

Trends influencing dental education in the United States: is there a crisis?

Études dentaires aux États-Unis sous influences : y a-t-il une crise ?

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ABSTRACT

Trends affecting dental education in the United States (US) will be discussed in this paper as viewed by two colleagues who share longevity and experience as dental educators. By citing and commenting on selected, current national and international research in education, this paper will explore a wide range of influences on dental education and attempt to judge and summarize the potential impact of these trends on the future of dental education in the US.

KEY WORDS

Dental curricula, interprofessional education, mid-level practitioner, dental therapist, healthcare reform.

Introduction

The literature in dental education reveals that numerous respected leaders believe that a crisis exists in the American system and are calling for immediate attention to a wide variety of influences (Baillit *et al.*, 2006;

DePaola, 2008; Kalkwarf *et al.*, 2005; Pyle *et al.*, 2006; Roth, 2007). Many of the influences enumerated are those affecting the dental profession itself that necessarily reflect back to shape dental education. Other trends noted are those that operate directly on school curricu-

la and the everyday lives of dental students. This paper intimates that pressures exist to open the doors of dentistry wider to meet the needs of a broader, more diverse population, to break barriers against tight controls on mid-level healthcare provider responsibilities, and to expand

RÉSUMÉ

Dans cet article, nous discuterons des tendances qui affectent les études dentaires aux États-Unis telles qu'elles sont perçues par deux confrères qui partagent une longue carrière et une grande expérience en tant qu'enseignants en odontologie. Après avoir sélectionné des travaux de recherche très récents portant sur l'enseignement, qui seront cités et commentés, cet article se propose d'explorer une large gamme de tendances qui influencent les études dentaires et tente de juger et de résumer leur impact potentiel sur l'avenir de l'enseignement dentaire aux États-Unis.

MOTS CLÉS

Programmes d'enseignement dentaire, formation interprofessionnelle, praticien de niveau intermédiaire, thérapeute dentaire, réforme des soins de santé.

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the scope of practice for dentists by encouraging both primary care and interprofessional healthcare provider models.

A Brief History

The American concept of dentistry as a health profession separate and apart from medicine found its beginning in the early 19th century. Baltimore College of Dentistry opened in 1840 marking the beginning of formal education for dentists (Schulein, 2004). The number of dental colleges in the United States grew in the late 1800's and were mostly proprietary (not affiliated with universities), private, for-profit institutions. In the early 20th century a newly established Council on Dental Education developed a well-known document, the Gies Report (Gies, 1926) which strongly recommended that dental schools become affiliated with schools of medicine and with major universities. This is basically what happened during in the 20th century and, in fact, by the early 1930's the last remaining dental proprietary school was abolished (Schulein, 2004). In 2002 Bertolami concluded in his paper on research and scholarship in dental schools "*the vast majority of U.S. dental schools are co-located with research-intensive universities*" (Bertolami 2002).

Opening of new dental schools

"Dentistry's position as a learned, self-regulating profession of equal occupational prestige and responsi-

bility to medicine and law depends upon having the stature and credibility in society that comes with being an integral part of research-intensive universities." (Formicola *et al.*, 2008a.)

After nearly a century of efforts by dental schools to follow the Gies Report's recommendation to affiliate with medical schools and research universities, a turnaround trend back to development of new schools that are autonomous or semi-autonomous colleges, is occurring. The rationale for the Gies recommendation was that a university affiliation was the appropriate path for increasing the scientific research base and credibility of an apprenticeship occupation that aspired to becoming a recognized scientific profession. Although the American Dental Association (ADA) website (American Dental Association, 2011a) states that no proprietary dental schools are currently operating in the US today a number of new US dental schools have proprietary-like profiles in that they are private, not located or directly affiliated with universities, do not require or stress research publication by faculty and/or do not offer tenure track positions for faculty. While European dental education is experiencing a change of direction from a stomatology focus to one of odontology (Scott, 2003), the background and reasons for their change in direction have few similarities to the US phenomenon. US dental schools have rarely been as closely aligned with medical school education, as have certain of those in Europe. But, US dental faculty collaboration with medical school researchers and others

at their affiliated universities has added significantly to quantity and quality of their research production.

All dental schools in the US offer a 4-year curriculum or its equivalent, preceded by 2-4 years of pre-requisites and/or a baccalaureate degree. The number of dental schools in the US rose from 55 in 2000 to 62 in 2012. Five of the six new schools that opened before 2012 are private, 1 is public. Two additional private schools are accreditation cleared and ready to open in 2012 and 2013 (**Table 1**). Further, it is well known in the community that more schools are preparing to open in the future (American Dental Association, 2011b, 2011c; Valachovic, 2012).

The new dental schools are generally placing a high priority on reaching out to underserved patient populations and service learning for students. They have funding for the development of state-of-the-art facilities and technology; most are affiliated with schools of osteopathic medicine rather than medical schools. (Osteopathic medicine is a branch of medicine in the US. Osteopathic physicians, who are granted a DO degree, are licensed and eligible to practice medicine in all 50 states.) All new schools are operating at an acceptable level of quality as ascertained by the Commission on Dental Accreditation. During a nearly 20 year period leading up to the opening of the first new dental school in 2000, seven dental schools in the US had closed; five of them were located with research universities (Formicola *et al.*, 2008b). The Commission on Dental Accreditation (CODA) (2010), which is supported by the American Dental Association, accredits all dental schools

S. K. RICH, H. NOWZARI

School	City	Affiliation	Open	Type
Arizona School of Dentistry and Oral Health	Mesa, Arizona	A.T. Still University, School of Osteopathic Medicine	2003	Private
Midwestern University	Glendale, Arizona	Arizona College of Osteopathic Medicine	2008	Private
Western University of Health Sciences' College of Dental Medicine	Pomona, California	Western University of Osteopathic Medicine	2009	Private
East Carolina University	Greenville, North Carolina	Brody School of Medicine at East Carolina University	2011	Public
Midwestern University	Downer's Grove, IL	Chicago College of Osteopathic Medicine	2011	Private
Roseman University of Health Sciences College of Dental Medicine	South Jordan, Utah	Roseman University College of Pharmacy	2011	Private
LECOM School of Dental Medicine	Bradenton, Florida	Lake Erie College of Osteopathic Medicine (LECOM)	2012	Private
University New England College of Dental Medicine	Portland, Maine	New England College of Osteopathic Medicine	2013	Private

Table 1. New Dental Schools in the United States (2000-2013)

Tableau 1. Nouvelles écoles dentaires aux États-Unis (2000-2013).

every 7 years. According to new Standards set by the Commission, all dental schools “*must make research an integral component of the purpose/mission, goals and objectives of the dental school*” and faculty “*must engage in research or other forms of scholarly activity*”. While all schools will be held to this standard, it is likely to be difficult for the faculty from some of the new schools to conduct and publish research of the quantity and quality that can be produced with medical school and university affiliations. While there is pressure from the national dental education association to increase scholarship through educational research publications of high quality, there is also a movement to broaden

the definition of “scholarship” to include, not only educational research, but recognition for a wide-range of didactic and clinical teaching duties and responsibilities (American Dental Education Association, 2012; Jahangiri *et al.*, 2011). This trend toward increased support for educational research could definitely bolster the science of education in areas such as the development of valid and reliable learning outcome measures. But, if the trend falls into a pattern whereby CODA and others accept teaching activities, that are only marginally related to true scholastic endeavor, as being equal to that of scientific discovery and research publication, the vision of Gies may come to be regarded as challenged.

An expanding dental workforce

“While concerns about a future shortage persist, the size of the overall dental workforce has been steadily increasing during the last two decades.” (Guthrie *et al.*, 2009.)

In 2009, Guthrie *et al.* (2009) commented on a two decade long increase in the size of the US dental workforce and attributed the increase to expanded enrollments from existing and newly-opened dental schools. An American Dental Association report entitled, *Adequacy of Current and Future Dental Workforce*, concluded that growth in the number of dentists would outstrip

Trends influencing dental education in the United States: is there a crisis?

Études dentaires aux États-Unis sous influences : y a-t-il une crise ?

the demand for dental services by 2022 (Brown *et al.*, 2005). In spite of this study and prevailing opinions on the side of caution, opening of new dental schools was deemed necessary by those who looked at designated workforce shortage areas in specific cities and remote areas and advocated the training of more dentists to meet the needs of underserved populations (Guthrie *et al.*, 2009).

Likely due to the call for more dentists and the recent opening of new dental schools, the US applicant pool showed a significant increase from 2003 (7,412 applicants) to 2010 (12,202 applicants). From 2001 to 2010, total first year enrollment in US dental schools increased by 17.6% (4,327 enrollees to 5,089 enrollees) (American Dental Association, 2011a). Workforce predictions were made in the time of a stronger economy and may not hold today as families are tightening their budgets and foregoing elective and other dental work. There is evidence from online blogs and from graduates who are speaking out that dental associate positions are difficult to find, and they are worried about getting work and paying back school loans in a sluggish economy.

Nevertheless, concern for health care needs of underserved US populations is a serious one and oral health care is no exception. Europe has a strong record of community-funded, primary care that has not been common in North America (Shanley, 2007). Currently, health care reform under Obama's Presidential Administration is attempting to address underserved populations and this focus is likely to affect trends in den-

tal education, the future of dental graduates, as well as the American population at-large.

Healthcare reform

"Perhaps more important than any specific oral health provision, however, is the Patient Protection and Affordable Care Act's (PPACA) strong encouragement of the ongoing effort to integrate the different components of the health care delivery system into a more seamless and interdisciplinary medical home." (Sparer, 2011.)

"... if our goal is the oral health of the American people, we must be open and flexible in investigating and evaluating all strategies available to achieve this good. To say that this is our goal, but to immediately follow (or precede) that vision with a declaration that there is only one way to accomplish it, the way we do it now, is antithetical to the attitude of science, and the scientist; which dentistry and dentist are or should be." (Nash, 1994.)

The emphasis on comprehensive health care reform has highlighted the rising costs and disparities of access to oral care that exist in the US. Approximately two-thirds of the US population is receiving dental care based on the traditional, solo private practice system of providing care (O'Neil and Nagai, 2011). This served and treated portion of the population is characterized as having resources, general good health, care-seeking behavior, and access to professional services. O'Neil and Nagai state that the traditional

dental delivery system, although remarkably successful for two-thirds of the population, has barriers for the remaining one-third or approximately 100 million American people (O'Neil and Nagai, 2011). Disadvantaged segments of the population are made up of those who are geographically isolated, institutionalized and/or from groups of vulnerable low income, children/adolescents, disabled, elderly, homeless, pregnant women and mothers, racial and ethnic minorities. The extensive dental needs of these special groups are well-documented with statistics and comments through the survey research publication, *Improving Access to Oral Health Care for Vulnerable and Underserved Populations*, of the Institute of Medicine (2011), our nation's premier source of independent, expert advice on scientific and medical issues (Institute of Medicine of the National Academies, 2011).

In combination with the ongoing economic recession and the Patient Protection and Affordable Care Act, signed into law by President Obama on March 2010, all health professions have been under pressure from both private and public sources to develop new models of providing care (Sparer, 2011). The emphasis is on models that can build on the existing current system with use of technology, innovative cost cutting, and increased access to care. Dental educational institutions are attempting to respond to calls from the Commission on Dental Accreditation and others to generate curriculum content and models of care delivery that address topics such as: interprofessionalism, ethical standards, culturally and ethnically

S. K. RICH, H. NOWZARI

sensitive issues, and evidence-based science. Nationally, new models of care delivery are still being considered and debated and all the aforementioned curricular content topics are relevant for the future of dental education.

O'Neil and Nagai (2011) have emphasized that the health care reform law is focused on universal access, controlling expenditures, improving quality and efficiency of the system; however, enforcement has not included proposals for reduced payments to providers (considered a "politically distasteful option"). Rather than reduced payments to providers, the government is advising innovative and expanded use of technology and alteration of existing practice models to new models that can be delivered at lower costs. The new dental schools, and existing traditional schools, are sensitized to the needs of the underserved US populations and are attempting to guide their students in the direction of community service. The autonomous, proprietary-type schools may be better positioned to meet this call with dental educational models that directly address identified public needs. The new schools have flexibility in designing their curriculums from the bottom up, while most older schools are grappling with overloaded curriculums and seasoned faculty who are reluctant to give up hours in their particular areas (Drisko, 2012).

Interprofessional education (IPE)

"Should the dentist play a larger role in the primary care delivery system,

working with primary care physicians, nurse practitioners, and physician assistants? But where does the dentist fit in the emerging primary care system?" (Sparer, 2011.)

Concern about the systemic connection to oral health and oral health care is part of the overall driving force in a movement toward interprofessionalism and new models of dental care delivery. Hendricson and Cohen (2001) expressed criticism that dental school curricula continues to be dedicated heavily toward a technical focus on tooth restoration when an obvious educational direction should be toward expanded training in systemic disease pathophysiology and a scope of practice that supports an oral physician model. Other health professional groups have come forth with many articles to advocate for interprofessional education and new models of providing care (Alfano, 2012; Frenk *et al.*, 2010). The advocacy is for multiple health workers from different professional backgrounds to join together in interprofessional, collaborative efforts to provide high quality care for patients. The vision is that medical doctors, dentists, nurses, dental hygienists, pharmacists, physical therapists, and other health professionals will work together to treat the whole patient. Much of the prior work on this issue has culminated in 2011 with a detailed document by an expert panel from an array of health professions entitled: *Core competencies for interprofessional collaborative practice* (Interprofessional Education Collaborative Expert Panel, 2011). This document will provide guidance for educators who are seeking to bring more exposure for

this advocacy to the dental school curriculum.

Emerging new healthcare workers

"Amidst the growing chorus of those citing dentistry's imperative to address access to care issues in rural and low-income segments of the population, support for midlevel providers is mounting." (Guthrie *et al.*, 2009.)

The national health initiative, *Healthy People 2020*, has called for expanded provision of oral health care for all age groups (United States Department of Health and Human Services, 2010). Alternative models of oral health care delivery have been proposed to help meet needs with emerging new health professionals such as the "dental therapist" or "mid-level practitioner" in the states of Alaska (Nash *et al.*, 2008; Westerrhall *et al.*, 2011) and Minnesota (Blue and Lopez, 2011). The dental therapists' scope of practice has been increased by law in these states so that dental therapists can provide basic preventive and restorative care for children and adults with minimal or no dentist supervision on site. Nash *et al.* reported (2008) that a dental therapist model has been well tested and is currently being utilized in 53 countries with an estimated 14,000 therapists. This figure does not include 25,000 dental assistants, similar to the dental therapists, who are functioning rural areas in China. The model has been shown to be favorably accepted by the public served in other countries over a period as long as 80 years with patient

Trends influencing dental education in the United States: is there a crisis?
Études dentaires aux États-Unis sous influences : y a-t-il une crise ?

satisfaction and quality of care judged to be equal of that provided by dentists. Many envision the dental therapist movement as one that can free up time for dentists to pursue a broader scope of practice, allowing them to work as primary care providers to help screen for conditions such as diabetes mellitus, hypertension, dermatopathology, need for obesity intervention or to provide smoking prevention and cessation activities. Since 70% of adults in the US saw a dentist in 2010, the opportunity to make a significant contribution toward improving both general and oral health is present through this ready access to patients (Lamster and Eaves, 2011).

Relationships with Industry

“Industry’s presence in academe is a concern. Dental educators, as stewards of the profession, must be nimble in brokering industry’s presence without compromising the integrity of both the educational program and the teaching institution as a whole.” (Gillis and McNally, 2010.)

Barnett (2002) has pointed out that dental school/industry relationships are becoming more common due to that fact that academia can be a resource for industry and vice-versa. Industry has a need for sites at which clinical research can be conducted and dental schools have partnered with them to provide facilities and expertise for clinical trials. However, dental school/industry financial relationships carry some significant disadvantages that can reflect heavily on dental student education.

An American law, known as the Bayh-Dole Act of 1980, has served to facilitate financial agreements between biomedical academicians and the biotechnology industries (Johnston, 2008). Over the years, concern has increased for the conflict of interest that has been generated between the researchers’ need to be guided by ethical and scientific principles and their own goals for financial gain. Several investigations in the medical literature describe that positive study results are significantly more often reported in those studies that are financially supported by industry sponsors versus those that are not (Bero *et al.*, 2007; Golder and Loke, 2008; Sismondo, 2008). In a systematic review article published in the *Journal of the American Medical Association*, Bekelman *et al.* (2003) concluded that “*strong and consistent evidence*” indicates that commercially-supported research leans toward findings that favor the study funding source. Investigators determined that some of the factors contributing to a conclusion of bias include withholding negative data from publication, poor study design, using inappropriate placebos, overly favorable interpretation of results, inadequate blinding, and other problems. Conflicts of interest can develop when investigators have equity interest in the product being tested or are serving as board members, speakers or consultants for the company involved. Bekelman *et al.* (2003) estimated from their review that 23%-28% of academic researchers have industry funding, 40% accept industry gifts, and approximately 33% have personal financial connections with industry sponsors.

Universities and other institutions are attempting to deal with conflict of interest in research with disclosure rules and regulations. To date there is no data to support the efficacy of these measures.

Without a doubt, the central issue arising from a finding of bias in research is concern for patients who may be harmed. As dental educators, we are also concerned about the impact commercial interests in academia may have on dental students. Gillis and McNally (2010) looked at the influence of industry on dental education in Canada. Drawing conclusions after in-depth faculty interviews, they reaffirm that dental faculties have a responsibility to protect academic integrity by ensuring that any arrangements with industry are appropriate. By necessity industry’s goal is profit; they seek exclusive contracts with dental schools for their products and view students as potential clients for their dental implants, etc. This practice may limit students’ exposure to other products and help promote a “culture of competition” in their future dental practices whereby having the latest equipment and/or products appear to be more highly valued than the quality of dental care provided. There is a concern that alliances of academia and specific companies may unduly influence the curriculum itself and less objectivity may be exercised in curriculum design and in classrooms than would otherwise be the case (Barnett, 2002). Closely related to influence on daily school curriculum is the issue of continuing education courses and the influence industry has on both dental students and graduate dentists through the commercialism that

S. K. RICH, H. NOWZARI

results from their support of this endeavor (Angell, 2000).

Students need skills that will help them critically evaluate evidence in the academic literature, as well as that provided for them by entrepreneurs. Leaders in dental education and dentistry have urged retention of a strong research mission in dental education (Bailit *et al.*, 2006; Bertolami, 2002; Formicola, 2008c; Pyle, 2006; Roth, 2007). Dental school relationships with industry can be favorable for both parties as long as the mission of the academic unit is not jeopardized (Barnett, 2002). Glick (2010) has commented that public trust is violated if health professionals are unprepared or unable to assure the populace that research is conducted with scientific rigor and adheres strictly to scientific principles. A milieu that gives students research exposure, opportunity for research experience, and supports achievement of the skills necessary for critical review and interpretation research findings is essential for meeting the challenges of academic/industry relations.

Web-based learning

“Abundant research now reassures us regarding the effectiveness of e-learning in comparison to non-intervention, and the essential equivalence of e-learning in comparison to traditional methods. Further studies of these types will do little to advance educational science. Instead, we need to clarify the use of e-learning by studying when to use it and how to use it effectively.” (Cook, 2009.)

The many advantages and attractions of e-learning (online or web-based learning) are well-known to students, including increased accessibility to information, programs that provide a means of practice, reinforcement, and flexibility in pacing of learning. Dental student response to online learning has been somewhat mixed. A survey at Baylor College of Dentistry (McCann *et al.*, 2010) with 346 of 432 (85%) students responding, found that 74% wanted e-materials to supplement, but not replace lectures. Students preferred printed, hard copy materials over digital documents for long, reading assignments and felt that e-resources should not replace live interaction with faculty. Other surveys by dental and medical educators found that students held attitudes and preferences that supported the use of web-based learning, but the respondents were not in favor of a virtual education delivered entirely online (Brunet *et al.*, 2011; Ruiz *et al.*, 2006). A study by Gadbury-Amyot and Brockman (2011) found that a comparison of online grades with grades from formerly taught traditional classes revealed stronger grades for the virtual learner, but due to students' requests for more interaction with the course director, they will provide more face-to-face contact with the instructor in the future. Finally, to add to the mix, some investigators have found that students have strong preference for online learning and digital materials with few complaints about lack of faculty contact (Mitov *et al.*, 2010; Peterson *et al.*, 2007). The type of outcome measures used in studies investigating e-learning may be too limiting. Kirkpatrick

(1996) suggested a four-level model for educational outcomes that includes measuring: (1) satisfaction, (2) knowledge or attitudes, (3) skills (in a test setting), and (4) behaviors (in practice) or effects on patients. While measurement of preferences, attitudes, motivation and even critical thinking skills are important outcomes in education, factual and procedural knowledge are key intended qualities that assessment in dental school must measure in order to assure achievement of competency at graduation.

To date, few studies in health professions online education research have focused on measurement that is beyond student attitudinal assessment of virtual learning. A systematic review and meta-analysis of outcomes related to Internet learning for health professionals was conducted by Cook *et al.* (2010). From 2,705 articles, they selected 51 studies that met their inclusion criteria, including 30 randomized trials. Overall, they were unable to draw any strong conclusions or recommendations on the efficacy of Internet learning and noted that *“few studies addressed outcome skills, behaviors in practice, or effects on patients care”*.

In the 2010 report, in addition to improved learning outcomes for satisfaction, self-assessment and attitudes with Internet learning, Cook *et al.* discovered the features of web-based *“interactivity”*, *“practice exercises”* and *“repetition and feedback”* were particular ways of using the computer programs that did result in an increase in knowledge achievement outcomes. Consequently, the authors maintain that web-based learning is not inherently better

Trends influencing dental education in the United States: is there a crisis?
Études dentaires aux États-Unis sous influences : y a-t-il une crise ?

or worse than traditional instruction, but it is “different and complementary”. They have expressed a philosophical opinion that the question is not “Should we use web-based learning?” but “How and when should we use web-based learning?” (Cook *et al.*, 2010). So far, the literature has taught us little about how to effectively use e-learning, thus these investigators are advocating research to clarify how and when to use e-learning, not by comparing to traditional education, but by generating studies that compare one e-learning intervention to another.

The US Department of Education has developed a national document entitled, “*Transforming American Education, Learning Powered by Technology*” (United States Department of Education, 2012). While the plan is directed toward elementary and high school education, the goal is to prepare students of today to thrive with current technology and as well as meet advancements that will emerge in the future. Theoretically, most of what the US government plan addresses also applies to students in higher education to include dental and other health professional schools. Students of all ages today have lives that are filled with technology, giving them mobile access to resources and information 24 hours a day, 7 days a week. Most participate in online social networks that allow people from all parts of the world to share thoughts and ideas, collaborate, and learn from each other. The challenge for educators is to become proficient themselves in the use of technology in order to help leverage untapped learning potential of the web-based technology that has so fully attrac-

ted and drawn the attention of 21st century students world-wide.

The Curriculum & Innovative Pedagogies

“The largest change was the increased proportion of schools requiring community-based experiences for students.” (Haden *et al.*, 2010.)

The most direct, day-by-day affect on any dental student derives from the curriculum and how it is presented and experienced at their particular school. World-wide, each dental school has a curriculum driven by history and culture as well as current rules, regulations and expectations. As stated in the opening of this paper, many leaders have judged a crisis in US dental education and this has included concern for curriculum. The ADEA Commission on Change and Innovation in Dental Education (CCI) was formed in 2005 with faculty member representatives from every US dental school to address curricular issues in dental education. In breaking ground, CCI referred back to the Institute of Medicine (IOM) report of 1995, which called for flexibility and innovation in dental school curricula (Field, 1995). CCI has been working with a variety of national organizations to help initiate systematic change in dental education. The focus of the CCI effort has been encouragement and support for innovative curricular changes that integrate clinical with the basic sciences through approaches are interactive, learner-centered, student-driven, problem-based, and directed toward

achievement of critical-thinking skills (Hendricson *et al.*, 2006).

Progress on the dental school curriculum in the CCI focus areas has been tracked by ADEA and reported most recently in 2010 (Haden *et al.*, 2010). Fifty-five dental schools (50 US and 5 Canadian schools) responded to a dental school curricula survey (86% response rate). Broad areas surveyed were curriculum format, assessment, innovation and resources. Approximately 50% of respondents indicated that some aspect of problem-based learning (PBL) outside of the clinic was being used in at least some part of their curriculum, but only two schools reported using PBL format for all of their courses. This represented only a slight increase in use of PBL since the Association’s 2002-03 survey and schools were clear in stating that they had no substantial plans to make further increases in use of PBL pedagogy in the future. The investigators concluded that interest in PBL has peaked and is not likely to increase much in the future. Another finding from the ADEA survey was that interest in interprofessional education is increasing and 55% of schools have increased interactions with other health professional schools on their campuses. This finding supports comments about the current influences of US health care reform and increased interest in interprofessional education presented in this paper. A striking change was in the proportion of schools that are requiring community-based clinical experience (91%, up from 64% in the previous survey). Half of the schools are requiring 5 weeks or more of dental student time spent at community

S. K. RICH, H. NOWZARI

locations. Again, the ADEA finding is consistent with comment in this paper that new schools are opening with goals to meet the needs of underserved populations and that existing dental schools are also becoming more heavily involved in community service.

The investigators also presented findings that competency-based education is the accepted norm, meaning that Accreditation standards and ADEA's work in designing, as a guide for schools, *Competencies for the New General Dentist*, has likely made a significant impact on US dental education (American Dental Education Association, 2011). Schools that have not already implemented curriculum in certain categories considered by the survey, state that priorities for the future are to increase: interdisciplinary curriculum, integration of the basic and clinical sciences, online core curriculum, new techniques for assessing competencies, and to institute more opportunities for collaboration with other health professionals.

Finally, when the respondents to the ADEA survey were asked what resources are needed for curriculum revision, the top three answers included budget needs, development of faculty skills in areas such as curriculum design, teaching strategies and assessment techniques, and expansion of information technology. Major reasons for crisis calls on the part of well-known US dental educators cited in this paper relate to spiraling student debt and soaring healthcare costs. Although, a number of authors cited were making the urgent calls for change early in the new millennium, the economic turnaround, evident since 2008, has contri-

buted greatly to the urgency of the problems.

The Economy (Economic Downturn) and Financing Dental Education

Walker *et al.* address four major economic challenges currently facing US dental education, "increasing student tuition and debt, decreasing funds for faculty salaries, faculty shortages, and the high cost of clinic operations". (Walker *et al.*, 2008.)

In the 1960's and early 1970's, due to anticipation of an increasing US population and needs for dental care, the federal government supported an expansion of dental school enrollments. Funds were made available for construction of fourteen new dental schools and renovation of others (Brown and Meskin, 2004). A national Health Professions Capitation Grant allowed schools to receive funds based on the number of students they enrolled and, until the early 1970's, government grants were covering one-third or more of the cost of dental education (Winslow and Warren, 1981). Federal support for dental education started to dwindle in the early 1970's and has since decreased dramatically. By 2001 less than 1% of dental education was supported by federal revenue (United States Department of Health and Human Services, 2005). In 2008 Walker *et al.* described a cascade of economic events that was already progressing in dental education (Walker *et al.*, 2008). The trends described were exacerbated by the national and international eco-

nomie downturn that has led to further increases in student tuition and the consequent student debt burden; a decrease in money available for faculty salaries leading to faculty shortages and increased teaching loads with loss of time for research and scholarship. Additional issues related to the turnaround include the high cost of clinic operations, aging dental school facilities, and lack of funds to support information technology and infrastructure. Adding further to this picture are National Institutes of Health cut backs in research budgets for school grant monies, budget reductions in Medicare (insurance for the elderly), Medicaid (support for the indigent) and decreases in state and federal support for health professional education (Formicola *et al.*, 2008c).

Of trends enumerated in this paper, financial challenges perhaps loom largest of all and solving them would hold much power to help address all other challenges in dental education. Indeed, financial concerns may prove to be the driving force that will promote change and sustain strong survival for dental education in the United States. Many solutions have been proposed in the dental literature for addressing finances (Bailit *et al.*, 2006, 2007; Brown and Bailit, 2011; Formicola *et al.*, 2008c; Sparer, 2011; Walker *et al.*, 2008) and the practice of dentistry, as we know it today.

Conclusion

The purpose of this paper was to describe trends affecting dental education in the United States. It is beyond the scope of this article to additionally identify the multitude of

Trends influencing dental education in the United States: is there a crisis?
Études dentaires aux États-Unis sous influences : y a-t-il une crise ?

solutions that have been proposed to address challenges described here. Positive trends are that dental school application pools remain robust as dentistry continues to be viewed as a desirable profession, attracting bright and talented students who want to help in efforts to reach out to underserved populations (Holtzman and Seirawan, 2009).

In 2006 Bailit *et al.* stated that to call the current situation in dental education a widespread “crisis” was probably premature. But, the authors predicted that, should the trends continue for “...the next ten years, there is little doubt that the term ‘crisis’ will describe the situation faced by dental schools.” Great resiliency, determination and innovation will li-

kely be required of dental school faculties, deans, students, professional organizations, legislators, decision-makers and the voting public to adequately address the broad range of issues bearing on US dental education and, consequently, on the oral health of all Americans. □

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S. K. RICH, H. NOWZARI

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