Integrating Oral Health into the Interdisciplinary Health Sciences Curriculum

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KEYWORDS

- Collaborative practice • Interprofessional education • Oral health
- Team-based competencies

KEY POINTS

- The burden of oral diseases and access to care are significant health challenges for an aging society, and calls for reforms in health professions education.
- Transformation of health professions education necessitates innovative models linking interprofessional education (IPE) and collaborative practice.
- Innovations in Interprofessional Oral Health: Technology, Instruction, Practice, Service is an innovative IPE model for integrating oral health in health sciences curricula.
- The Program of All-inclusive Care for the Elderly (PACE) is a patient-centered interdisciplinary practice model for improving oral health of older adults.

INTRODUCTION

Over the last 100 years there has been a historical movement of change in the landscape of professional health education in North America. Seminal reports, such as Flexner (1910),[1] Welch and Rose (1915),[2] Goldmark (1923),[3] and Gies (1926),[4] influenced instructional and institutional reforms in medicine, public health, nursing, and

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dentistry. These early reports generated groundbreaking shifts toward advancing scientific curricula, linking education to research, and establishing professional education in universities. In 2010, the Lancet Commission,[5] a global independent Commission on Education of Health Professionals for the twenty-first century, assessed educational institutions in medicine, nursing, and public health from global and systems perspectives. Despite a century of reforms, professional health education had not kept pace with global health challenges and inequities, shifts in societal demographics and burden of diseases, advances in scientific knowledge and technology, and increasing complexity of health care systems.

Oral health is a neglected global and local health issue, and the burden of oral diseases has significant consequences for individuals, populations, and health systems worldwide.[6] In 2012, there were approximately 810 million people aged 60 or older, and this number is projected to increase to more than 2 billion by 2050.[7] Given the trend in global population aging, improving oral health and general health for an aging society presents an immense challenge. More than a decade ago, the US Surgeon General described the nation's poor oral health status as a "silent epidemic" and brought widespread attention to the vast oral health inequities that persist today.[8] Although overall improvements in oral health have been reported, the burden of oral disease and access to oral health care remain significant for vulnerable and underserved populations, particularly older Americans.[8–10] Several factors contribute to poor oral health care for older adults, including inadequate education of nondental health care professionals (eg, nurses, pharmacists, physicians, and others) about oral health and diseases, and the lack of attention to oral health by health care professionals.[8–10] Moreover, health professionals and dental professionals have been educated separately, thus promoting the separation of oral health from general health.[9,10] Academic institutions need to enhance curricula to address the global challenges of oral health and local oral health care needs of an aging population.

The transformation of professional health education to strengthen the performance of health systems in meeting the needs of patients and populations is an imperative for academic institutions.[5] Curricular reforms are needed to effectually respond to local and global health contexts and advance health equity for individuals and populations.[5] The Lancet Commission provides a framework for action through its proposed set of academic reforms for the next century, including the adoption of a competency-based approach to curricula, promotion of interprofessional education (IPE), and application of advanced technologies for professional health education.[5]

Advancing oral health warrants bold action from educational institutions, and necessitates new models of IPE that are responsive to global and local oral health needs of an aging society. This article discusses the Bouvé College of Health Sciences (Bouvé College) at Northeastern University's response to the call to action for transforming professional health education, and describes its IPE model for strengthening the primary care health system to promote healthy aging. The Innovations in Interprofessional Oral Health: Technology, Instruction, Practice and Service (Oral Health TIPS) program at Bouvé College is an innovative IPE model that aims to prepare the next generation of health professionals with requisite team-based competencies to meet the oral and systemic health needs of vulnerable and underserved patients and populations, particularly older adults. Mechanisms for integrating oral health into interdisciplinary health sciences curricula are described. The discussion concludes with an exemplar case for aligning IPE and clinical practice to improve oral and systemic health outcomes for older adults in a patient-centered medical home.

BACKGROUND AND SIGNIFICANCE

Oral Health Call-to-Action

In 2000, the US Surgeon General's report, *Oral Health in America*, raised awareness about the importance of good oral health as an integral component of general health and well-being.[8] The report highlighted the potential contribution of all health care professions to improve oral health, and the necessity for collaborative, interdisciplinary approaches to care. With appropriate education in oral health promotion and disease prevention, primary care providers are well positioned to integrate oral health as a component of general health.[8] The report presented a framework for action to address oral health inequities and optimize the oral and general health care systems. Preparing health professionals with the competencies to collaborate with each other in providing oral health care as a component of comprehensive care requires curricula reform with an increased emphasis on interdisciplinary training.[8] In 2003, a partnership of public and private organizations issued a national call to action to enable further progress in improving oral health.[11] The need to revise curricula and include interdisciplinary training were reiterated as important actions to enhance the capacity of all health professionals in improving access to oral health care.[11] In 2011, the Institute of Medicine (IOM) released two independent reports, *Advancing Oral Health in America*,[10] and *Improving Access to Oral Health Care for Vulnerable and Underserved Populations*.[9] Although some improvements have been reported in the last decade, vulnerable and underserved populations in the United States continue to suffer the burden and consequences of oral diseases.[9] Both reports underscored the pivotal role of all health care professionals in oral health promotion and disease prevention, the value of interprofessional team-based care to improve oral health, and the need for additional education and training of health professionals in oral health.[9,10]

IPE for Collaborative Practice and Teamwork

IPE for collaborative practice and teamwork has been an important and enduring movement in health care.[12] **Box 1** provides a description of terms.[13,14] Early work in

Box 1
Description of terms

Interprofessional education "occurs when two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes."[13]

Collaborative practice "occurs when multiple health workers from different professional backgrounds provide comprehensive services by working with patients, their families, carers and communities to deliver the highest quality of care across settings."[13]

Interprofessional teamwork is "the levels of cooperation, coordination and collaboration characterizing the relationships between professions in delivering patient-centered care."[14]

Interprofessional competencies in health care refers to the "integrated enactment of knowledge, skills, and values/attitudes that define working together across the professions, with other health care workers, and with patients, along with families and communities, as appropriate to improve health outcomes in specific care contexts."[14]

Adapted from World Health Organization Study Group on Interprofessional Education and Collaborative Practice. Framework for action on interprofessional education and collaborative practice. Geneva (Switzerland): World Health Organization; 2010. Available at: http://whqlibdoc.who.int/hq/2010/WHO_HRH_HPN_10.3_eng.pdf; and Interprofessional Education Collaborative Expert Panel. Core competencies for interprofessional collaborative practice: a report of an expert panel. Washington, DC: Interprofessional Education Collaborative; 2011. Available at: http://www.aacn.nche.edu/education-resources/ipecreport.pdf.

IPE and team training in the United States can be traced to 1969, with the institution of an interdisciplinary health sciences curriculum at the University of Nevada School of Medical Sciences aimed at promoting teamwork in primary care.[15] Contemporary dialogue on interdisciplinary team-based education for US health professions was signaled by the 1972 IOM conference, “Interrelationships of Educational Programs for Health Professionals.”[15] This pioneering event convened 120 leaders from five health professions (allied health, dentistry, medicine, nursing, and pharmacy) to explore the promises and challenges of educating for teamwork in health care.[15] These leaders recommended that the educational process should not isolate students in the health professions from each other, and interdisciplinary education should be linked to practice needs in health care systems.[15] In the twenty-first century, a resurgence of the IPE movement in the United States was marked by its national focus on health care quality and patient safety. In 2003, the IOM landmark report, *Health Professions Education: A Bridge to Quality*, impressed the need for IPE and collaborative practice to improve health care quality and safety, and recommended teamwork as a core interprofessional competency for all health professionals.[16]

In 2010, the World Health Organization issued its global *Framework for Action on Interprofessional Education and Collaborative Practice* to strengthen the health system and improve health outcomes through effective training in collaborative teamwork.[13] The global aim is to develop a “collaborative practice-ready” workforce (ie, students ready to enter the health care system as members of a collaborative practice team).[13] The 2010 Lancet Commission report underscored the importance of teamwork as a cross-cutting competency for all health professions and led to the formation of the IOM Global Forum on Innovation in Health Professional Education.[5,17] This forum brings together leaders from academia, professional associations, and government to advance the global discourse on health profession education through institutional and instructional reform. In 2011, the US Interprofessional Education Collaborative (IPEC) Expert Panel, comprised of members from the American Association of Colleges of Nursing, Association of American Medical Colleges, American Dental Education Association, Association of Schools of Public Health, and American Association of Colleges of Osteopathic Medicine, established core competencies for interprofessional collaborative practice.[14] The IPEC core competency domains are described in **Box 2**.

Box 2
Core competencies for interprofessional collaborative practice

Values/ethics for interprofessional practice: “Work with individuals of other professions to maintain a climate of mutual respect and shared values.”

Roles and responsibilities for collaborative practice: “Use the knowledge of one’s own role and those of other professions to appropriately assess and address the healthcare needs of the patients and populations served.”

Interprofessional communication practices: “Communicate with patients, families, communities, and other health professionals in a responsive and responsible manner that supports a team approach to the maintenance of health and the treatment of disease.”

Interprofessional teamwork and team-based practice: “Apply relationship-building values and the principles of team dynamics to perform effectively in different team roles to plan and deliver patient-/population-centered care that is safe, timely, efficient, effective, and equitable.”

Adapted from Interprofessional Education Collaborative Expert Panel. Core competencies for interprofessional collaborative practice: a report of an expert panel. Washington, DC: Interprofessional Education Collaborative; 2011. Available at: http://www.aacn.nche.edu/education-resources/ipecreport.pdf.

Connecting Dental and Health Sciences through Innovations

In response to the 2003 IOM report,[16] New York University (NYU) demonstrated bold action by creating an innovative institutional partnership model that organized the College of Nursing within the College of Dentistry.[18,19] Initiated in 2005 under the visionary leadership of Drs Michael Alfano and Terry Fulmer, this unique interdisciplinary model cultivated vast opportunities for interprofessional collaborations in research, education, and practice. Nursing and dental students learned about, from, and with each other, in a variety of IPE experiences including didactics, clinic rotations, global outreach, and community service. Evidence-based practice was a major curricular theme and cross-cutting competency, which served to advance IPE across the dental and nursing programs. Importantly, dental and nursing students learned about each other's professional roles and contributions to improve oral and systemic health through evidence-based care.

The institutional model at NYU continues to generate innovations in interprofessional collaboration, such as the establishment of a nurse practitioner–managed primary care practice colocated at the College of Dentistry.[18,20] This interprofessional practice model resulted in cross-referrals between primary care and dental clinics, and the integration of oral health as a component of comprehensive health in a nurse practitioner–managed primary care clinic. In 2011, a distinct interprofessional curriculum, NYU3T: Teaching, Technology, Teamwork, was implemented at the NYU College of Nursing and School of Medicine.[21] The NYU3T curriculum was grounded in two evidence-based team training programs: Geriatric Interdisciplinary Team Training[22] and TeamSTEPPS.[23] This innovative program exploits the novel use of collaborative online learning, virtual patient cases, and simulation-learning to enhance team-based competencies.[21]

Another outcome of this innovative academic partnership is the Oral Health Nursing Education and Practice program, which was launched in 2011.[24] This national program aimed to prepare a collaborative practice-ready nursing workforce with the competencies to prioritize oral health promotion and disease prevention, provide oral health care in a variety of practice settings, and collaborate in interprofessional teams to improve access to oral health care.[24] The innovative synergies created at NYU served as a catalyst for expanding oral health education across all health sciences curricula at Bouvé College.

Bouvé College

Bouvé College is an innovative, and contemporary educational institution uniquely poised to advance IPE in health sciences under the new leadership of Dean Terry Fulmer, formerly the founding Dean of NYU College of Nursing. Bouvé College is the largest health sciences college in metropolitan Boston with more than 3700 students, 186 full-time faculty, and 145 part-time faculty within its three schools: Health Professions, Nursing, and Pharmacy. The School of Health Professions is comprised of four academic departments (Counseling and Applied Educational Psychology, Health Sciences, Physical Therapy, and Speech-Language Pathology and Audiology) and a Physician Assistant program. The School of Nursing has both baccalaureate and graduate programs. The School of Pharmacy consists of two departments: Pharmaceutical Sciences and Pharmacy Practice. Bouvé College has three interdisciplinary programs (biotechnology, health informatics, and personal health informatics) and 10 interdisciplinary research centers within the University.

Health is one of three strategic areas of commitment at Northeastern University, and Bouvé College is setting the standard for excellence in innovations, research,

education, and practice. The mission of Bouvé College is to inspire and create the next generation of interprofessional health care leaders for the well-being of our global community. Students are prepared for interprofessional practice through campus-based learning and experiential education. Bouvé College is at the vanguard of improving health through its four pillars of excellence: (1) Drug Discovery, Delivery, and Diagnostics; (2) Urban Population Health; (3) Self-care/Self-management; and (4) Healthy Aging. This framework provides a platform for interdisciplinary partnerships in research, teaching, and practice within Bouvé College, across the University, and between other academic institutions and health systems. Bouvé College continues to expand its dedicated cluster of faculty focused on advancing the science of healthy aging and team-based geriatric care.

Bouvé College envisions a new generation of interprofessional health care leaders with team-based competencies to improve oral health and healthy aging across the life cycle, particularly for vulnerable and underserved populations. This goal requires a fundamental shift in health sciences curricula and care delivery models to enhance the integration of oral health care as an essential component of comprehensive primary health care, with an emphasis on oral health promotion and prevention. Every primary care visit is an opportunity for clinicians to incorporate oral health into their practice.[25] Nurses, nurse practitioners, pharmacists, physicians, physician assistants, and other health professionals can address oral health promotion and prevention as a component of comprehensive health in a variety of primary care settings including private offices, community health centers, retail medical clinics, and pharmacies. To that end, Bouvé College is making great advances in integrating oral health education in interdisciplinary health sciences curricula through its innovative IPE program, Oral Health TIPS, funded by the DentaQuest Foundation and launched in 2013. The purpose of the Oral Health TIPS model is to enhance the capacity of the primary care health system for improving oral health across the life cycle, particularly for vulnerable and underserved populations.

ORAL HEALTH TIPS

Program Overview

Equipping faculty and graduates with the knowledge, skills, and attitudes to integrate oral health promotion and oral disease prevention into practice, and shifting from educating health professionals separately to team-based education are high priorities at Bouvé College. The overarching goal of the Oral Health TIPS program is to prepare primary care professionals across disciplines with team-based competencies to integrate oral health into comprehensive general health care, with an emphasis on health promotion and disease prevention. The primary aims of the program are to integrate oral health education across interdisciplinary health sciences curricula; and promote team-based, collaborative practice models for oral health promotion and disease prevention in primary care settings. The Oral Health TIPS program builds on the collaborative work of the National Interprofessional Initiative on Oral Health, whose mission is to engage primary care clinicians in oral health.[26]

Approach

Organizational leadership is paramount in transforming health professions education to address local and global oral health challenges. The Oral Health TIPS program is supported by a multilevel leadership infrastructure that includes deans, directors, faculty, and students across Bouvé College and its Schools of Health Professions, Nursing, and Pharmacy. Organizational engagement strategies include convening

discussion forums and presentations to create awareness about oral health inequities, align faculty and students toward a shared vision of improving oral health through interprofessional collaborative practice, and make the case for integrating oral health as an essential component of comprehensive health care in primary care settings. Faculty members from each academic department serve as oral health champions and facilitators for integrating oral health and teamwork competencies into their respective health science curriculum.

The Oral Health TIPS program uses a multimodal approach to advance IPE and collaborative practice in oral health. Learning innovations bring students together from multiple health professions to learn about, from, and with each other. Interprofessional learning is contextualized using a team-based approach to improving oral health and promoting healthy aging across the life cycle. The approach integrates strategies for adopting competency-based curricula, strengthening educational resources, promoting team-based practice, leveraging educational technologies, and designing experiential learning.

Adopting competency-based curricula

The IPEC core competencies for interprofessional collaborative practice[18] are adopted as a framework for advancing the integration of oral health into health sciences curricula, and preparing graduates with basic oral health competencies to assess risk for oral diseases, provide oral health promotion and disease prevention information, integrate oral health information with patient and family counseling about healthy personal behaviors, and make referrals to dentists and other health professionals.[9] *Smiles for Life: A National Oral Health Curriculum*[27] is endorsed as an online, modular curriculum for integration into existing undergraduate and graduate courses across the health sciences. For example, Course 8: Geriatric Oral Health addresses the role of primary care clinicians in promoting oral health for older adults through comprehensive oral assessments and collaborating with dental professionals. Faculty can readily integrate this module in courses that address the management of common geriatric oral-systemic health problems.

Strengthening educational resources

Strengthening educational resources is essential to enhance oral health and teamwork competencies.[5] The Oral Health TIPS program prioritizes faculty development through investing in ongoing train-the-trainer workshops and other educational programs designed to enhance oral health and team-based competencies. The *Smiles for Life* curriculum is featured as a strategy for faculty enrichment.[28] Faculty development programs focus on integrating oral health care into comprehensive primary health care, common oral-systemic health problems, oral health promotion and disease prevention for healthy aging, and the medical-dental interface. The Dean's Seminar Series offers faculty and students the opportunity to learn about current issues in oral and systemic health, and engage in conversational learning with prominent leaders in research, education, practice, and policy.

Promoting team-based practice

Adopting teamwork as a cross-cutting competency for all health professionals, the Oral Health TIPS program uses team-based instructional methods to prepare students for effective team-based practice. Instructional methods are designed to engage students from multiple professions to learn together, particularly about each other's roles; work toward a common goal; and collaborate across traditional professional boundaries. Collaborative didactic teaching-learning, specially designed to enhance core competencies for collaborative practice, is an effective strategy for

engaging students across health professions to learn about, from, and with each other toward a shared goal of improving oral-systemic health in a primary care setting. For example, faculty from Bouvé College, Harvard School of Dental Medicine, and Harvard Medical School collaborated on the design, planning, and implementation of IPE didactic sessions at the Beth Israel Deaconess Medical Center - Crimson Care Collaborative, a student-faculty collaborative primary care practice. The didactic sessions underscore the importance of conducting an oral examination as an integral component of a primary care visit. Teaching-learning strategies include interprofessional faculty and students cofacilitating case discussions; problem-based cases designed to foster collaboration between dental, medical, nurse practitioner, and pharmacy students in the assessment, diagnosis, and treatment of older adult patients presenting with an oral-systemic condition or interaction; and dental students teaching health sciences students how to conduct an oral health examination and screening.

Leveraging educational technologies

Simulation-learning is an innovative approach to integrating oral health across health sciences curricula, and preparing primary care health professionals with the competencies to address oral health in every primary care visit and across a variety of primary care settings. The Arnold S. Goldstein Simulation Laboratories Suite at Bouvé College is dedicated to linking IPE and clinical practice. The Oral Health TIPS program leverages simulation-learning to create realistic representations of primary care practice environments through a variety of activities and technologies, ranging from low-technology role-playing to high-fidelity human patient simulators. Simulated environments may include community health centers, school-based programs, retail medical clinics, pharmacies, and other primary care settings. Simulation scenarios are designed to replicate real-life primary care clinical encounters. Health sciences students across Bouvé College engage with dental students from other academic institutions in team-based simulations focused on oral health promotion and oral disease prevention for healthy aging across the life cycle. The team-based simulations use standardized patients (trained actors) and debriefing techniques to enhance a patient-centered approach to integrating oral health as a component of comprehensive primary care.

Designing experiential learning

Innovations in experiential learning, such as cooperative education and community service, serve as a nexus between IPE and collaborative practice. Experiential learning provides students with real-life situations working with interprofessional teams in a community setting or practice environment, and the opportunity to apply concepts about oral health and healthy aging across the life cycle. A well-designed community service-learning experience is an effective strategy to increase student's awareness of oral health inequities and the underlying determinants of poor oral health for different population groups. For example, faculty and students from Bouvé College participated in a community service outreach to the Wampanoag Tribe of Gay Head (Aquinnah) on Martha's Vineyard, Massachusetts, led by Dr Brian Swann from Harvard School of Dental Medicine. Health sciences students collaborate with dental students and faculty in conducting oral health screenings, risk assessments, and health histories. Students interact in an interprofessional way with tribal community members by providing oral health information and counseling about healthy personal behaviors. Bringing together students and faculty across health professions in a community outreach is a promising approach to enhance interprofessional teamwork

competencies, and promote the integration of oral health as an important component of general health.

INTERPROFESSIONAL COLLABORATIVE PRACTICE IN ACTION

> *…Very much like the model, should be national model of care, encourages cost effective care, makes smart financial decisions, includes the patient in the care plan…*
>
> *—Joe Stanley*

The US population is aging and the number of people living with chronic conditions grows to levels not ever seen before. The resulting burden on the system is already being felt: national long-term care spending in 2007 neared $207 billion, of which about 62% was spent on expenses related to nursing home care.[29] End-of-life health care costs continue to grow; by 2050, they are projected to be twice the current levels. To manage the inevitable strains on the health care system in the years to come, there will be an unprecedented need for multidisciplinary models of care to reduce cost and to raise system efficiency in the delivery of care. In particular, policy makers have started to focus on community- and home-based long-term care as a way to curb costs.[30] This section introduces and discusses one such multidisciplinary practice model, Program of All-inclusive Care for the Elderly (PACE), which has great promise in providing efficient and effective care. Over the years, PACE has grown from its quiet beginnings to become an integral part of modern home-based long-term care models.[31]

PACE is a nonprofit, multidisciplinary medical home program for the elderly funded by the federal government to provide eligible elderly a concierge-type patient-centered care. The PACE care model started in San Francisco, CA in the 1970s, when a Chinatown community decided to care for its elderly to avoid their unnecessary admission into nursing homes and hospitals.[32,33] A few years later, Dr William Gee, a dentist, together with the University of California San Francisco created the On-lok Senior Health Services, in which elderly receive all of their health care needs from the same place.[33] The original PACE care model offered these minimums: primary care services, social services, restorative therapies, personal care, nutrition, counseling, supportive care, and meal services.[32,34] It has grown to include additional services on-site including an oral health and dental clinic, planned daily activities, games, exercise, and personal and cosmetic care activities. There are presently 104 PACE programs in 31 states, and this number continues to grow.[35]

An important reason for the success of PACE is reduction in health care costs: with PACE the average monthly savings of using a community-based model of care versus nursing home admission is about $3632 per patient per month.[36,37] Equally important to its success, PACE allows the elderly to maintain their autonomy in decision making and to stay in their own homes for a longer amount of time, and the coordination of care through a “one-stop shop” model in which care providers work together to manage the patient’s care. With respect to oral care, some PACE centers offer an on-site oral health clinic.[33] Most, however, contract with an independent dentist to work on-site. An on-site oral health clinic offers several benefits, such as lower dental care cost; improved accessibility to oral health care; regular continuous monitoring patients’ oral health condition; and regular weekly updates of patients’ medical, social, living, and medication changes. Unique to the Elder Service Plan of the North Shore’s PACE program is the collaborative agreement with the Beth Israel Deaconess Medical Center’s Interdisciplinary Geriatric Fellowship in Dental, Medical and Mental/Behavioral Health supported by the US Department of Health and Human Services, Health Resources and Services Administration. In the practice setting of Elder Service Plan

of the North Shore, IPE is integrated into this model to improve health outcomes in the care and management of older adults and enrich medical/dental training. Working side by side in the same facility, the geriatric fellows learn from each other and practice collaborative and coordinated care aligned to the health care goals of each participant. There is a vital need for integrating oral health care into the elderly patients' overall treatment planning and management of care. Oral health care has seen great improvements in knowledge and clinical skill in the last century, during which there grew a developed body of literature that unequivocally linked poor oral health to overall health problems. For example, poor periodontal health and active disease in the oral cavity have been linked to systemic conditions, such as aspiration pneumonia (a leading cause of death in the elderly), diabetes, Alzheimer's disease, rapid weight loss, and cardiovascular condition.[38–46] All of these are examples of how oral health condition has an important effect on the patient's quality of life and longevity.

To better understand the benefit of the PACE model of care and how oral health can be integrated within it, we examine a common scenario encountered by a geriatric dentist. We present this case (**Box 3**) to highlight the breadth and comprehensiveness of care that a dentist is able to deliver to the geriatric patient.[47] The case also showcases the vital role a dentist can play in overall patient management and end-of-life planning involving one of the commonly diagnosed conditions in the elderly: Alzheimer's disease. The oral health care provider has a vital role from the beginning to the end in managing Alzheimer's patients.

The PACE model of care has been continuously growing.[48] Although each PACE site operates differently and independently, the guiding principle remains the same: combining a multidisciplinary approach with a patient-centered model. This model has provided a medium in which all health professionals work together in providing comprehensive care to the patients. The model allows for oral health care providers to interact directly with the primary care provider, patient's nurse, physical therapist, and counselor and to provide oral health services and treatment recommendations in

Box 3
The value of an interdisciplinary, patient-centered care model

Mr Smith is 75 years old and has recently enrolled into the PACE program. He was previously diagnosed with Alzheimer's disease, diabetes, hypertension, fibromyalgia, arthritis, and hyperlipidemia. He suffered a motor vehicle accident about 8 years ago, which damaged his lumbar spine. Since then, he has been living with chronic lower back pain. He can drive short distances but long distances are often hard on him. He lost his wife in this accident. His children have also moved away because of their employment conditions. He has a younger brother living with him, but the two do not have a good relationship. They decided to share a house because of Mr Smith's financial difficulties, so that he does not lose his house. Mr Smith has had considerable difficulty ever since his accident and his resulting inability to work—especially when his children moved away. During the cold season, he is often unable to leave the house for days because of pain. As his dementia advances, life is becoming more and more difficult for him. He and his children together decided to enroll him at the local PACE center.

Mr Smith married his high school sweetheart when he was 18. His wife worked at a fast food restaurant for many years and Mr Smith was a carpenter. They had two children who lived nearby until about 5 years ago. Mr Smith's only family is now his younger brother who works at a car shop. Mr Smith is extremely social and has many friends that continuously help him out, especially on days when he cannot leave his house. The only thing that bothers him is his continuous fights with his brother.

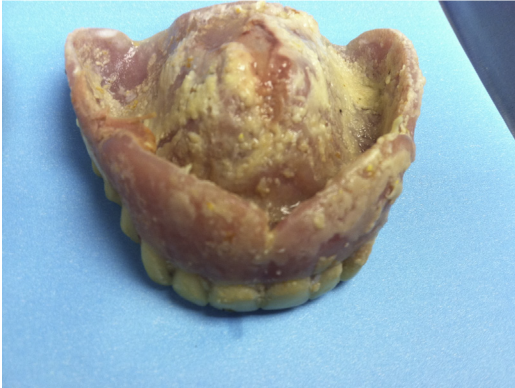
Today Mr Smith has come to the PACE center for his regular check-ups and to see the onsite dentist to start his oral health treatment. This is Mr Smith's second visit at PACE since his enrollment 3 weeks ago. So far he is extremely happy with the care and services that he has been receiving.

Geriatric dental assessment: oral, systemic, capability, autonomy, and reality

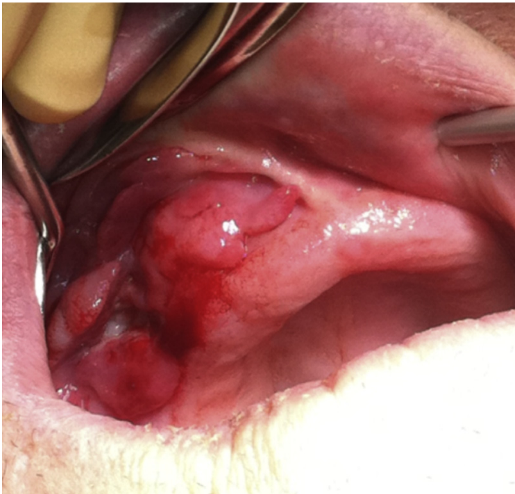
Oral Examination

Patient is edentulous and has been wearing dentures for 15 years. His current dentures set is his second. He does not recall what happened with his lower denture but reports to you that he cleans his dentures nightly. Your intraoral examination shows the following:

- Mr Smith's upper denture looks like this



- When you elevate his upper lip you find this lesion



Systemic Examination

Alzheimer's disease, diabetes, hypertension, fibromyalgia, arthritis, and hyperlipidemia.

Capability

Patient reports that he is able to accomplish his personal care without any problems by himself. However, based on your assessment of his oral health condition, you realize that the patient's dentures are not cleaned daily. You observe denture stomatitis on the upper jaw along with gingival hyperplasia and denture sore suggestive that his dentures have not been removed from his mouth for a long time. His lower jaw was unremarkable, suggesting that the patient probably lost his lower dentures a long time ago.

Autonomy

The patient consents for his treatment, but his daughter and son, who live in another state, are also his health proxy.

Reality

The patient is the only person who is currently caring for himself. At the same time, he does require additional help. In addition, he suffers from multiple medical conditions, and importantly, he is dealing with advancing dementia.

Case summary

It is no secret that good oral health plays an important role in systemic health, and that good oral hygiene aids in the prevention of infectious diseases, such as aspiration pneumonia. As a patient's dementia progresses, oral hygiene and oral examinations in many cases become more challenging. Presenting the oral health care team from the beginning in the management of these patients is an important component of the multidisciplinary, patient-centered care team.

Mr Smith is a patient who is currently not working and is dealing with chronic pain and conditions that limit his ability to care for himself. He also suffers from a progressively advancing dementia, and his oral health needs daily care. Being part of an interdisciplinary team allows the dentist to start working with the patient at the first time that the dementia is diagnosed. Dentists are able to train the patient's caregiver and primary care team on how best to carry out the daily oral health routine for the patient. Being part of the PACE program, the dentist can regularly check the patient and ensure that his oral hygiene is maintained at a reasonable level.

consultation with other health care professionals. In this model, dentists and dental hygienists are an integrated part of the primary care team.

SUMMARY

Advancing oral health necessitates new models of IPE and practice that are responsive to the complex oral and systemic health needs of an aging society. The Oral Health TIPS program is an innovative IPE model that aims to prepare the next generation of health professionals with oral health and team-based competencies to strengthen the primary care health system and integrate oral health in every primary care visit. This innovative model holds great promise for linking IPE and clinical practice through innovations in technology, instruction, and experiential learning. The PACE model of patient-centered care is an exemplar for integrating oral health as an essential component of comprehensive primary care.

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REFERENCES

1. Flexner A. Medical education in the United States and Canada: a report to the Carnegie Foundation for the advancement of teaching. New York: The Carnegie Foundation for the Advancement of Teaching; 1910. Available at: http://www.carnegiefoundation.org/sites/default/files/elibrary/Carnegie_Flexner_Report.pdf.
2. Welch WH, Rose W. Institute of hygiene: a report to the General Education Board of Rockefeller Foundation. New York: The Rockefeller Foundation; 1915.
3. The Committee for the Study of Nursing Education. Nursing and nursing education in the United States. New York: The Rockefeller Foundation; 1923.
4. Gies WJ, Pritchett H. Dental education in the United States and Canada: a report to the Carnegie Foundation for the advancement of teaching. New York: The Carnegie Foundation for the Advancement of Teaching; 1926.
5. Frenk J, Chen L, Bhutta ZA, et al. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. Lancet 2010;376(9756):1923–58. Available at: http://dash.harvard.edu/bitstream/handle/1/4626403/Ed_HealthProfCommisionp5_40.PDF?sequence=1.
6. Beaglehole R, Benzian H, Crail J, et al. Oral health atlas: mapping a neglected global health issue. Cointrin (Switzerland): 2009. Available at: http://issuu.com/myriadeditions/docs/flipbook_oral_health. Accessed December 31, 2013.
7. Population ageing and development: ten years after Madrid. 2012. Available at: http://www.un.org/en/development/desa/population/publications/pdf/popfacts/popfacts_2012-4.pdf. Accessed December 31, 2013.
8. United States Department of Health and Human Services, Office of the Surgeon General. Oral Health in America: a report of the Surgeon General. Rockville (MD): National Institute of Dental and Craniofacial Research, National Institutes of Health; 2000. Available at: http://www.surgeongeneral.gov/library/reports/oralhealth/index.html.
9. Institute of Medicine. Improving access to oral health care for vulnerable and underserved populations. Washington, DC: Institute of Medicine; 2011. Available at: http://www.iom.edu/reports/2011/improving-access-to-oral-health-care-for-vulnerable-and-underserved-populations.aspx.
10. Institute of Medicine. Advancing oral health in America. Washington, DC: Institute of Medicine; 2011. Available at: http://www.iom.edu/Reports/2011/Advancing-Oral-Health-in-America.aspx.
11. United States Department of Health and Human Services. National call to action to promote oral health. Rockville (MD): US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Institute of Dental and Craniofacial Research; 2003. Available at: http://www.surgeongeneral.gov/library/calls/oralhealth/nationalcalltoaction.html.
12. Schmitt MH, Gilbert JHV, Brandt BF, et al. The coming of age for interprofessional education and practice. Am J Med 2013;126:284–8. Available at: http://www.ncbi.nlm.nih.gov/pubmed/23415053.
13. World Health Organization Study Group on Interprofessional Education and Collaborative Practice. Framework for action on interprofessional education and

collaborative practice. Geneva (Switzerland): World Health Organization; 2010. Available at: http://whqlibdoc.who.int/hq/2010/WHO_HRH_HPN_10.3_eng.pdf.
14. Interprofessional Education Collaborative Expert Panel. Core competencies for interprofessional collaborative practice: a report of an expert panel. Washington, DC: Interprofessional Education Collaborative; 2011. Available at: http://www.aacn.nche.edu/education-resources/ipecreport.pdf.
15. Institute of Medicine. Educating for the health team. Washington, DC: Institute of Medicine; 1972.
16. Institute of Medicine. Executive summary: health professions education: a bridge to quality. Washington, DC: Institute of Medicine; 2003. Available at: http://www.iom.edu/Reports/2003/health-professions-education-a-bridge-to-quality.aspx.
17. Global forum on innovations in health professional education. Available at: http://www.iom.edu/Activities/Global/InnovationHealthProfEducation.aspx. Accessed December 31, 2013.
18. Westphal CM, Furnari W, Haber J. College of Dentistry/College of Nursing partnership. Access 2009;23(6):18, 21.
19. Alfano M. Connecting dental education to other health professions. J Dent Educ 2012;76(1):46–50.
20. Haber J, Strasser S, Lloyd M, et al. The oral-systemic connection in primary care. Nurse Pract 2009;34(3):43–8.
21. Djukic M, Fulmer T, Adams JG, et al. NYU3T: teaching, technology, teamwork. A model for interprofessional education scalability and sustainability. Nurs Clin North Am 2012;47:333–46.
22. Geriatric interdisciplinary team training (GITT) program. 2011. Available at: http://hartfordign.org/education/gitt/. Accessed December 13, 2013.
23. TeamSTEPPS. 2013. Available at: http://teamstepps.ahrq.gov. Accessed December 13, 2013.
24. Dolce MC, Haber J, Shelley D, et al. Oral health nursing education and practice program. Nurs Res Pract 2012;2012:149673. http://dx.doi.org/10.1155/2012/149673.
25. Fulmer T, Cabrera P. The primary care visit? What else could be happening? Nurs Res Pract 2012;2012:720506. http://dx.doi.org/10.1155/2012/720506.
26. National Interprofessional Initiative on Oral Health. Clinicians for oral health. 2011. Available at: http://www.niioh.org. Accessed December 16, 2013.
27. Clark MB, Douglass AB, Maier R, et al. Smiles for life: a national oral health curriculum. 3rd edition. 2010. Available at: http://elearning.talariainc.com/buildcontent.aspx?tut=555&pagekey=62948&cbreceipt=0. Accessed December 19, 2013.
28. Dolce M. Nurse faculty enrichment and competency development in oral-systemic health. Nurs Res Pract 2012;2012:567058. http://dx.doi.org/10.1155/2012/567058.
29. Komisar HL, Shirey L. National spending for long-term care. Washington, DC: Health Policy Institute, Georgetown University; 2007.
30. Long-term care: issues and policy considerations. Available at: http://www.mffh.org/mm/files/FactSheetLTC.pdf. Accessed December 19, 2013.
31. Eng C, Pedulla J, Eleazer GP, et al. Program of All-inclusive Care for the Elderly (PACE): an innovative model of integrated geriatric care and financing. J Am Geriatr Soc 1997;45(2):223–32.
32. Lee W, Eng C, Fox N, et al. PACE: a model for integrated care of frail older patients. Program of All-inclusive Care for the Elderly. Geriatrics 1998;53(6):65–9.
33. PACE innovation act reaches milestone. 2013. Available at: http://www.npaonline.org. Accessed December 19, 2013.

34. United States Department of Health and Human Services, Centers for Medicare and Medicaid Services. Quick facts about Programs of All-inclusive Care for the Elderly (PACE). Washington, DC: Centers for Medicare and Medicaid; 2011. Available at: http://www.medicare.gov/Pubs/pdf/11341.pdf. Accessed July 25, 2014.
35. National PACE Association. Who, what, and where is PACE? Alexandria, VA: National PACE Association; 2014. Available at: http://www.npaonline.org/website/article.asp?id=12&title=Who,_What_and_Where_Is_PACE? Accessed July 25, 2014.
36. Hirth V, Baskins J, Dever-Bumba M. Program of All-inclusive Care (PACE): past, present, and future. J Am Med Dir Assoc 2009;10(3):155–60. Available at: http://www.dhcs.ca.gov/provgovpart/Documents/Waiver Renewal/PACE_Article_JAMDA_091.pdf.
37. Costs of care. Available at: http://longtermcare.gov/costs-how-to-pay/costs-of-care/. Accessed December 19, 2013.
38. Newman MG, Takei H, Perry R, et al. Carranza's clinical periodontology. 10th edition. Philadelphia, PA: Saunders Elsevier; 2006.
39. Stein P, Steffen M, Smith C, et al. Serum antibodies to periodontal pathogens are a risk factor for Alzheimer's disease. Alzheimers Dement 2012;8:196–203.
40. Stein PS, Desrosiers M, Donegan SJ, et al. Tooth loss, dementia and neuropathology in the Nun Study. J Am Dent Assoc 2007;138:1314–22.
41. Steward R. Mouths and brains. Could oral infection be a risk factor for dementia? J Neurol Neurosurg Psychiatry 2009;80:1184.
42. Sarin J, Balasubramaniam R, Corcoran AM, et al. Reducing the risk of aspiration pneumonia among elderly patients in long-term care facilities through oral health interventions. J Am Med Dir Assoc 2008;9(2):128–35.
43. Moodley A, Wood NH, Shangase S. The relationship between periodontitis and diabetes: a brief review. SADJ 2013;68(6):260–4.
44. Shangase SL, Mohangi GU, Hassam-Essa S, et al. The association between periodontitis and systemic health: an overview. SADJ 2013;68(1):8, 10–12.
45. Suzuki K, Nomura T, Sakurai M, et al. Relationship between number of present teeth and nutritional intake in institutionalized elderly. Bull Tokyo Dent Coll 2005;46(4):135–43. Available at: http://ir.tdc.ac.jp/irucaa/bitstream/10130/242/1/46_135.pdf.
46. Syrjälä AM, Pussinen PI, Komulainen K, et al. Salivary flow rate and risk of malnutrition: a study among dentate, community-dwelling older people. Gerodontology 2013;30(4):270–5.
47. Laudenbach JM, Jacobsen PL, Mohammad AR, et al. Clinician's guide oral health in geriatric patients. 3rd edition. Edmonds, WA: American Academy of Oral Medicine; 2010.
48. Turk L, Parmley J, Ames A, et al. A new era in home care. Semin Nurse Manag 2000;8(3):143–50.