100 Years of Dental Hygiene Research: Progress and possibilities

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Ann Eshenaur Spolarich, RDH, PhD, FSCDH

ABSTRACT

During the last century, the role of dental hygienists as leaders in the recognition, prevention, and treatment of oral diseases has grown, reflecting the ever-evolving knowledge base of the profession. The American Dental Hygienists’ Association (ADHA) has contributed to and supported research that has formulated the scientific basis for the profession to inform education and practice. Progress has been made across multiple priority areas identified on the National Dental Hygiene Research Agenda, including educational research examining the impact of curriculum models on teaching and learning; health services research projects documenting workforce issues and cost-effectiveness of practice models; and public health initiatives expanding access to care to provide oral health care services for diverse patient populations. The Journal of Dental Hygiene, established in 1927, has played a significant role in disseminating scientific evidence to the global dental hygiene and professional communities. Collaborative efforts both within dental hygiene and externally with interprofessional partners and key stakeholders have positively contributed towards building the research infrastructure to support the profession. The number of dental hygienists who are actively engaged in research has increased, as has the value for research as part of the research culture. Focused research priorities and training efforts have encouraged collaborations across the globe to conduct and promote the science supporting dental hygiene education and practice. Development, testing and validation of theoretical frameworks is essential to drive all professional activities. Building a community of scholars who will continue to define the dental hygiene discipline through scholarship is critical to promote a scholarly identity for the profession.

Keywords  Dental hygienists, dental hygiene research, scholarly identity, research agenda, interprofessional collaboration, theoretical frameworks

NDHRA priority area: Professional development: Education (interprofessional education)

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INTRODUCTION

Dental hygiene is defined as the science and practice of recognition, prevention and treatment of oral diseases and conditions as an integral component of total health. This includes assessment, diagnosis, planning, implementation, evaluation, and documentation. The American Dental Hygienists’ Association (ADHA) advocates for equitable, comprehensive, evidence-based, interprofessional, preventive, restorative and therapeutic care for all individuals. As oral health care professionals, dental hygienists are educated to deliver quality care based on sound science and in accordance with the highest set of ethical practice standards.

A discipline encompasses the generation of knowledge that is applied by the profession into practice. The ADHA has supported the conduct of research to grow the body of knowledge unique to the discipline of dental hygiene, the translation of this knowledge into educational models and curriculum and practice standards, and more recently, the development and testing of theoretical frameworks. To this end, the ADHA supports basic science and applied research in the investigation of health promotion/disease prevention and theoretical frameworks which form the basis for education and practice. All research efforts should enhance the profession’s ability to promote the health and well-being of the public. Promotion of the scientific basis for dental hygiene practice requires a strong research infrastructure.

BUILDING A RESEARCH INFRASTRUCTURE

The establishment of a research infrastructure is essential to purposefully and systematically build the scientific knowledge base. This infrastructure facilitates the conduct of research and the dissemination of the findings for translation into educational curricula and to ultimately inform practice. There are five essential and interrelated elements of a research infrastructure used in the health professions:

- A critical mass of researchers/scientists
- Research priorities that produce clinically relevant knowledge
- Communication systems that promote linkages among researchers and increase access to research findings
- Funding mechanisms to support research
- Demonstrated value for research and its relationship to practice

The following sections highlight progress made in addressing each of these essential elements. A summary of historical progress made towards advancing the dental hygiene research infrastructure is found in Table 1.

Critical Mass of Researchers

An important component of a research infrastructure is to put programs in place to train new researchers to purposefully grow the number of dental hygienists who actively engage in research. These efforts cannot be accomplished by any one organization or institution alone: this work requires concerted, coordinated, and dedicated efforts by those who are invested in advancing the profession.

Historically, the primary responsibility for training new researchers has fallen to graduate dental hygiene programs. At the time of this writing, there are 17 graduate programs in the United States. Unfortunately, several programs have closed within the past decade. The emphasis placed on research training in existing graduate programs is inconsistent. While all include didactic coursework in research methodology, few require completion of original thesis research, but have opted for lesser-intensive research-related projects, such as a Capstone project, as a requirement for graduation. Among the current graduate programs, a heavy emphasis has been placed on preparing future educators to fill ongoing vacancies in academia. Thus, new faculty who are hired to teach in undergraduate and master’s degree programs are graduates of these programs, entering academic careers that require participation in scholarly activities, including conducting their own original research, for which they may be inadequately prepared. Their lack of experience presents another challenge when they...
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<th>Year</th>
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<td>1914</td>
<td>Fones’ 5-year demonstration project is initiated in public schools</td>
<td>First research results documenting the success of the dental hygienist in education and dental disease prevention</td>
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<td>1927</td>
<td>First issue of the <em>Journal of the American Dental Hygienists’ Association</em> (JADHA) is published; name is changed to Dental Hygiene in 1972 and Journal of Dental Hygiene in 1988</td>
<td>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.</td>
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<td>1936</td>
<td>“Oral Hygiene as an Exact Science” paper is read before the Annual Convention of the New York Dental Hygienists’ Association</td>
<td>First known paper focused on principles and scientific support for the services delivered by dental hygienists; paper also published in JADHA</td>
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<td>1940</td>
<td>ADHA Presidential Address focuses on the importance of “promoting an understanding the scientific procedure”</td>
<td>The president also stated in her address, however, “to think of producing scientists is improbable…”</td>
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<tr>
<td>1945</td>
<td>First dental hygiene research article is published in JADHA</td>
<td>The article presents results from a survey of dental hygiene programs in the United States (n=14)</td>
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<td>1955-59</td>
<td>Proportion of pages the JADHA dedicates to manuscripts decreases from 51% in 1927 to 31%</td>
<td>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%</td>
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<td>1960</td>
<td>First master’s degree program for dental hygienists is established at Columbia University</td>
<td>Focus is dental hygiene education, but program also lays the foundation for becoming one of the first to require research for the advanced degree</td>
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<td>1966</td>
<td>The Role of the Dental Hygienist in Dental Research: I-III reports are published in JADHA</td>
<td>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</td>
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<td>1968</td>
<td>National Institutes of Health Research Training Grants funds dental hygiene faculty</td>
<td>Purpose is to fund research, teaching, and related activities</td>
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<td>1971</td>
<td>“The Dental Hygienist in Dental Research” is published in JADHA</td>
<td>A dental hygienist author describes the excitement of employment as a research associate</td>
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<td>1974</td>
<td>The Forsyth Experiment is completed at the Forsyth Dental Research Institute in Boston, MA</td>
<td>Findings show improved cost and no loss of quality when restorative dental services are delivered by trained DHs</td>
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<td>Mid-1970s</td>
<td>ADHA appoints first Committee on Research</td>
<td>By 1979, the Committee evolves into the Council on Educational Services and Research, eventually to become the Council on Research (1987 to 1988)</td>
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<td>1978</td>
<td>ADHA Foundation (formerly the Educational Trust Foundation) is created to provide activities and programs such as research</td>
<td>The Foundation eventually will become the Institute for Oral Health in 1985 to continue the former mission but also to expand its scope</td>
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<td>1979</td>
<td>ADHA Foundation establishes the first Research Grant Program to fund research conducted by dental hygienists</td>
<td>Grant Review Committee and guidelines are established; awards range from $100 to $1,000</td>
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<td>1980</td>
<td>First research text, <em>Research Methods for Oral Health Professionals</em>, published by CV Mosby</td>
<td>Textbook is written by dental hygienist co-authors and published for use by dental hygienists and dentists as an introduction to research methods</td>
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### Table I. 100-Year History of Dental Hygiene Research* (continued)

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<td>1975-81</td>
<td>Proportion of the Journal dedicated to original research articles increases from 26% in 1975 to 42% in 1981</td>
<td>• 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%</td>
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<td>1982</td>
<td>First Conference on Dental Hygiene Research 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.</td>
<td>• 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.</td>
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<td>1984</td>
<td>First ADHA National Agenda on Dental Hygiene Research Conference is held in Denver, Colorado</td>
<td>• The focus is to encourage participation in research and teach basic research skills; educators were predominant dental hygienists in attendance</td>
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<td>1987</td>
<td>Health Manpower Pilot Project (HMPP #139), the Dental Hygiene Independent Practice Prototype, is initiated in California</td>
<td>• To study safety and access to dental hygiene care in unsupervised settings using a planned, systematic approach to alternative health-care methods.</td>
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<td>1987</td>
<td>Second ADHA National Conference on Dental Hygiene Research is held at the University of Iowa, Iowa City, Iowa</td>
<td>• Agenda focuses on theory development, a body of knowledge in dental hygiene, the developing discipline, and approaches for building knowledge in the discipline</td>
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<td>1988</td>
<td>ADHA publishes <em>Prospectus on Dental Hygiene</em> positioning the dental hygienist as member of the health care team</td>
<td>• 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.</td>
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<td>1988</td>
<td>Goal of ADHA first Council on Research is established</td>
<td>• “...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.”</td>
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<td>1990</td>
<td>Canadian Dental Hygienists’ Association (CDHA) holds a symposium in Edmonton, Alberta on “Clinical Dental Hygiene: Directions for Research, Teaching and Evaluation.”</td>
<td>• 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.</td>
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<td>1991</td>
<td>The ADHA-IoH embarks on a development campaign to establish a Research Fund.</td>
<td>• The campaign is successful and earns $150,000. In 1991, it was renamed the John C. Thiel Research Endowment Fund</td>
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<td>1991</td>
<td>John Thiel Faculty Research Fellowship Program is established by the ADHA-IoH</td>
<td>• Fellowship is established as a means of specifically supporting the professional advancement of dental hygiene educators pursuing a masters or doctoral degree</td>
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<td>1992</td>
<td>ADHA convenes a panel on theory development in dental hygiene</td>
<td>• 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.</td>
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<td>1993</td>
<td>The Human Needs Conceptual Model is proposed for Dental Hygiene</td>
<td>• Purpose is for use as a theoretical framework for research, education, and practice</td>
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<td>1993</td>
<td>National Center for Dental Hygiene Research is established at Thomas Jefferson University via a grant from Bureau of Health Programs, DHHS</td>
<td>• Through additional BHP, DHHS grants, the National Center develops the DhNet in 1995 and EBNnet 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 USC in 1999 continuing its important mission in fostering dental hygiene research.</td>
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<tr>
<td>1993</td>
<td>CDHA holds the fourth annual professional conference, the North American Research Conference: An Exploration into the Future.</td>
<td>• The American Dental Hygienists’ Association participates in the development of the conference workshops.</td>
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<td>1994</td>
<td>ADHA holds the Third Dental Hygiene Research Conference in Minneapolis, Minnesota</td>
<td>• Professional Growth through Research was the title of the conference.</td>
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<td>1995</td>
<td>Journal of Dental Hygiene (JDH) publishes the study validating the first National Dental Hygiene Research Agenda</td>
<td>• National Center for Dental Hygiene Research conducts a study to validate the first agenda; results of Delphi study used to reach consensus were published</td>
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<td>1995</td>
<td>International Association of Dental Research (IADR) establishes Oral/Dental Hygiene Research Group</td>
<td>• IADR later changes name to Oral Health Research Group; the dental hygiene focus remains but is diminished</td>
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<td>1995</td>
<td>CDHA’s Board Council on Education and Research offers the first research grant/award to members.</td>
<td>• Award is part of CDHA’s goal to promote quality dental hygiene research in Canada</td>
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<td>Mid-1990’s</td>
<td>ADHA Research Division is established</td>
<td>• 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.</td>
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<td>1999</td>
<td>CDHA publishes inaugural edition of Probe Scientific</td>
<td>• Offers a forum for Canadian dental hygienists to publish their own research while also remaining open to publishing international research</td>
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<td>2000</td>
<td>Fourth ADHA National Research Conference is held in Washington D.C.</td>
<td>• The Millennium for Dental Hygiene Research Conference participants assisted with updating the ADHA National Dental Hygiene Research Agenda</td>
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<td>2002</td>
<td>National Conferences in Dental Hygiene Research in Sweden are initiated</td>
<td>• Held at Dalarna University for doctoral students and doctoral-prepared dental hygienists to present their research findings</td>
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<td>2003</td>
<td>CDHA holds its National Dental Hygiene Research Agenda Workshop</td>
<td>• Eleven individuals from across Canada are brought together to develop the first CDHA Dental Hygiene Research Agenda</td>
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<td>2003</td>
<td>Dental Practice-Based Research Network is initiated</td>
<td>• National Institute of Dental and Craniofacial Research provides main source of funding for dental and dental hygiene practitioners</td>
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<td>2005</td>
<td>ADHA publishes Focus on Advancing the Profession</td>
<td>• Establishes three major aims and several related objectives for dental hygiene research in everyday clinical practice</td>
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<td>2007</td>
<td>JDH publishes the updated National Dental Hygiene Research Agenda</td>
<td>• 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</td>
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<td>2009</td>
<td>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</td>
<td>• 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.</td>
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<tr>
<td>2009</td>
<td>ADHA announced the DENTSPLY/ADHA Graduate Dental Hygiene Research Program.</td>
<td>• Provides each graduate dental hygiene program the opportunity to nominate one outstanding graduate student project, based on criteria determined by the program, to represent them at the ADHA CLL at Annual Session.</td>
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<td>2011</td>
<td>Second North American/Global Dental Hygiene Research Conference: Inspiration,</td>
<td>• 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.</td>
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<td></td>
<td>Collaboration, and Translation is sponsored by the National Center for Dental</td>
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<td></td>
<td>Hygiene Research and Practice, in partnership with ADHA, and CDHA in Bethesda,</td>
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<td>Maryland</td>
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<td>An International Task Force is formed to plan the first doctoral degree program in dental hygiene</td>
<td>• Support is provided by Idaho State University's Master of Science in Dental Hygiene Program and Division of Health Sciences</td>
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<td>ADEA in collaboration with ADHA develops ADEA Core Competencies for Graduate</td>
<td>• Guidelines identify eight core competency domains and establish benchmarks for educational quality and curriculum development and enhancement.</td>
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<td>Dental Hygiene Education</td>
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<td></td>
<td>The Istituto Stomatologico Toscano, a Research Center on oral hygiene was created</td>
<td>• The 1st National Congress on Research in Dental Hygiene was held in Pisa, Italy entitled Nonsurgical Periodontal Treatment: How to Conciliate Scientific Evidence and Clinical Practice as a result of the creation of this institute</td>
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<td>in order to coordinate and stimulate activity designed to identify and verify new</td>
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<td>procedures and new materials in dental hygiene and to test related clinical</td>
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<td>activities</td>
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<td>2013</td>
<td>JDH celebrates 100 years of dental hygiene</td>
<td>• Began in 1927 as 16 pages with no research; current issue is 55 pages: 75% original research manuscripts.</td>
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<tr>
<td>2013</td>
<td>Dental Hygiene celebrates 100 years as a profession</td>
<td>• Special supplement on 100 years of dental hygiene research is published in JDH and ADHA</td>
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<td>• Annual Session in Boston is dedicated to celebrating the many accomplishments of dental hygienists since 1913.</td>
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<td>2017</td>
<td>4th Global Dental Hygiene Research Conference: “Translating Knowledge to Action”</td>
<td>• Over 500 participants from 16 different countries attended the conference whose theme was “Translating Knowledge to Action.”</td>
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<td>in Ottawa, Canada.</td>
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<td>2021</td>
<td>ADEA and ADHA approve updated Graduate Dental Hygiene Program Aims and Outcomes.</td>
<td>• Provided an updated definition of a master’s-level dental hygienist was created as a foundation for master’s level curricula. The revisions reflect contemporary practice and current state, national, and global changes in the healthcare environment. They are designed to guide existing, developing and future graduate level dental hygiene education programs.</td>
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<td>2021-2022</td>
<td>ADHA partners with the American Dental Association for research on impact of</td>
<td>• The collaborative is the first study of the impact of the COVID-19 pandemic on dental hygienists in the United States. Seven papers (2 editorials and 5 original research papers) were published in the Journal of Dental Hygiene in 2021 and 2022.</td>
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<td>COVID-19 pandemic on dental and dental hygiene practice.</td>
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are expected to mentor student research projects, which become understandably restricted in scope and based on faulty methodology, thus limiting the possibility of a meaningful contribution via publication. These problems are further confounded by the lack of mentorship and dedicated time for faculty research, all of which constrain efforts towards achieving a critical mass of researchers. This training pipeline, as it currently exists, cannot support much-needed efforts to increase the numbers of dental hygienists who are actively engaged in research.

In 2021, ADHA collaborated with the American Dental Education Association (ADEA) to develop criteria designed to guide graduate dental hygiene program aims and outcomes, broadening the scope of the curriculum and updating core competencies for graduates of these programs. To meet program aims, “graduate education must socialize students to a research culture so they engage in scholarly pursuits.” For the first time, the need for doctoral level programs in graduate dental hygiene education was addressed by both professional associations. Over the past ten years, advocacy for doctoral education has increased, given greater awareness about the need for dental hygienists to have more advanced research skills and productive lines of research as core qualifications to become academic scholars, to participate in and lead interprofessional healthcare teams, create novel models of quality care delivery, and to affect change at the policy level. Obtaining the terminal degree in the field is among the hallmarks of a true profession, and dental hygiene must move forward with efforts to create this educational curriculum. In 2005, ADHA published “Dental Hygiene: Focus on Advancing the Profession”, a document that included the goal of establishing the doctoral degree by 2025. Models of doctoral program curricula have been proposed and published, including a professional pathway (Doctor of Science in Dental Hygiene) and an academic pathway (Doctor of Philosophy). Many other allied health professions have transitioned to the professional doctoral degree for entry-level into practice. Both dental hygiene educators and dental hygiene graduate students report perceived values for and the support of creation of the doctoral degree. In the interim, the number of dental hygienists with doctoral degrees has markedly increased; however, these degrees have been granted in fields outside of the dental hygiene discipline.

Other organizations continue to support the development of researchers to encourage engagement in research. In 1995, the International Association for Dental Research (IADR) established the Oral/Dental Hygiene Research Group in recognition of the increasing numbers of dental hygiene researchers and their unique bodies of work. Today, the group has been renamed as the Oral Health Research Group, and has broadened its membership to include other professionals, but still remains the professional home for many dental hygiene investigators. Between 2009 to 2017, the National Center for Dental Hygiene Research and Practice (NCDHRP) partnered with ADHA and the Canadian Dental Hygienists’ Association (CDHA) to host a series of global dental hygiene research conferences, where training programs for researchers were consistently provided. Ongoing collaborative efforts are needed to build the critical mass of dental hygienist researchers.

Research Priorities that Produce Clinically Relevant Knowledge

Research agendas are used to identify priorities and related funding initiatives and serve as working documents to guide efforts to advance the body of knowledge systematically and purposefully. Agendas should reflect national health objectives so that research findings are used to ultimately improve the health of the public. To monitor progress made while addressing and identifying priorities takes a significant amount of commitment by the professional community at large: stated objectives must be embraced by all dental hygienists, especially by practitioners who provide the greatest representation of the profession to the public. The tenants of practicing with an evidence-based philosophy requires that practitioners use current research to support their decision-making and adopt the use of best practices for the delivery of quality care to their patients.
Identified priorities drive research in all facets of the profession. Examples include educational research that leads to curricular changes in and a better understanding of teaching and learning strategies; health services research to study cost-effectiveness of different practice models on improving access to care and the value and quality of delivered care; and public health initiatives that aim to address health promotion and disease prevention on the population level.

Research priorities should continually evolve, requiring frequent re-examination and updating of the agenda. Tracking progress made on addressing the research agenda can be challenging. However, efforts have been made to assist with this process by linking grant funding opportunities from the ADHA Institute for Oral Health (IOH) with identified priorities, and by requiring funded investigators to submit their research for publication in the Journal of Dental Hygiene (JDH). Also, authors who publish in the JDH must identify how their work supports the research agenda. Similar actions have been taken by the CDHA with the Canadian Foundation for Dental Hygiene Research and Education grant program and for authors who publish in the Canadian Journal of Dental Hygiene (CJDH).

The ADHA National Dental Hygiene Research Agenda (NDHRA) was first conceptualized in 1993 as a working model for guiding research efforts to purposefully expand the profession’s body of knowledge, encourage collaborative research and to guide education and practice. The agenda was validated through use of a Delphi survey method by the National Center for Dental Hygiene Research (now NCDHRP). This agenda was updated in 2001 by the ADHA Council on Research in response to the 2001 U.S. Surgeon General’s Report “Oral Health in America” and Healthy People 2010 objectives, and from input gained through discussions at the 2000 ADHA National Dental Hygiene Research Conference. In 2006, a second Delphi study was conducted to re-examine the 2001 categories and topics to determine whether these priorities reflected current global health care issues as well as other issues that impacted the profession. As a result of the study, the third iteration of the ADHA NDHRA was adopted in 2007. The latest update to the NDHRA was presented in 2016 to improve usability of the research agenda document across the profession, incorporating input from the IFDH, the CDHA and the NCDHRP. There is an ongoing need to update the ADHA NDHRA to reflect current priorities.

The five primary objectives proposed with the original ADHA NDHRA remain relevant and applicable today:

- To give visibility to research activities that enhance the profession’s ability to promote the health and wellbeing of the public.
- To enhance research collaboration among members of the dental hygiene community and other professional communities.
- To communicate research priorities to legislative and policy-making bodies.
- To stimulate progress toward meeting national health objectives.
- To translate the outcomes of basic science and applied research into theoretical frameworks to form the basis for dental hygiene education and practice.

Communication Systems that Link Researchers and Increase Dissemination of Research Findings

Networks for researchers to communicate scientific findings with key stakeholders, the public, and with other researchers are essential components of an infrastructure. Dental hygiene researchers must become more visible to the public, including special interest groups representing a variety of patient populations, to external professional organizations, to strategic professional working groups, and to federal agencies. Increased visibility grants dental hygienists a seat at the table, providing opportunities to collaborate and translate research outcomes to improve access to care, promote best practices with the provision of dental hygiene services, obtain funding to support research efforts, and to have a voice to inform policy change.
The most recognized source for dental hygiene research is the JDH, established by ADHA in 1927. It was named the *Journal of the American Dental Hygienists' Association* when ADHA membership was approximately 400 dental hygienists. The ADHA's commitment to publish a refereed journal composed of original research articles is significant to establishing the identity and uniqueness of the dental hygiene profession. Currently, the JDH is one of three primary research publications in the world specifically for dental hygiene and has been vital for the growth of the profession.

In the early 1990s, the purpose of the JDH was updated to include a clear statement that the publication is a refereed and scientific publication. 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. In the 2000s, sections were added to the journal to reflect the article focus including Critical Issues in Dental Hygiene, Innovations in Education and Technology (now Innovations in Dental Hygiene Education), Linking Research to Clinical Practice, Short Reports, and Research (original research articles) providing a platform for different types of scholarship, reflecting a changing profession. The JDH is currently published bi-monthly online and is indexed in PubMed and other allied health databases. The JDH will need to continue to adapt to future trends in scholarly publishing, but it will remain essential for dental hygiene’s professional identity and growth.

Communicating research activities traditionally occurs during annual meetings of professional societies and at research conferences during scientific sessions featuring oral and poster presentations. Several ADHA research conferences have been held over the years, the first of which was held in Denver, Colorado in 1982, followed by conferences in 1987, 1994 and 2000 (Table I). In 2009, the NCDHRP strategically partnered with ADHA and CDHA to publish the first proceedings of the North American Dental Hygiene Research Conference held in Bethesda, Maryland, disseminating research findings presented at the conferences through dual publication in JDH and the CJDH. As subsequent conferences expanded to global audiences in 2012, 2014 and 2017, so did the reach of the proceedings. In addition, a commemorative issue of the JDH was published in 2013 to highlight dental hygiene research to date and future directions.

A current excellent example illustrating the importance of collaborative research and dissemination of findings occurred between ADHA and the American Dental Association (ADA) Health Policy Institute. During the COVID-19 pandemic, these organizations studied both dental hygienists and dentists, gathering practice trend data and mental health challenges during the pandemic. Over a span of one year, seven papers were published that highlighted findings from their collaborative investigations.

Technology now affords opportunities for greater dissemination and discourse through webinars, podcasts, and on-demand learning. Using live, online platforms, ADHA and ADA collaborators informed clinicians about how to navigate the pandemic in real time, disseminating current research findings directly into the hands of the users where information was needed most. Platforms continue to evolve to assist clinicians with obtaining evidence-based information to support practice decisions and to locate resources related to research. The ADHA has introduced CE Smart, an online learning platform that offers comprehensive continuing education courses and tracks CE credits. The platform also includes evidence-based webinars, which are later converted into on-demand courses available in the CE Smart catalog. The DHNet, created and hosted by the NCDHRP, links clinicians with resources that support dental hygiene research, evidence-based practice, education and community outreach.

**Funding Mechanisms to Support Research**

Collaborative efforts are needed to create opportunities for dental hygienists to obtain the funds necessary to conduct research. In addition, mechanisms to secure and dispense funds are necessary to ensure equitable disbursement and accountability for spending. To date, professional dental hygiene organizations have been...
instrumental in establishing funding paths for students and early career investigators.

The primary objective of the ADHA IOH foundation is to advance the dental hygiene profession and enhance the availability of oral care through student scholarships, research grants, and community service grants. The IOH is dedicated to improving overall public health by promoting awareness of and ensuring access to high-quality oral health care for all individuals. In pursuit of its mission, IOH aims to:

- Empower dental hygienists to enhance public health by offering community service grants
- Support advancements in the dental hygiene profession through research grants
- Enhance access to educational programs for dental hygienists through scholarships

The IOH Research Grant Program facilitates various forms of research, including original studies, developmental projects, and qualitative and quantitative investigations. Funding is prioritized for projects supporting the NDHRA. Proposals for IOH funding should develop or expand upon the dental hygiene body of knowledge; promote the public’s oral health by improving dental hygiene education and practice; and/or support the delivery of quality oral health care.

The Canadian Foundation for Dental Hygiene Research and Education also offers a grant program for members of the CDHA who must also be registered dental hygienists within Canada. This grant funds a one-year research project that will advance the dental hygiene body of knowledge and, ultimately, enhance the oral health and well-being of Canadians. Proposals must align with the CDHA's Dental Hygiene Research Agenda.

The NCDHRP offers a research grant program to dental hygiene graduate students to support thesis or capstone project research. The purpose of this grant program is to support research that addresses the oral health of the public with a focus on prevention and the translation of research evidence so that it is meaningful and useful for the public and dental hygiene education and practice.

These organizations and small “internal” grant programs available at many academic institutions allow dental hygienists to obtain seed monies to collect pilot data, establish an area of expertise, and build a funding track record, all of which are necessary to successfully apply for and obtain federal monies for larger projects. Grant programs available through private foundations and industry are also potential sources for funding.

**Demonstrated Value for Research and Its Relationship to Practice**

Each of the infrastructure components previously described emphasize the fundamental value that the profession must place on research. Strategies to increase visibility of research help to underscore its importance and value in relation to professional activities. Recently, ADHA has begun to highlight research in emailed announcements to its membership, grouping articles by “themes” to increase the visibility of the research published in the JDH. Multiple organizations, including ADHA, ADEA, CDHA, IADR and NCDHRP are committed to increasing research visibility to promote the culture of research among dental hygienists.

Clinicians are becoming more aware of and have a willingness to adopt an evidence-based philosophy of practice; however, open access to published research is a barrier to widespread adoption. Refereed journals in dental hygiene must address the open access issue to help overcome obstacles with finding current research to support best practices. In the interim, dental hygiene investigators are encouraged to translate their research findings through presentations at professional meetings, webinars, podcasts, and by publishing articles in peer-reviewed clinical news magazines, all of which have widespread reach to practicing clinicians.

The ADHA has promoted student research recognition and visibility through several programs with the assistance of corporate funding. The graduate dental hygiene student research competition is held during the ADHA Annual Conference and presentations are open to the membership. The ADHA/Sigma Phi Alpha student journalism award was created to recognize excellence in dental hygiene journalism.
Theoretical Frameworks

Theory development is essential to a discipline as it provides a framework for understanding, guides practice, predicts outcomes, supports continuous improvement and fosters professional identity and unity. It enables professionals to navigate complex challenges, make informed decisions, and contribute to the advancement of their field. Prior to the early 1990s, dental hygiene did not significantly explore theoretical models. However, Darby and Walsh introduced a paradigm for the discipline of dental hygiene science during that time. This paradigm included key concepts such as the client, environment, health/oral health, and dental hygiene actions. The ADHA embraced this paradigm, leading to a more refined definition of dental hygiene as a discipline. This shift recognized that dental hygiene involved the study of phenomena and allowed for the advancement of knowledge through research and theory development, moving beyond a mere list of duties.

Theoretical frameworks for dental hygiene are found in Table II.

The ADHA supports the need for further development of the theoretical basis for the growth of the profession and ultimately, to become a unique discipline. As conceptual models continue to evolve, practitioners can select an approach to client care that is both scientifically grounded and aligned with their personal philosophies. The practice of dental hygiene must be based on sound science. Despite the unique and distinctive aspects of the process of dental hygiene care described by these models, to date, there are few studies that have used these conceptual frameworks as the basis for the research, and far fewer that have attempted to test and validate these theories. Moving forward, theory testing and validation should be prioritized.

Creating a Scholarly Identity

Advancements in the development of the dental hygiene discipline are crucial to enhance its impact on interdisciplinary research and improve oral health in the general population. Walsh and Ortega recognized that embracing a scholarly and interdisciplinary approach to dental hygiene research empowers the dental hygiene profession to play a significant role in national and international efforts to prevent oral diseases and promote overall health.

Having a community of scholars and a scholarly identity are vital to this progress as they provide the structure for collective growth, knowledge sharing, and advancement. A community of scholars fosters collaboration and networking among professionals, enabling the exchange of ideas, research collaboration, and innovation within the dental hygiene profession. A scholarly identity is critical to the profession as it drives the advancement of the discipline, promotes evidence-based practice, enhances professional credibility, promotes continuous learning and growth, and facilitates collaboration among professionals.

A scholarly identity encompasses several key characteristics. It involves having a comprehensive understanding of the dental hygiene discipline, recognizing its interconnectedness and interdependence with other related disciplines. It also entails a lifelong commitment to the advancement of dental hygiene knowledge by actively engaging in research and asking meaningful research questions that address the core issues of the discipline. Dental hygiene research scientists use evidence to support their viewpoints, drawing upon existing research and the work of other scholars in both dental hygiene and other disciplines. They recognize the importance of situating their own findings within this broader context, highlighting the relevance and implications of their work. Finally, a scholarly identity involves the dissemination of research findings through scientific publications, ensuring that new knowledge reaches and contributes to the larger scientific community and knowledge base.

Developing a scholarly identity involves three key strategies: coursework, socialization into the culture of scholarship, and high-quality mentored scholarship. For coursework, it is important to not only focus on
Table II. Dental Hygiene Theoretical Frameworks

<table>
<thead>
<tr>
<th>Year</th>
<th>Theoretical Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>Human Needs Theory</td>
<td>The Human Needs Conceptual Model for Dental Hygiene was proposed by Darby and Walsh and was the first theoretical model proposed for the discipline. The model is derived from Maslow’s basic human needs and focuses on various needs that individuals have related to their oral health and overall well-being.</td>
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<tr>
<td>1998</td>
<td>Oral Health-Related Quality of Life Model</td>
<td>Williams et al. introduced the Oral Health-Related Quality of Life Model for Dental Hygiene. This model is used to assess the well-being and impact of health and disease on individuals, focusing on six domains: health and preclinical disease, biological and clinical disease, symptom status, functional status, health perceptions, and overall quality of life.</td>
</tr>
<tr>
<td>2000</td>
<td>Client Self-Care Commitment Model</td>
<td>Calley et al. proposed the Client Self-Care Commitment Model which suggests that the interplay among five domains (initiation, assessment, negotiation, commitment, and evaluation) and the interaction between the client and the dental hygienist can empower clients to make decisions that contribute to their own health improvement through dedication and adherence.</td>
</tr>
<tr>
<td>2002</td>
<td>Transtheoretical Model for Oral Self-Care Behavioral Change</td>
<td>Astroth et al. introduced the Transtheoretical Model for Oral Self-Care Behavioral Change, which consists of four key components: stages of change, decisional balance, processes of change, and self-efficacy. According to the Transtheoretical Model, individuals go through a series of stages when intentionally changing a behavior.</td>
</tr>
<tr>
<td>2015</td>
<td>E-Model for Online Learning Communities</td>
<td>Rogo and Portillo proposed an e-model for online learning communities, which consists of four stages: building a foundation, establishing a supportive network, investing in the community, and transforming the community to enhance learning experiences.</td>
</tr>
<tr>
<td>2018</td>
<td>Advocacy Empowerment Model</td>
<td>Bono et al. developed an Advocacy Empowerment Model to increase participation in legislative advocacy, particularly in health policy development.</td>
</tr>
<tr>
<td>2018</td>
<td>Synergy and Social Action Theory</td>
<td>Rogo introduced the Synergy in Social Action Theory for dental hygiene. This model emphasizes the importance of learning and educating processes, critical awareness and empowerment, and individual and collective action. It aims to create a powerful synergy that challenges the status quo and improves access to oral health care.</td>
</tr>
</tbody>
</table>
research methods but also gain a critical knowledge of dental hygiene’s research priorities and interdisciplinary approaches. Socialization into the culture of dental hygiene scholarship involves integrating course work with the standards and values of the discipline, emphasizing the importance of asking questions central to dental hygiene’s perspective. Professional socialization and peer interaction play significant roles in fostering a scholarly identity. Lastly, high-quality mentored scholarship is crucial, where graduate learners develop original research projects, write theses or capstone projects, and defend their work orally and in writing. Mentors guide and support learners, match them with other appropriate mentors, and help them participate in scholarly activities, such as scientific writing and oral presentations.

Developing a scholarly identity has traditionally been the responsibility of graduate education programs. Currently, with no doctoral programs in dental hygiene, masters level programs have been contributing to this effort. This requires coursework in research methodology and statistics used for data analysis. Graduate learners should be encouraged to think critically and develop the values, behaviors, and attitudes necessary to assume a career in research scholarship. When possible, students should pursue original research for a thesis project, defend the project, present their research at national or international meetings, and submit a paper for publication in peer reviewed journals. These activities must be done under the careful supervision of a dedicated mentor(s).

Developing a scholarly identity in any discipline can pose challenges. One is the lack of recognition and support for scholarly pursuits within the dental hygiene profession, which may discourage dental hygienists from actively engaging in research and scholarly activities. Another challenge is the limited availability of resources and mentorship opportunities for aspiring scholars, hindering their growth and development. Additionally, in academia, the pressure to balance clinical practice skills and numerous academic responsibilities can pose significant challenges in establishing a strong scholarly identity. Overcoming these challenges requires a supportive environment, access to resources, and a commitment to prioritizing scholarly endeavors.

Furthermore, a scholarly identity must be nurtured. Even if students are well prepared and graduate having conducted original research, it does not mean they will continue in these research pursuits. For example, the state of academia places an increased emphasis on efficiently producing entry level graduates, often leaving insufficient time for faculty to pursue scholarly activities. Furthermore, faculty may face challenges with obtaining adequate resources and mentoring to support their work. Professional associations have been, and can continue to be, a resource for mentorship, helping aspiring scholars on their journey of developing their scholarly identity and becoming part of a community of scholars.

There is a critical need for doctoral programs in dental hygiene, especially in light of current challenges in the oral health care delivery system. Dental hygiene leaders and scholars are needed to work with interdisciplinary teams to conduct high-level research and represent the discipline’s perspective in oral health care. While graduate programs at the master’s level have made an impact, these programs are relatively compact, often lacking the time needed for the graduate student to become well-versed in different theories and methodologies while developing an in-depth expertise in an area of research interest.

**RECOMMENDATIONS FOR THE FUTURE**

While considerable progress has been made to expand the knowledge base of dental hygiene, there is a need to create a framework for ongoing and future research efforts to advance the discipline. Collaborative efforts with professional organizations such as the ADHA, academic partners, and key stakeholders from public health, private industry and other healthcare professionals are critical for success. Recommendations for consideration by the dental hygiene community for inclusion in future updates to the ADHA NDHRA are presented in Table III.
## Table III. Proposed Recommendations for Priorities for Updates to the ADHA National Dental Hygiene Research Agenda

| Theory Development and Testing | • Test and validate existing theories in different populations/settings.  
• Propose new theoretical models for testing and validation. |
|--------------------------------|-------------------------------------------------------------------------|
| Educational Research           | • Examine use of educational technologies on student learning outcomes.  
• Explore the use of artificial intelligence (AI) in dental hygiene education and related applications.  
• Assess the impact of different educational models on student performance outcomes, and recruitment/retention of the dental hygiene workforce.  
• Compare and contrast methods for determining and documenting minimum competency with internal metrics [within dental hygiene programs] and external metrics [board examinations].  
• Assess how dental hygiene education promotes the development of lifelong learners.  
• Examine methods for assessing continued competency as part of ongoing quality assurance.  
• Assess existing curriculum content and perceived level of preparation for treating geriatric and medically complex patients, and individuals with disabilities. [CODA requirement].  
• Develop new models of interprofessional education and document the impact of these training models on adoption of interprofessional practice.  
• Create and implement models for the doctoral degree in dental hygiene.  
• Document employment settings and roles and responsibilities of doctoral graduates.  
• Explore greater autonomy of the profession and the outcomes related to greater access to oral healthcare. |
| Practice-Based Research         | • Train dental hygienists to participate in and/or conduct practice-based research to answer common clinical questions that arise in daily dental hygiene practice.  
• Collaborate with federally funded practice-based research networks in dentistry and medicine to participate in ongoing research efforts to answer clinical questions about the oral health of the public. |
| Health Services Research        | • Conduct cost-effectiveness studies that examine the value of dental hygiene services on preventing and reducing the negative impact of oral diseases.  
• Apply cost-effectiveness data to promote reimbursement for dental hygiene services by third-party payers.  
• Explore models of value-based care in dental hygiene practice.  
• Document dental hygienists’ perceptions about the dental therapy model of practice. |
Table III. Proposed Recommendations for Priorities for Updates to the ADHA National Dental Hygiene Research Agenda (continued)

| Community/Public Health | • Assess how alternative practice models impact access to care for populations with high oral disease risk.  
• Examine the impact of social determinants of health on oral and general health needs of patients treated in the dental hygiene setting.  
• Explore how dental hygienists address social determinants of health in their patients to promote improved oral and general health outcomes.  
• Document dental hygienists’ engagement in public health initiatives (e.g., HPV vaccination messaging, vaccine delivery) to address local, regional and national health priorities.  
• Examine the impacts of systemic racism on the oral health outcomes of historically underrepresented groups (Black/African American, Hispanic/Latinx, American Indian/Alaska Native, Pacific Islanders).  
• Examine issues of diversity, equity and inclusion as it relates to equal representation among practicing dental hygienists.  
• Identify public health outcomes in populations who reside in states that have expanded function, alternative practice, affiliated practice models for dental hygienists.  
• Determine the percentage of patients who are directly reimbursed by Medicaid and/or who work with dentists who accept Medicaid for reimbursement. |
| Patient Reported Outcomes Research (PROMS) | • Create and validate PROMS tools for use when documenting outcomes in daily dental hygiene practice.  
• Use validated PROMS tools when conducting studies that include patient-reported metrics, including quality of life metrics, in studies of dental hygiene treatment.  
• Gather PROMS data to support the value and impact of dental hygiene treatment on oral health. |
| Interprofessional Education and Practice (IPE, IPP) | • Create, provide and validate educational models to train dental hygienists to work on interprofessional care teams (accreditation requirement in the U.S.).  
• Create, provide and validate models of interprofessional practice to prepare dental hygienists for employment in settings where dentistry and medicine are co-located.  
• Examine patient outcomes related to oral and general health when dental hygienists provide services as part of interprofessional teams. |
CONCLUSION

Throughout the last century, considerable progress has been made with expanding the dental hygiene knowledge base and dissemination of research findings. Notable efforts have helped to build the critical research infrastructure needed to support the growth of the profession. Continuing efforts are needed towards building a critical mass of investigators who are actively engaged in research. Research priorities must be identified and funded so these investigators can produce clinically relevant knowledge to address national health objectives and support the delivery of quality care to improve the oral health of the public. Theory development is essential to expand the scientific basis for the dental hygiene discipline and to promote the development of a scholarly identity for the profession. Moving forward, increased collaboration with professional organizations, academic institutions and strategic alliances will be vital to the expansion of a unique body of knowledge and the evidence base to inform education and practice.

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