service's Division of Manpower Education (Figure 3). The manikins were mounted on the dental lounge chairs in the Rotunda clinics and simulated a patient in the supine position. All cavity preparations were made using standard instrumentation and high speed dental handpieces. During the preclinical phase, the trainees worked without trained chairside assistants, while in the clinical phase assistants were utilized.

Evaluation of Restorative Procedures

The performance requirements in this study were that the restorative dental services consistently must be of high quality, equal to that produced by graduate dentists. Since evaluation of restorative procedures is subjective and may vary markedly among observers, definite standards were developed for the examiners in the form of a performance scale and specific criteria. These standards and criteria were used for evaluation of the restorative procedures in the preclinical laboratory and during the internship phase of clinical practice. After completion of the training program, the same procedures were used to evaluate the services provided during the experiments in delivery of dental care

Self-evaluation and peer review of completed exercises were used throughout the instructional period. To be effective in evaluating cavity preparations and restorations, the trainees had to have a thorough understanding of the criteria for evaluation and be able to apply the performance scale to the evaluation of restorative procedures in a consistent manner. The staff prepared ideal examples of each cavity preparation and the performance of the trainees was judged against these allowing a tolerance of ± 0.5 mm. In order for the trainees to learn to make this judgment, an exercise in application of metric measurement was de-

Figure 1: Original Floorplans for the Rotunda Clinic

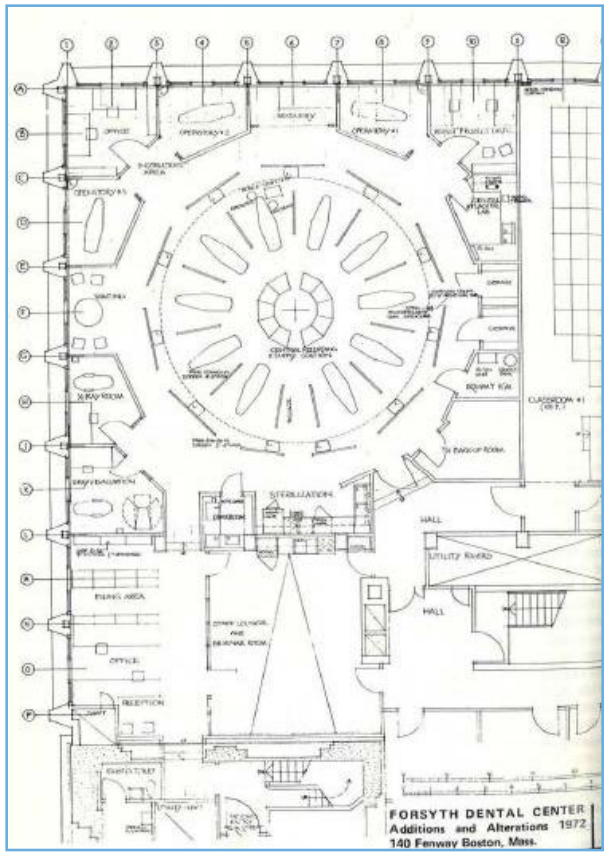


Figure 2: The Rotunda Clinic in Use

Table I: Duration of Curricula in Dental Auxiliary Training Programs

New Zealand Dental Nurse	2 years	1,608 hours
New Cross Dental Auxiliary	2 years	2,052 hours
Canadian Dental Corps Auxiliary	44 weeks	1,852 hours
Alabama Expanded Auxiliary	2 years	2,085 hours
Forsyth Dental Hygienist	2 years	1,742 hours
Predental-Dental School	8 years	9,700 hours

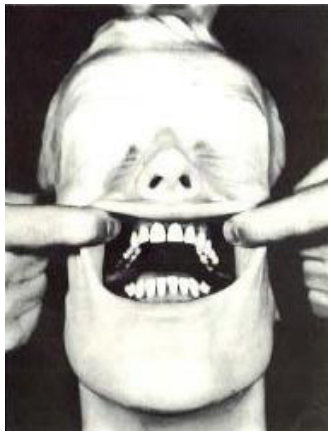
Table II: Comparison of Duration of Curricula in Biological Sciences

New Zealand Dental Nurse	340 hours
New Cross School Auxiliary	263 hours
Forsyth Dental Hygienist	516 hours

signed. Known dimensions of burs and hand instruments were used as aids in judging the depth, width, and length of cavity preparations.

Self and peer evaluation preceded all evaluations by the instructors, who recorded their scores on an appropriate form (Figure 4). Two of the three instructors had to agree as to the acceptability of the preparation or restoration. If anyone criterion (Figure 4) in the evaluation of these preclinical procedures was not met, the procedure was unacceptable and had to be repeated.

Figure 3: Life-like Manikin Used to Teach All Classes of Cavity Preparation and Restoration in Typondant Teeth



Results

The success of the instructional program was assessed by comparison of preinstructional and postinstructional didactic test scores. It was found that deficiencies in specific areas of knowledge, which had existed at the outset of the instruction, had been remedied by the instructional program.

The total time needed for acquisition of the skills required for clinical work was only 13 weeks. The clinical internship, which followed the preclinical phase, also lasted 13 weeks. After 26 weeks, the staff judged the group to be competent to perform the selected procedures in restorative dentistry. In this respect, the procedures performed by the advanced skills hygienists were regarded as equivalent to those performed by recent graduate dentists.

Time Required and Quality of Specific Procedures

The performance of the advanced skills hygienists in developing proficiency in cavity preparations of Class I, II, III, and MOD is shown in Figure 5. The mean time required for completion very first Class I occlusal cavity preparation on the manikin was 34 minutes, while the fourth preparation took only 19 minutes. As would be expected, the more difficult multiple surface preparation, Class II and MOD, required more time. However, on each successive attempt the mean time decreased. The group performance on Class IV cavity preparations with the placement of pins is not shown, but completion time ranged from 10 to 75 minutes, with a mean of 35 minutes by the fourth attempt.

Table III: Experimental Curriculum to Train Dental Hygienists in Selected Restorative Procedures

	Projected Hours	Actual Hours
Lectures, Demonstrations and Laboratory		
Restorative Dentistry – Cavity Design – Preparation	40	52
Instrumentation Lecture – Demonstration	40	18
Dental Materials Laboratory Exercise: Amalgam, Cements, Silicates, Plastics	64	26
Assistant Utilization Lecture - Demonstration	40	33
Subtotal	184	129
Preclinical Manikin Exercise		
Rubber Dam	16	11
Matrix	40	5
Amalgam – Class I, II, V	160	110
Composites, Resins, Silicates – Class III, V	80	46
Subtotal	296	172
Extensive Preparations, Cusp Reduction, Pins	0	76
Local Anesthesia – Instruction and Practice	20	9
Subtotal	20	85
Clinical Practice	896	360
Total	1,396	746
Training Time, Weeks (30 hours per week)	47	25

Table IV: Typical Dental School Curriculum Related to Restorative Procedures

	Hours	Total
First Year		
Preclinical Lectures	11	–
Dental Materials	44	–
Operative Techniques	88	143
Second Year		
Dental Materials	33	–
Operative Techniques	132	–
Operative Clinic	33	198
Third Year		
Operative Clinic	165	–
Lectures	33	198
Fourth Year		
Operative Clinic	352	–
Lectures	33	385
	Total 4 years	924

The use of trained chairside dental assistants had a profound effect on the time required for the more difficult multiple-surface cavity preparations (6); it reduced cavity-preparation time by approximately 50 percent without any loss of quality. However, the use of assistants did not have much effect on the time required for Class III and Class V preparations.

The times required for placement and finishing of fillings are summarized in Table V. Condensation and carving of Class I amalgam restorations required a mean time of 11 minutes. The finishing of these restorations, which could not be completed at the time of condensation, required a mean time of 14 minutes. More time was required to place

and finish Class II restorations and MOD amalgam restorations. This finding was expected in view of the complex nature of the more extensive restorations. In evaluating the completed Class II amalgam restorations in the manikin typodont, 30 percent were found unacceptable and had to be redone; 36 percent of the MOD amalgam restorations suffered the same fate. The mean time required to finish Class Ill restorations was 11 minutes, and only 10 percent of these restorations were unacceptable. The Class IV restoration requiring rebuilding of the incisal edges of anterior teeth was considered the most difficult. The mean finishing time for this restoration was 47 minutes, but the success rate was high; only 15 percent of the completed restorations were found unacceptable.

Productivity

It should be noted that at 13 weeks, the productivity of the trainees was between three and three and one-half surfaces of completed restorative dentistry per operative hour (Table VI). During the succeeding weeks of clinical practice, the productivity steadily increased so that by the time 25 weeks had elapsed the group could consistently produce five surfaces of completed restorations for every hour spent with patients. The staff dentists on this project, who delivered restorative services for patients in the same environment and under identical working conditions, consistently produce a mean of six surfaces per operative hour.

Each team, composed of a trainee and a dental assistant, spent 65 per cent of each six hour working day in patient contact. The productive time for this team of auxiliaries was similar to that reported for therapists by Pelton et al (7) In the latter study the chairside time in a "surrogate private practice" was approximately 50 percent of each eight-hour day.

Patient Acceptance

Continuous monitoring of patient acceptance of the services provided by the advanced skills hygienists has revealed that there is no reluctance on the part of adult patients or parents of child patients to accept these auxiliaries in a role which has traditionally belonged to the dentist. This finding is similar to that previously reported by Lotzkar et al (8) for expanded duties dental assistants. It would appear that acceptance of expanded duty dental auxiliaries does not present a problem with the public, but it may be a problem with regard to the dentist's self image.

Educational Costs

The costs of educating advanced skills hygienists is an important factor in determining the practicality of using such personnel in the future. A comparison of estimates of the cost of educating a dentist and an advanced skills hygienist in private educational settings is found in Table VII. The combined cost of private predental and dental education amounts to $62,400, including living costs while in school. The cost of two years of hygiene education at

Forsyth School for Dental Hygienists is $5,400. The additional cost of training the hygienist to become an advanced skills hygienist was $2,300, based on a dentist-instructor to student ratio of one to ten. Therefore, the total cost of producing an advanced skills hygienist was $7,700 and the total time 97 weeks. In the light of the savings of time and money which would accrue from the training of personnel other than dentists to provide 30-40 per cent of the needed dental care, it makes good sense for both the public and the dental profession to use advanced skills hygienists.

Income Producing Potential

The data on productivity of the advanced skills hygienists (Table VI) was used to project the possible income that a team made up of a dentist, an advanced skills hygienist, and a chairside dental assistant could produce in a year in a private practice setting. The projection in Table VIII only accounts for the income and expenses of the auxiliary part of the team and the supervision time of the dentist. Based on an effective six-hour day, the dentist would have 5.5 hours to do his own work since the team would require only one-half hour of supervision.

Using a composite fee, based on a welfare dental fee schedule, the team could produce a gross income of $47,250. After paying salaries of $12,000 to the advanced skills hygienist and $6,000 to the assistant and calculating overhead at 50 per cent of the net income after salaries, the projected income for the dentist is $ 14,625. The cost of these dental services to the public could be reduced if part of the net income from the use of this team were shared with the consumer in a manner that would also provide the dentist with adequate compensation for the time spent on supervision of the team. The economic aspects of the utilization of auxiliary teams in restorative dentistry are indeed most attractive, especially if their use results in a lowering of the cost of quality service to the consumer.

Concluding Remarks

The questions most often asked concerning the Forsyth program are the following. Why use hygienists when they are already in short supply? Why use the hygienist in restorative dentistry when, by tradition, hygienists belong in periodontics and prevention? The reasons are that hygienists are already licensed and can be regulated by existing dental boards, and the hygiene curriculum is extensive in those basic sciences which dental educators consider prerequisites to clinical dentistry. In addition, as now utilized in most private practices and as limited by some state laws, statutes, or regulations, most hygienists are overeducated and overtrained or underutilized.

Another strong argument in favor of the idea of expanding the hygienist's duties is that the potential breakthrough in the control of dental diseases may lead to a drastic decrease in the demand for restorative services. It certainly makes good sense to expand a pool of auxiliaries requiring far Jess education than dentists rather than to run the risk of overproducing professionals who must invest seven to eight years in preparation for a career. The current surplus of Ph.D.s, engineers, and teachers is a harsh reminder of this possibility. A look at educational facilities reveals that there are 150 schools of dental hygiene. These schools have well equipped clinics which, in the advent of a care crisis easily could be adapted to teaching advanced skills, including restorative procedures. In addition, if new facilities should be required to teach expanded intra-oral functions, it costs less than $1 million to build a hygiene school, while current costs for a dental school range from $15-35 million. Furthermore, as pressures create demands for more dental care, it is probable that the focus will be on children, for whom dental decay is the greatest problem. The Forsyth program has concentrated on restorative dentistry, because restorative services make up the bulk of the public's demand for dental care; this is the area where expanded duty auxiliaries will have the greatest impact on dentistry.