

→ In GREEN: "X" out missing teeth, chart root canal fillings, and caries.

→ In RED: chart calculus, and pathology.

CDA

Faculty Recruitment

Continuous Learners

Emerging Science

JOURNAL OF THE CALIFORNIA DENTAL ASSOCIATION VOL.33 NO.10

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TRENDS IN DENTAL EDUCATION

diagnōsis, (dī'eg-nōz'), *v.* **DIAGNOSING**, [*< diagnō-* recognize and identify (a disease) and observation. *v.i.* to make a diagnosis. (dī'eg-nō'sis), *n.* **DIAGNOSIS**

< Gr. diagnōsis, a distinguishing; diagnōskein, to distinguish; gignōskein, to know], 1. the act or process of recognizing the nature of a diseased condition by a careful investigation of the facts and the nature of a thing. 3. the decision or conclusion from such examination or investigation.

di-ag-nos-tic (dī'eg-nos'tik), *adj.* [*Gr. diagnōstikos, of or constituting a diagnosis*]. 2. of value in diagnosis; specifically characteristic. *n.* in diagnosis. 2. a symptom.

di-ag-nos-ti-cal-ly (dī'eg-nos'ti-k'l-i, dī'eg-nos'ti-k'l-i), *adv.* 1. by diagnosis. 2. with regard to diagnosis.

di-ag-nos-ti-cate (dī'eg-nos'ti-kāt'), *v.t. & v.i.* [*Gr. diagnōstikēn, to diagnose*]. **DIAGNOSTICATING**, to diagnose.

di-ag-nos-ti-cian (dī'eg-nos-tish'en), *n.* a person who diagnoses.

*oil, out; up, use, für; get; joy; yet; ch; simply, u in focus; ' as in able (a-bil-ity); x-xii, † foreign; * hypot-*

DAVID W. CHAMBERS, EdM, MBA, PhD



DEPARTMENTS

- 765** *The Editor/The Tip of the Iceberg*
767 *Feedback/Fluoridation and Public Health Dentistry*
769 *Impressions/Will Oral Health Assessment Bill Make the Grade?*
830 *Dr. Bob/Can We Talk?*

FEATURES

- 779** **CALIFORNIA'S DENTAL SCHOOLS HAVE CHANGED**
An introduction to the issue.
David W. Chambers, EdM, MBA, PhD
- 781** **ISSUES FACING DENTAL EDUCATION AND HOW TO ADDRESS THEM**
Jackson Brown, DDS, PhD, and Larry Meskin, DDS, PhD
- 787** **DENTAL FACULTY RECRUITMENT AT LOMA LINDA UNIVERSITY SCHOOL OF DENTISTRY**
Charles Goodacre, DDS, and William Loveless, EdD
- 793** **COMMENTARY: HOW DOES A DENTAL SCHOOL ENSURE THE CURRENCY OF PRACTITIONERS WHO GRADUATED SOME YEARS AGO?**
William R. Yancey, DDS
- 797** **CHANGING FINANCIAL BASE FOR DENTAL EDUCATION**
Julian Ponce, CPA, JD, MBA
- 801** **EDUCATING THE PRACTICE-READY DENTIST**
Nader A. Nadershahi, DDS, MBA, and David B. Nielsen, DDS, MA
- 805** **EMERGING SCIENTIFIC ADVANCES: HOW DO THEY ENTER DENTAL CURRICULA AND THE PROFESSION?**
Charles F. Shuler, DMD PhD

The Tip of the Iceberg

Last year, I was asked to write a piece on “anything I wanted” for my component society newsletter. In pondering a topic, I realized I had been seeing a series of patients with a very confusing problem, and I wrote an article about them. After its publication, the state oral and maxillofacial surgery association asked to reprint it for its members, and I have since received a request from another component society to publish it in their newsletter. The Dental Board of California had the issue on the agenda for a recent meeting due to the growing concern for these patients. As a result of this, I would like to offer a modification of the original article to our readers.

This is neither a scientific article, nor is it an absolutely pure editorial. It is not supported with any significant research, laboratory studies, or extensive literature reviews.

There exists a subset of patients that has a very significant problem that needs to be shared with the dentists in our community. There is growing concern about these people that is supported by some articles and observations by other clinicians.^{1,2} It is my hope I can share my experiences in what is believed to be an escalating problem.

There are a number of radiographic lesions of the jaws associated with systemic conditions. Within this group are primary bone tumors along with metastatic tumors from distant malignancies as well as osteoporosis. Specifically, multiple myeloma, metastatic breast cancer and metastatic prostate cancer create radiolucent or sometimes mixed lesions that can be seen in the jaws.

Treatment of these diseases is complex with many modalities and therapeutic agents used. Some of the more commonly accepted and increasingly popular agents in these and other tumor management protocols are bisphosphonates, used to inhibit osteoclastic activity and limit the spread of the disease within the bone. These drugs, such as zoledronate (Zomeda) and pamidronate (Aredia) are given intravenously once a month. Alendronate (Fosamax) is an oral form of the drug used in the treatment of osteoporosis, usually in the postmenopausal female.

One of the apparent, but not scientifically well documented, side effects of these drugs is altered bone metabolism resulting in what has been termed bisphosphonate-associated osteonecrosis. This is a condition where the bone in the jaws necroses spontaneously or more frequently as a result of a dental traumatic etiology such as an extraction or an ill-fitting prosthesis.

Patients complain of pain, possible purulent drainage if there is a secondary infection, loose teeth or exposed bone in their jaws. Examination will reveal a variety of findings. In some patients, there may be little that is noted to be abnormal; in others, it will be obvious there are small or impressively large amounts of exposed necrotic bone. These are the extreme presentations with a host of possibilities in between.

Radiographically, and paralleling the clinical findings, there may be no obvious bone pathology to the extremes of radiolucent areas within the jaws. Frequently, there appears to be a mottled, dysplastic bone present in the area of the symptom-



The first rule
of medicine is to
do no harm.

atic sites. Poorly healing extraction sites in the affected area are common. Rarely is a specific sequestrum identifiable, and on some occasions, spontaneous fracture of the mandible can be noted.

This condition needs to be differentiated from acute or chronic osteomyelitis as well as osteoradionecrosis. Osteomyelitis is a pure infection of the cancellous and cortical portions of the bone that generally is of bacterial origin. It can be acute or chronic, and has limited margins within the bone. Osteoradionecrosis is a condition where the bone in a field that has had significant radiation loses vascularity with ultimate necrosis and possible exposure. Bisphosphonate-associated osteonecrosis has some of the characteristics of each of these conditions but is neither. There is not an obvious infectious cause and the patient has not had radiation.

The tendency in these patients is to perform endodontic procedures on many of the teeth in the area that is symptomatic, usually in the absence of a better diagnosis. This is likely to be unsuccessful since the origin of the pain is not dental, but rather from the necrotic bone. Subsequent to endodontics, apicoectomy or extractions are done. Such surgical procedures result in a potential acceleration of the problem with increasing bone necrosis.

We are left with the question: How do we treat them? Philosophically, as dentists, we are taught to “do” for our patients. It must be recognized, for this group of patients, “doing” may be more deleterious than not doing. While it is sometimes difficult to take a cognitive approach with our patients, it is imperative we establish a good working diagnosis and consider the implications of treatment before we perform invasive procedures. The first rule of medicine is to do no harm.

A good treatment philosophy for bisphosphonate-associated osteonecro-

sis is to counsel the patient and advise them of the nature of their problem including the long-term poor prognosis for healing. It is very helpful to put the complication into perspective relative to the control of the malignancy that is offered by bisphosphonates. My interaction with the primary care hematologists and oncologists has, in the past, supported this philosophy of management. Make every attempt not to do any invasive procedures unless absolutely indicated. When a patient is acutely infected with purulent discharge noted, culture, and sensitivities (although likely they will grow oral flora) are indicated, as well as topical antibacterial rinses and irrigation. Systemic antibiotics that are appropriate for the oral flora are often prescribed as well.

For the patient with chronic exposed bone, minimal or no treatment is a good method of preventing further harm. When spicules of bone are loose, certainly, limited debridement is helpful to the patient. Rough edges can be smoothed gently with a bone file without anesthesia since the bone is dead. This is a procedure that may need to be repeated intermittently. Hyperbaric oxygen has not been shown to be of great value in re-establishing vascularity to the area.

Marginal or segmental bone resections have been done by some of our colleagues. In the treatment of osteoradionecrosis or osteomyelitis, surgeons resect back to bleeding bone since there is an end to the radiation field or area of bone infection and the damage that accompanies it. While it has been reported that segmental resections to bleeding bone can be done, in bisphosphonate-associated osteonecrosis patients, it is unclear as to whether or not that trauma will precipitate additional bone necrosis. This puts the clinician in a difficult situation of develop-

ing a successful margin. Bone grafting with cancellous bone or with vascularized grafts are relatively contraindicated since the grafts are unlikely to heal to the necrotic bone edges.

There is no indication as to the number of patients on these drugs who are experiencing this problem, and the epidemiology is unclear. Patients with osteoporosis who take oral bisphosphonates do not appear to be at-risk levels equivalent to the intravenous drug group, though there are a growing number of reported cases in that group as well. It also has been noted that cessation of the drug does little to change the prognosis for these patients since the damage has already been done. In cases where the bisphosphonates are continued for the systemic well-being of the patient, it is unclear whether or not additional damage ensues.

We have a problem that has developed in a subset of patients with very serious diseases. There may be no alternative to the cessation of bisphosphonate therapy in some primary or metastatic bone malignancies. We all will be seeing more patients with this problem — either self-referred or coming from their treating physicians. As dentists, we are reminded that thinking rather than doing is always the best course of action, as it is always in the best interest of the patients. It is being suggested that a pretreatment dental evaluation and care as in radiation patients would be appropriate. However once the patient presents with symptoms, a word to the wise ...

CDA

Reference: / 1. Ruggiero SL, et al, Osteonecrosis of the jaws associated with the use of bisphosphonates: a review of 63 cases. *J Oral Maxillofac Surg* 62(5):527-34, 2004.

2. Marx RE, Pamidronate (Aredia)- and zoledronate (Zometa)-induced avascular necrosis of the jaws: a growing epidemic. *J Oral and Maxillofac Surg* 61(9):1115 (letter to the editor), 2003.

Comments, letters, and questions can be addressed to the editor at alan.felsenfeld@cda.org.



Fluoridation and Public Health

I want to congratulate the CDA and the *Journal of the California Dental Association* on its July 2005 publication on public health dentistry. As a former practicing oral and maxillofacial surgeon who now works in dental public health, it is gratifying to see CDA inform the profession and the public about what we are doing to better the oral health of all Californians.

In the interest of completeness, I would like to correct some of the statements made by Dr. Marvin Marcus in his article on dental public health in California. While Dr. Marcus' article is essentially right on, some of the statistics quoted need to be corrected. According to the Centers for Disease Control and Prevention, California's fluoridation rate is 28.7 percent, not 50 percent as stated in the article. Also, while the fluoridation constituency has been very successful in elevating the fluoridation percentage in California, from 17 percent in 1995 to 28.7 percent currently, we do not rank anywhere near 40th in the United States. We do not rank 48th in the country as we did in 1995 when AB 733 was signed, but we are not ranked above 10 other states yet.

Sometime in late 2006 or very early in 2007, approximately 18 million residents

in six counties in Southern California, alluded to by Dr. Marcus, will have fluoridated water when the Metropolitan Water District of Southern California comes online. Until then, California will have approximately 10 million of its residents having the oral health benefits of fluoridated drinking water. Once the Metropolitan Water District of Southern California fluoridates its five treatment plants, California should be in the 60 percent to 70 percent range and close to the Healthy People 2010 goal of 75 percent.

CDA has played an integral part in the success of the water fluoridation effort in California. Not only was CDA the principal supporter of the Speier legislation, much of the bill was crafted by the Office of Government Affairs at CDA. The association has been a continual supporter of the fluoridation effort both monetarily and using in-kind staff support. Again, congratulations on a well-done issue of the *Journal*. Dental public health is every bit as important a specialty of dentistry as the other recognized specialties, and many times our work goes unnoticed.

Keep up the good work.

David F. Nelson, DDS, MS
Fluoridation consultant
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It is gratifying to see CDA inform the profession and the public about what we are doing to better the oral health of all Californians.



Will Oral Health Assessment Bill Make the Grade?

By Patty Reyes

Over the years, studies have shown that dental problems — tooth decay in particular — are the leading cause of missed school days for children, making learning difficult, as well as resulting in lost revenues for a public school's average daily attendance. Research also has shown that oral health issues, such as caries, are preventable.

With that in mind, the California Dental Association is sponsoring AB 1077

by Assemblywoman Wilma Chan, D-Oakland, which, as originally written, was fashioned after an Illinois law requiring documentation of a dental exam for children no later than May of their kindergarten, second- and sixth-grade years.

The California bill provides that an oral health assessment by a dentist or other licensed or registered dental professional be completed by Jan. 15 of the school year in which it is required. The requirement



"We have kids in sixth grade, and it's the first time they've ever seen a dentist."

MARY PAT BURGESS

may be waived if the parent or guardian indicates the assessment poses an undue financial burden, if they lack access to a dental professional, or if they do not want their child to receive the assessment. One standardized form will be used for the oral health assessment or for a parent or guardian to request a waiver. There would be no penalty for opting out of the assessment.

Support for the bill has come from various groups concerned about children's health, including the California Society of Pediatric Dentistry, the California Dental Hygiene Association, and the California School Nurses Association. And while initially concerned that this would be one more unfunded mandate on schools, many educational entities, recognizing the overwhelming need to address children's oral health, are in support, including the California Teachers Association and the Los Angeles County Office of Education.

The bill, intended to raise awareness and as a first step in the process of ensuring that every child has access to primary dental care, will gather data about the dental health status of school children and identify access barriers. It requires all public schools to send an annual report to its county public health department by June 30, including data ranging from the total number of children enrolled in kindergarten, second and sixth grades; the total number of pupils who completed the assessment; and most importantly, the reasons children were not able to obtain the assessment.

AB 1077 was passed by the Assembly Health Committee April 5 on a 10-2 vote and passed by the Assembly Education Committee on April 20 on a 10-0 vote. But because the annual cost has been estimated at \$8 million, the legislation was placed on the "suspense file" of the Assembly Appropriations Committee, where costly bills are prioritized as part of the budget process. It has been made a two-year bill to facilitate discussion and can be heard again in January.

The Illinois law, which took effect July 1, was hailed as "a step in the right direc-

tion," according to Rep. David Miller, DDS, D-Calumet City, Ill., who sponsored the measure. "The intent of the legislation is not to penalize schools or the kids to be taken out of school for a lack of dental exam," he said in a previous interview. As with the proposed exemptions in California, the Illinois law exempts those students who are religiously opposed to dental care or cannot afford it.

The grades chosen for examination correlate to specific dental developments, such as kindergarten is a prime time to teach good oral hygiene habits, the first adult molars grow in by the second grade, and the second adult molars emerge when the child is in the sixth grade, Miller said.

For the past five years, dental teams have been stopping by Chicago schools, providing fluoride treatments, sealants, cleanings, and referrals for extractions or caries paid by KidCare insurance and Medicaid.

"We have kids in sixth grade, and it's the first time they've ever seen a dentist," said Mary Pat Burgess, director of the oral health program for Chicago's Department of Public Health, in a previous interview.

"The law will bring more children in to get their exam because they need it for school," said Mila Tsagalis, DuPage dental health services program manager. "There's definitely a greater awareness because of the law."

There also were some who, while applauding the goal of the Illinois law, said it did not go far enough in that it did not address access to affordable dental care and, as caries often develops before a child enters kindergarten, may not reach children early enough.

CDA has proposed to limit the assessments to kindergarten as a starting point, which may reduce the projected cost of the bill and improve its chances for advancement in January. In the meantime, CDA continues to work with the California Society of Pediatric Dentists and other interested groups to find additional ways to reduce the cost of the bill while maintaining its goal of improving children's oral health.

When Being on Pins and Needles Is a Good Thing

A new report indicates that acupuncture is providing much-needed relief to those who suffer from dry mouth.

"Typical treatment options for dry mouth have been short-term at best," said Warren M. Morganstein, DDS, MPH, and associate dean at the Baltimore College of Dental Surgery, University of Maryland Dental School. "Studies have found that acupuncture was a viable option to successfully treat dry mouth pain in patients and provide long-term relief."

The emergence of acupuncture allows some patients to relieve or significantly reduce the debilitating effects of xerostomia, according to an article in the May/June 2005 issue of *General Dentistry*, the Academy of General Dentistry's peer-reviewed journal. Seven patients who had undergone neck and head radiation therapy were treated with acupuncture. Patients were seen once a week for four to five weeks, followed by two or three biweekly sessions. Morganstein found that eight months after treatment, all had reported a decrease in dry mouth

symptoms, and an increase in salivary flow, the ability to eat and speak, and improved sleep.

Xerostomia is a painful condition, caused by a reduction in the amount of saliva in the mouth when saliva glands work improperly. Saliva, a natural defense for teeth and a major role-player in preventing tooth decay, neutralizes harmful acids and rinses away food particles.

Decreased saliva can put patients at risk for gum disease, cavities, and be uncomfortable if foods adhere to the teeth for a long time. Symptoms include infections of the tissues of the mouth, difficulty in speaking, eating and swallowing, extensive dental decay, ulceration of the mouth, an altered sense of taste, and trouble in wearing dentures. Dry mouth can be caused by medications such as decongestants, antidepressants, antihistamines, and diuretics. The condition often can be treated by a dentist.

Acupuncture primarily is performed by licensed, nonphysician acupuncturists, in the United States. Physicians and a small number of dentists have been trained in medical acupuncture.

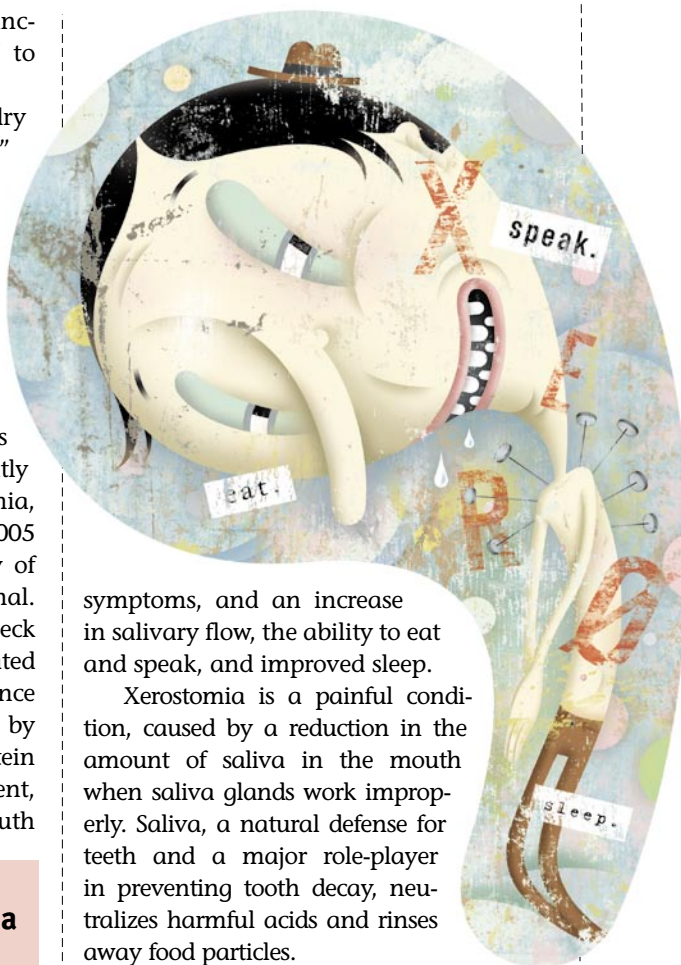


Illustration: Matt Mullin

Suggestions to Ease Xerostomia

- Avoid caffeine and alcohol.
- Avoid smoking.
- Avoid over-salted foods.
- Avoid juices such as tomato, orange, and grapefruit.
- Avoid dry foods, such as crackers or toast.
- Brush and floss twice a day.
- Chew sugarless gum.
- Drink plenty of water.
- Use over-the-counter moisture replacement therapies.
- Visit the dentist regularly.

"The extraordinary prevalence of periodontal disease makes its impact on systemic health very important."

ROBERT J. KLAUS

Greater Awareness Urged for Periodontal Disease

Periodontal disease, long viewed as an infectious condition of concern to dentists, especially periodontists, has potentially significant systemic health implications. This was a major conclusion from a recent meeting of the National Periodontal Disease Coalition, which explored the relationship between overall health and the presence of specific oral bacteria.

Formed by Oral Health America in 2004, the coalition is comprised of dentists, physicians, academics, insurance companies, and public policy experts who spent the last six months investigating health issues surrounding periodontal disease. At the coalition's meeting last June, Moïse Desvarieux, MD, PhD, assistant professor at the University of Minnesota School of Public Health, presented ground-

breaking research showing strong evidence of a relationship between carotid intima-media thickness and specific periodontal bacteria, a major predictor of stroke. Previous studies relied on surrogate markers of bacterial infection.

"Periodontal disease is no longer just about teeth," Desvarieux said. "It's about the whole body. Increasingly, we are seeing physicians talk to their patients about oral bacteria and gum disease. The boundaries that used to exist between medicine, dentistry and public health are

beginning to crumble."

While the coalition acknowledged the need for additional research to further investigate causality between overall health and oral bacteria, many members called for broad-based screening, prevention programs, and increased access to patient education. Several members also urged employers to initiate worksite screening and wellness programs.

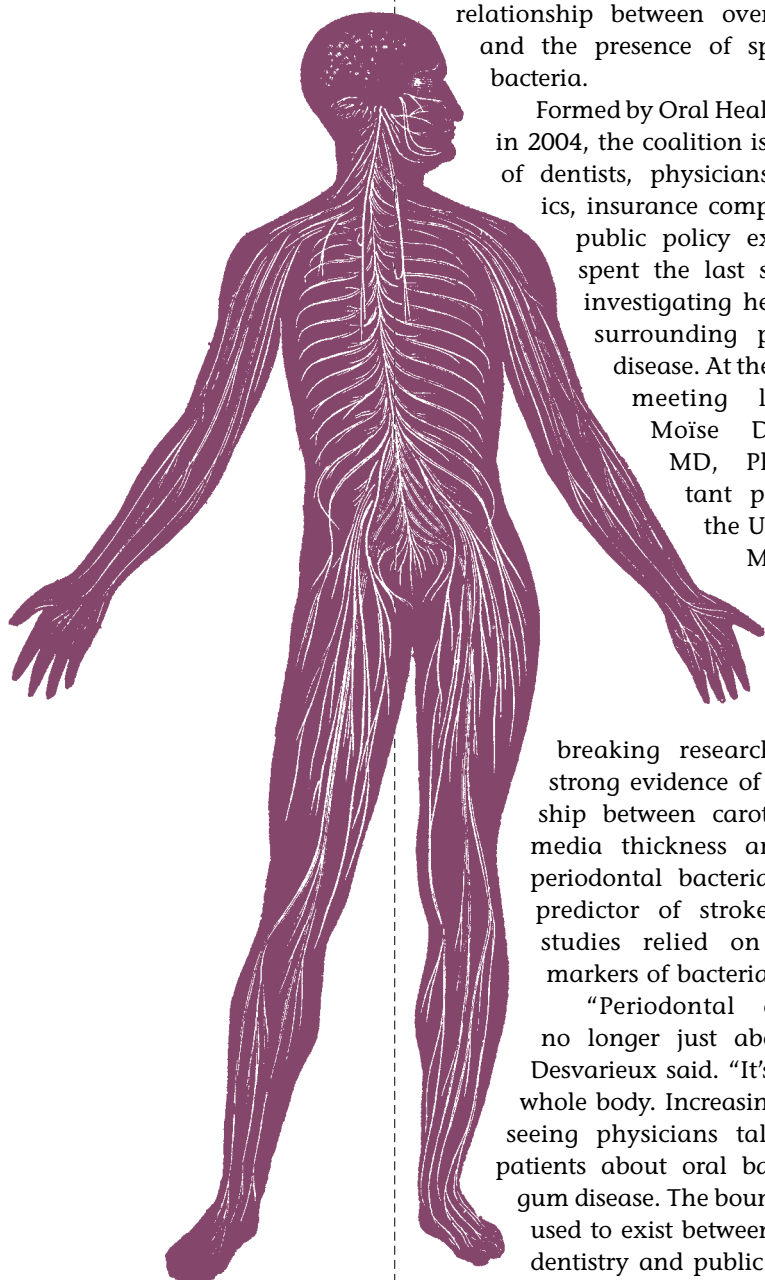
"Having a standard diagnostic procedure and treatment recommendations are critical steps toward improving a patient's overall oral and systemic health," said Robert J. Klaus, president and chief executive officer of Oral Health America. "Despite the prevalence of periodontal disease among adults, it is still under-diagnosed and under-treated, putting patients at risk for systemic disease."

Since the evidence linking specific oral bacteria to serious conditions of body organs and the heart, the coalition emphasized the importance of early detection and prevention.

"Increasingly, the medical community is recognizing the importance of dental screening and treatment to overall patient health," said Klaus. "The extraordinary prevalence of periodontal disease makes its impact on systemic health very important."

In recognition of this evidence, New York Gov. George Pataki had proclaimed June as Periodontal Disease Awareness Month.

"Periodontal disease not only causes pain and suffering for the individual but costs New York government, citizens and businesses significant amounts of money in direct medical costs as well as absenteeism and lost productivity," Pataki said. "The New York State government is pleased to join with healthcare providers ... to increase the public's awareness and understanding of periodontal disease and new methods for its treatment."



Soft Tissue Damage May Forecast Facial Fractures

Trauma patients who sustain certain types of facial soft tissue injuries should get a computed tomography scan of their face, as well as a standard head scan to uncover the presence and significance of fractures.

In a study published in the May issue of the *Journal of Oral and Maxillofacial Surgery*, specific soft tissue injury areas are associated with a higher incidence of facial fractures in trauma patients who undergo head CT, a retrospective study of more than 9,800 trauma patients found.

Lip, nasal, and intraoral lacerations to subconjunctival hemorrhages and periorbital contusions were injuries most closely linked with facial fractures.

"In the high-pressure environment of a trauma center, these findings could help trauma surgeons decide more quickly whether to order facial CT in conjunction with head CT in facial trauma patients," said principal author Eric P. Holmgren, DDS, MD, MS, a resident in the department of oral and maxillofacial surgery at Oregon Health and Sciences University in Portland.

As a result of the findings, Holmgren and his co-authors proposed the acronym LIPS-N (lip laceration, intraoral laceration, periorbital contusion, subconjunctival hemorrhage, and nasal laceration) as a tool to determine when a trauma patient who is getting head CT should also get facial CT.

"The use of the mnemonic LIPS-N could help providers make the best use of facial CT in conjunction with head CT, especially when they're confronted with other, more pressing concerns," Holmgren noted. Unresponsive, intubated or intoxicated patients, and those who don't speak English can make a thorough head and

neck examination unreasonable. The patient may already be in the scanner, in some cases, or a facial trauma surgeon may not be immediately available for consultation.

Referring to the finding that 39 percent of patients who received both head and facial CT did not have facial fractures, Holmgren noted that use of LIPS-N mnemonic could decrease the overuse of facial CT as well.

"The timely use of proper imaging is important for early diagnosis of facial fractures, and facial CT is the best diagnostic tool for identifying and characterizing the extent of a fracture, especially when a fracture is suspected or discovered on initial examination," Holmgren said.

"Although nothing substitutes for a thorough head and neck examination and patient history in determining whether a facial trauma patient needs facial CT, trauma doctors often do not have the luxury of time, and may have to rely on soft tissue markers alone."

Cuts in the nose, lips, and inside the mouth, along with wounds leading to a black eye and subconjunctival hemorrhage, were significantly more prevalent in patients found by facial CT scan to have facial fractures, according to the study.

Conversely, scalp lacerations and contusions were significantly more common in patients found not to have facial fractures than in patients who did. The incidence of soft tissue injuries of the cheek, chin, ear, eyelid, eyebrow, forehead, and tongue were identical between the two groups.

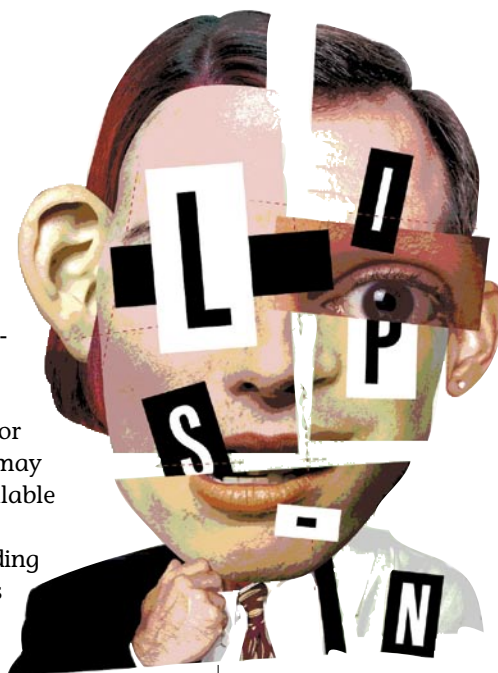


Illustration: Matt Mullin

"The timely use of proper imaging is important for early diagnosis of facial fractures, and facial CT is the best diagnostic tool for identifying and characterizing the extent of a fracture."

ERIC P. HOLMGREN, DDS, MD, MS

New Dental Specialty Considered

The ADA Council on Dental Education and Licensure will consider, at its meeting Nov. 14-15, a written request from the American Academy of Craniofacial Pain to recognize craniofacial pain as a dental specialty.

Its recommendation regarding the application will be forwarded to the 2006 House of Delegates.



Ohio Uses Web to Attract Auxiliary Career Candidates

In an effort to address its members' recruitment and staffing challenges, specifically the lack of qualified candidates for dental assisting and dental hygiene positions, the Ohio Dental Association has developed a website, <http://beyondbabysitting.com>, that targets teen girls between the ages of 13 and 16.

ODA specified to the firm designing the website that it be lively, visually attractive and informative, according to Kathy Woodward in an article in the May 2005 issue of *ODA Today*.

The website provides information on auxiliary careers, educational requirements, and income potential, for example. It also includes a list of Ohio's dental assisting and hygiene programs, the locations, and contact information.

The site is intended for use primarily by students, and the ODA brought it to the attention of school guidance counselors through a mass e-mail last spring.

FDA OKs New Drug to Help Cancer Patients' Mouth Sores

Patients with cancer may find relief from painful mouth or throat sores using a new drug recently approved by the U.S. Food and Drug Administration.

An intravenous drug, palifermin (brand-name Kepivance) is designed to help shorten the duration or prevent mucositis in cancer patients.

Many cancer patients who develop mucositis, a result of radiation or chemotherapy treatments, have trouble eating and swallowing, some to the point they must receive fluid replacement and nutrition intravenously.

A study of palifermin showed 63 percent of patients taking the drug developed mucositis with the condition lasting for an average of three days, while 98 percent of patients who didn't take the drug experienced the mucositis for an average of nine days.

Honors



Antonio Ragadio Jr., DDS, assistant clinical professor at the UCSF School of Dentistry, was recently honored with the Excellence in Teaching Award and the Riebe Award for clinical teaching. Both awards were voted on by members of the fourth-year DDS class.

Upcoming Meetings 2005

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|-----------------|--|
| Oct. 6-9 | ADA Annual Session, Philadelphia, (312) 440-2500. |
| Nov. 4-6 | Second International Conference on Evidence-Based Dentistry, Chicago, www.icebd.org . |

2006

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|--------------------|--|
| March 15-18 | Academy of Laser Dentistry, Tucson, www.laserdentistry.org . |
| April 27-30 | CDA Spring Session, Anaheim, (866) CDA-MEMBER (232-6362). |
| Sept. 15-17 | CDA Fall Session, San Francisco, (866) CDA-MEMBER (232-6362). |
| Oct. 16-19 | ADA Annual Session, Las Vegas, (312) 440-2500. |
| Dec. 3-6 | International Workshop of the International Cleft Lip and Palate Foundation, Chennai, India, (91) 44-24331696. |

To have an event included on this list of nonprofit association meetings, please send the information to Upcoming Meetings, *CDA Journal*, 1201 K St., 16th Floor, Sacramento, CA 95814 or fax the information to (916) 554-5962.



diagnose (di'æg-nōz'), *v.t.* [DIAGNOSED, DIAGNOSING], [*< diagnosis*], to make a diagnosis; to recognize and identify (a disease, etc.) by examination and observation. *v.i.* to make diagnoses. **diagnosis** (di'æg-nō'sis), *n.* [*pl.* DIAGNOSES (-sez)], [*< Gr. diagnōsis, a distinguishing, discrimination; diagnōskein, to distinguish: dia-, through, between.*]



INTRODUCTION

CALIFORNIA'S DENTAL SCHOOLS HAVE CHANGED

The Future of the Dental Profession Emerges From Its Dental Schools

David W. Chambers, EdM, MBA, PhD

Five of the nation's 55 dental schools are in California. Although they differ in size, sources of funding, and emphasis, they are among the very best in the United States. Generally, they share the same four-part mission: education, research, patient care, and support of the practicing profession.

The balance of that mission has not remained constant. Education has become complex and expensive, research has assumed greater prominence, and support for the profession has dimmed. In 1926, the Carnegie Foundation for the Advancement of Teaching issued its Bulletin No. 18: the Gies report on dental education. This was the landmark report that clearly established that dentistry would be a separate profession from medicine. It was based, in part, on personal visits Dr. Gies, a biochemist, made to every school in the U.S. and Canada. The three California dental schools, the University of Southern California; the University of California, San Francisco; and the College of Physicians & Surgeons (Pacific), were described in full detail. Comparison with the recent ADA *Survey of Dental Education* statistics is instructive.

Eighty years ago, the three California schools graduated 460 dentists, about one for every 8,700 Californians. Today, our five schools graduate 575, or one for every 43,700 citizens in the state. California is a net importer of dentists. Last year, about 1,200 dental licenses were granted. California schools produced less than half of that number. Three-quarters of graduates from California schools are Golden State natives, the same in 1925 and 2003. Almost one-third of California's

young men and women who become dentists receive their training in schools outside the state. Four percent of dental students in 1925 were from other countries.

Dental education has become expensive. The average cost to educate a dentist in the United States (annual budget of all schools divided by number of graduates) is \$82,000 per year. In 1925, the average for California schools was \$330. Using the CPI as an inflation adjuster, the current cost is still almost 25 times as great.

In 1925, the schools in California paid their clinical science faculty members an average of \$857 per year. Obviously there were many part-time faculty members in that group since the average salary for all Americans was \$1,300 in that year. Seventy-five years later, when the average American earned \$16,300, dentists teaching in school averaged \$53,100. Today, that is about one-third of the net income of general practitioners. The missing figure is the net income of 1925 dentists, although it is unlikely that it would have been more than 10 times the national average is it is now.

The quality of graduates three-quarters of a century ago appears to have been more acceptable to the profession. Among



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California schools in 1925, the state board failure rate was 4 percent; it varies from three to five times that today.

There seem to be no differences between 1920 and 2005 in the role of patient care in dental education or the types of patients treated. They remain individuals of lesser means who have generally more challenging oral condi-

tions. Three-quarters of a century ago, the three California schools based their education on an average of 150 patient visits each year per enrolled student. Today, nationally, that figure has risen by 7 percent to 161. Because the number of years of instruction has risen from three to four, the real increase in patient experience for today's graduates

is more like 45 percent. Across America today, dental schools provide 2.9 million patient visits annually.

In the 1920s and 1930s, commercialism had a bad odor in dentistry. In some states, dentists could lose their licenses for attending courses sponsored by manufacturers. Dental companies were prohibited from attending, let alone exhibiting, at dental society meetings. Almost all continuing education was provided by schools or through study clubs. About 4 percent of the budgets of the California schools at that time were devoted to this type of support for the profession. Today, the percentage is less than 1 percent, across all dental schools. Schools are being pushed out of this service function to the profession by the institutes and by organized dentistry.

Professional development in schools has been replaced by research. In 1925, only one of the three California schools, UCSF, had any budget devoted to research. The P&S faculty had published a single paper in the year Dr. Gies visited and none the year before. They had, however, made a cash donation to UCSF for research purposes amounting to 4 percent of that school's research budget. There were a few more papers published at USC and Gies took pains to note that a major research theme at the only school in the south of the state was "investigations into the validity of commercial claims made by dental suppliers." Today, the research budgets of American dental schools is 11 percent of all expenses, some \$215,000,000 annually. Three of California's dental schools – UCSF, UCLA, and USC – are among the strongest in the nation. The California schools combine for almost 20 percent of the entire dental school research budget in this country. Adjusted for inflation, this is an 800-fold increase in 80 years.

If we can read the future of dentistry in California from the strength of its schools today, we might conclude that the state is having to increasingly bring in dentists and to provide for their continuous education while schools continue to subsidize care for the underserved and develop the knowledge that will advance the profession. **CDA**



ISSUES FACING DENTAL EDUCATION AND HOW TO ADDRESS THEM

L. Jackson Brown, DDS, PhD, and Larry Meskin, DDS, PhD

Dental education currently faces several significant issues that must be addressed if it is to experience a healthy and vibrant future. And all concerned — practitioners, educators, researchers, and the public — have a vital stake in securing that bright future for dental education. Without a high quality, economically viable education system, the nation cannot replenish its supply of dental professionals. Without such a system, the public will not have continued access to the world's best oral health services. And without such a system, the chances of future scientific breakthroughs are diminished. Too much is at stake. We cannot afford to let dental education fail, even in part. Nor can we afford to let it decline in quality until it is considered more a trade than a learned profession.

The origin of these issues can be traced to the rapid changes that the profession has experienced. Dentistry's many advances have greatly expanded the capabilities of the individual dentist, as well as the entire practice of dentistry. As dentistry's capabilities have expanded, the scope of dental practice has broadened. Today's dentists must be better prepared and more competent than ever before.

As the profession has advanced, the nation's dental education system has responded. Indeed, dental schools have been in the forefront of dentistry's

many advances — conducting research, testing innovative practices and training students to practice effectively and efficiently. Dental schools continuously “raise the bar” for the profession, increasing the requirements that their programs must meet as each new challenge is achieved.

Today's dental educators are expected to provide classroom education and clinical training, to teach students to use new and emerging technologies and to instill professionalism and integrity in their students. Dental schools must invest in new technologies and modernize laboratories, expand course curriculum, recruit specialized faculty and enhance research and clinical capabilities.

As a consequence, the cost of dental education continues to increase. Every component of the dental program, from faculty and administrative staff salaries, to supplies, building maintenance, technological investments and clinic operations has been affected. At the same time that costs have been escalating, revenues have been difficult to expand. Public support, in particular, has slackened. Many schools have found it difficult to offset ebbing revenues with major cost economies without threatening important educational programs. This has created a financial hardship for dental schools and placed them under grave pressure to limit costs of operation and delay capital improvements.

Over the last four decades, con-

clusions from a variety of national reports on the state of dental education have indicated the need to focus on its high cost. Failure to do so, observers have warned, could undermine the entire future of the dental profession. Responses by educators have been largely on an individual school basis employing limited approaches, rather than a concerted effort engaged by the entire dental educational system. Skyrocketing tuition, high student debt, vacant faculty positions and aging physical facilities now have led many concerned and knowledgeable individuals to now believe we have approached the crisis stage in dental education. Others, while not choosing to use the word, “crisis,” agree that understanding the underlying issues impacting dental education is crucial to its eventual reform.

The limited approach to the reform of dental education may be partly attributed to a deficiency in available economic research and documenting and interpreting the economic issues facing dentistry.

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Although several previous reports have described the underlying problems confronting dental education, little economic research has been conducted regarding these issues. Without the marshalling of the most appropriate and accurate data and without detailed investigation of these issues, solutions remain uncertain and elusive. Decision-makers, with inadequate information, understandably hesitate to make fundamental changes. This monograph begins to address the needed economic research.

An Economic Perspective on Dental Education

The perspective taken in this monograph is that the difficulties facing dental education are fundamentally economic. While noneconomic issues do exist, and are important, unless a sound financial foundation can be secured for dental education, these other issues cannot be effectively addressed. Moreover, the economic issues facing dental education are systemic — that is, they go to the very structure of the enterprise. Sources of funding are changing. Public funds for dental education are diminishing. Operating costs of dental schools are increasing. Student debt is soaring. These financial developments have created the financial dilemma that dental schools are experiencing.

This monograph reviews the economic forces that drive the dental education system. It also presents a variety of innovative strategies undertaken by dental programs across the country that attempt to enhance revenues, reduce clinical costs, and improve operational efficiency. For example, many schools have increased student tuition to previously unimagined high levels. Contributing authors caution that the rising level of student tuition is likely to impact the diversity of program applicants and discourage debt-laden graduates from practicing in low-income communities or less financially rewarding specialties and practices. Some dental programs

are entertaining proposals to enter into relationships with noneducational organizations, affiliations that could significantly impact the philosophy and structure of dental education. Some schools have delayed building maintenance and deferred technological investments, steps that may impair future training. Despite such actions, many programs are in difficult financial straits.

Dental education has always been costly to provide, in large part due to the expense involved in maintaining clinical training programs. Considerable agreement among leaders of dentistry exists regarding the nature of the problems and the need to address them successfully, and soon. The consequences of inaction are clear: If the financial position of dental schools continues to deteriorate, fewer programs will be available that offer high-quality education, the nation's access to quality care will be jeopardized, research and innovation will decline, and both the public and profession will suffer.

As emphasized by contributing authors, underlying economic forces shape the markets for dental education and dentistry in the United States. Economic forces influence the location of schools, the availability of teaching faculty, the level of student tuitions and fees, the financial viability of the nation's dental education programs, and the number of student enrollment opportunities. This monograph provides in-depth analysis of key economic factors that drive dental education and the challenges facing the dental education system.

Economic Issues and Options

The first six chapters of the monograph describe the economic trends unfolding in dental education and analyze the major economic issues challenging dental education. The last six chapters discuss promising programs to address these issues.

Setting a framework for the monograph, Chapter 1 presents an historical overview of the dental education

system. Comparing dentistry's clinical training arrangements with those of medical education, the authors note that dental programs absorb high per student clinical expenses while medical programs are able to pass such costs on to hospitals, which are reimbursed, at least in part, for patient care provided.

The economic attractiveness of dentistry as a profession is addressed first because all else depends upon it. The first prerequisite for a vibrant dental education program is the ability to attract talented students into the profession. Without a talented student body, the entire enterprise is compromised. Since a talented and dedicated faculty is an essential component of a successful educational program, a second and related requisite is the ability to entice talented professionals to a career in dental education. From an economic perspective, neither of these crucial requirements can be satisfactorily accomplished unless dentistry, as a career, remains financially attractive compared to other career options available. Similar reasoning applies to maintaining a talented dental school faculty. That career option must be attractive compared to other options, such as private practice, that are available to graduate dentists. While financial reward is not the only factor involved in both of these decisions, it is an important element and can often tip the decision one way or another.

Once a dental school enrolls a talented student body to be taught by a well-qualified faculty, a school must secure the revenue to operate its education programs and to maintain its facilities and invest in new technologies. How much revenue will be required depends on the costs of operating the school. Costs, in turn, depend strongly on the size and efficiency of the operation. A predominant portion of those costs is the expense required to maintain a talented staff. Economics teaches that all of these issues are interrelated,

affecting one another in an integrated system of continuous feedback.

In order to address the attractiveness of dentistry, one must first understand the characteristics of its labor market. In Chapter 2, the labor market for dental schools is described from an economic perspective. In this chapter, the basic elements of economic markets are applied to determine whether a shortage of dental faculty exists. If a labor market is functioning, economists do not use the term "shortage" to define transient shortfalls in faculty. Indeed,

financial attractiveness of a faculty career, the results are not as encouraging. Using trends in the level and growth of dental school faculty salaries, ROR for a career in dental school faculty based on faculty salaries is estimated. ROR estimates vary based on type of faculty. For example, total compensation ROR for nonadministrative faculty (clinical, basic science, and research faculty) ranged from 14.2 percent to 17.1 percent for full-time clinical faculty. Chapter 3 reveals that dental schools can effectively compete in the market

and are likely to continue to do so. This has forced dental schools to rely more on private sources of funds, such as tuition, clinic income, and philanthropy. Chapter 4 provides a number of strategies to improve financial viability, including improvements in clinical efficiency and productivity. A potential change in clinical education that promises to reduce costs is partnering with organized dentistry to move portions of high-cost clinical education into the community.

If the privatization of dental school funding continues, the revenue sources of public schools will converge toward the revenue pattern exhibited by private schools. This is likely to cause public schools to behave more like private schools in their overall operating policies and in their admissions criteria. Tuition and clinic income will grow more important as sources of revenue. One might also expect that public school staffing patterns will change to more resemble those of private schools.

Given that economic factors are critical issues, the structure and efficiency of dental schools are crucial to their survival. Dental schools utilize various resources at different rates to train dentists. Total annual expenditures per DDS equivalent averaged \$78,763 in fiscal year 2002, but ranged from \$39,739 to \$142,871. This variation is too wide to be solely explained by variation in regional input prices (i.e., variations in the cost of doing business). Variation in structural and operational efficiency as well as in the intensity and quality of training across dental schools may be additional reasons.

In Chapter 5, the focus is on the structure and efficiency of dental schools. The authors found that private schools, on average, registered lower costs than public schools. Private schools maintained this cost advantage, even after adjustment for regional cost of living, size of school and other factors. Chapter 5 shows also that the intensity of training is an important contributor to cost, and that the quality of the student body

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the labor market for dental faculty seems to be functioning but faculty supply lags behind increases in applications and enrollment. Although the situation may be one of market lag, individual dental schools face unique problems in attracting and employing faculty because dental schools are in competition with private practice opportunities in their search for faculty.

In Chapter 3, the focus turns to the rate of return earned by dental students that choose faculty positions. ROR encapsulates in one summary measure the financial attractiveness of dentistry and is critical to understanding the likelihood of the profession to compete with other learned professions for the bright young individuals choosing a career. The authors conclude that dentistry exhibits a very high ROR. This is a sanguine indicator that dentistry remains a very financially attractive career and that dental schools will continue to be able to attract a talented student body.

Switching to the analysis of the

for dentists who want employed positions in dentistry. However, because of the large disparity between faculty compensation and private practice income, especially among specialists, the ability of dental schools to compete with private practice is very limited. This situation is likely to continue into the future and force dental schools to rely on faculty recruitment through dentists retiring from other salaried positions or faculty from foreign dental schools.

The changing sources of revenue represent another economic issue facing dental education. Chapter 4 provides a comparison of trends in dental schools' revenue streams with their operating expenses to examine financial strength. The financial situation of individual schools varies significantly. In 2000, for example, 24 dental schools reported total revenue exceeding expenses by as much as 55 percent, while 16 schools reported deficits reaching up to 30 percent of total expenses. The analysis shows that public sources of revenue have declined

(measured by DAT scores) is inversely related to cost — the more talented the student body, the less the cost per student. The analysis clearly indicates that school size is important to the costs of dental education, and that the current sizes of U.S. dental schools, as a group, are systematically too small to realize all of the potential cost savings that might accrue from a larger size.

While the authors call for increased efficiencies, they find that the small size of some schools generally limits their potential to realize as much efficiency as could be achieved with a larger size. An analysis of dental curriculum and its costs is then presented in Chapter 6. Here, the authors examined three issues: 1) the structure of the curriculum and variation in curriculum hours among schools; 2) the relationship between basic medical science and clinical curriculum hours and the cost of education; and 3) the associations among basic medical science and clinical curriculum hours and performance on national board examinations. The authors noted that over the past two decades, the number of basic science hours has declined among the curricula of U.S. dental schools. The concern voiced is that the commitment to basic science has become perilously low, compared to the preparation needed for dentists to practice effectively in an environment of increasingly complicated co-morbidities and complex therapeutic regimens. The dental practice of the future will require a sound foundation in the basic sciences to allow dentists to integrate a variety of clinical and laboratory information and to effectively collaborate with the entire health care team.

In addition, the authors of Chapter 6 found that several factors were associated with lower total expenditures per student. On average, these expenditures were less among private schools compared to public schools. They were also lower among schools that had larger classes, gener-

ated less revenue from intramural faculty practice and from extramural research activities, and had fewer basic medical science hours. Finding a positive and significant relationship between hours of basic medical science curriculum and Part I of the National Board scores, but not between hours of curriculum and Part II scores, the authors recommend strengthening the accreditation and certification systems used to regulate dental schools to differentiate among schools and students with widely different educational programs.

The remaining chapters of the monographs describe some of the options that have the potential to increase efficiency and reduce the cost per student. Any

option of extramural experience could be commenced earlier. Both eventualities hold the prospect of reducing costs.

Chapter 7 examines clinical program costs. Changes in curriculum, infection control concerns and, advances in technology have forced dental schools to modernize preclinical facilities. Based on the University of Louisville's experience as an example, dental schools are encouraged to consider simulation clinics. Dental school simulation clinics promote better communications between disciplines, use state-of-the-art technology and provide clinic-like operating conditions. Moreover, in the University of Louisville example, using half of the lab space of the previous

U.S. DENTAL SCHOOLS, AS A GROUP, ARE SYSTEMATICALLY TOO SMALL TO REALIZE ALL OF THE POTENTIAL COST SAVINGS THAT MIGHT ACCRUE FROM A LARGER SIZE.

reform that aims to accomplish these objectives must be able to deliver one of two payoffs. Either, the program must reduce the cost per student, or it must move the student through the education process more quickly so that a student's preparation is completed in a shorter time. Since staffing expense, especially faculty budget, is the predominant source of expenditure for dental schools, new approaches must efficiently utilize that costly resource and ultimately permit a reduction in staffing per student ratios. Staffing efficiency can potentially be realized by using technology to reduce staffing requirements.

One option is the use of simulation in preclinical teaching. This reform offers the prospect of moving students more rapidly to the dental clinic while requiring less space and fewer staff. If this payoff can be realized, students could become more productive sooner, and the

preclinical lab, the simulation clinic contributes about \$ 1 million dollars in cost savings. Additional savings were also achieved by replacing discipline-specific clinics with general practice clinics for third- and fourth-year students. At the University of Louisville, the general practice clinics increased productivity by 39 percent and contributed to higher national rankings on the National Board Part II.

Is research a partial answer to the financial crunch facing dental education? Certainly, research programs can provide a school with an infusion of financial support, but the important issue to consider is whether research programs can generate net revenue with which to support other educational endeavors. To assess this issue, Chapter 8 describes one the most successful research programs among U.S. dental schools. The University of California at

San Francisco is among the leaders in the amount of research conducted and the amount of research funds received.

The author concludes that a research program is not a major solution to the financial issues facing the didactic and clinical portions of dental education because research programs do not generate a large amount of discretionary income. Nevertheless, research offers many benefits including, for example, the ability to hire additional staff and faculty, purchase advanced equipment and modernize laboratory facilities. Research programs can generate external as well as internal prestige for a dental program, helping to establish that program as a key element in the intellectual mainstream of its university and making the dental program more attractive to prospective faculty and students.

The author cautions that building a sponsored research program requires an organizational commitment of resources and administrative expertise, and may not be the best organizational option for many excellent dental programs. Nevertheless, a vibrant research program within the nation's dental schools is critical for the enterprise to maintain its recognition as a high quality academic undertaking.

Intramural practice has been mentioned as another possible relief for dental schools dealing with a financial crunch. Medical education has been able to incorporate the teaching model within an extensive intramural faculty practice program. With this model, health care and education are jointly produced. A substantial portion of medical school education has been shifted to hospital and outpatient settings. Moreover, medical education has been able to support a notable proportion of its educational expenses with funds that are targeted to provide medical services. Dental education has yet to develop a comparable model of similar scope.

To explore the revenue generating potential of this strategy, Chapter 9 provides an overview of key aspects of intra-

mural faculty practice plans, including organizational issues, governance issues, revenue management and operational issues at the University of North Carolina Dental School, which has one of the largest intramural practice programs. Chapter 9 describes potential benefits that can be realized from intramural practice. An effective intramural program can enhance faculty commitment and loyalty. It permits new faculty to more easily establish an ongoing group practice, and it can improve administrative management (e.g., peer review, infection control, HIPAA compliance). In addition, intramural practice can help with faculty recruitment by helping to make total faculty compensation more competitive with private practice. Finally, an intramural program can provide some discretionary funds for the school.

However, to have a major impact on the cost of dental education, an important characteristic of intramural practice in dental schools must be changed. Traditionally, intramural practice has not been well integrated into the teaching mission of the school. Unless education and faculty practice can be integrated similar to the medical model, faculty practice will continue to be separated from the education of students and will reduce the time for educational activities of those faculty that participate. This lost educational activity will have to be provided by other faculty. The net result may not be improved staffing ratios.

It has often been noted that, unlike medical schools, dental schools must run their own clinic operations, instead of transferring this responsibility to hospitals. Clinic operations in dental schools have typically not generated net revenue. Even the most efficient programs find it difficult to break even with their clinic operations. One promising solution to this economic issue is to transfer a portion of the clinical education experience outside of the dental schools to extramural sites. In principle, this could reduce clinical operat-

ing expenses, provide additional care to some segment of the community, and provide the receiving clinical site with additional dental staff.

The University of Colorado School of Dentistry has one the most extensive and longest running extramural programs, and as such, is the topic of Chapter 10.

Community-based dental education's potential to reduce the cost of predoctoral education has captured much attention. The most critical issue will be applying sound strategies for implementing pre-competency CBDE and for developing competency within CBDE. As extramural programs play an increasing role in undergraduate education, savings in clinic expenses must be realized by reductions in clinic staff and other expensive clinic inputs.

Finally, to fully understand the economics of dental education, it is important to appreciate the extent to which the demand for, and supply of, dental education is influenced by the nation's economy, societal trends and developments within dental science and technology. Economics teaches that the demand for dental health professionals derives from a demand for dental services. In turn, the need for dental schools and dental educators derives from the demand for practicing dentists. Clearly, the entire system is interrelated. Changes in society that impact the demand for dental services will, given time, influence the size and distribution of the dentist work force, as well as the capacity and structure of the dental educational enterprise.

Chapter 11 looks at the market for dental education in the country as a whole. While evidence indicates that there is adequate dental capacity at the national level, some regions of the country are underserved, partly due to recent population trends. Though market forces will address this issue, supply side responses take time and several strategies are suggested to speed the process and train more

students who are likely to practice in areas that require greater dental capacity.

Regional market coordination should be strengthened for several reasons. First, each region and state confronts somewhat different demographic and economic trends that influence dentist work force requirements. National averages obscure these regional and state differences. The lagged work force response to changes in population engenders short-term regional and state work force imbal-

ances. Given time, these imbalances will be redressed by the natural flow of dentists in response to economic opportunity. However, if the U.S. population continues rapid migration, the market adjustment mechanism could be playing "catch up" for an extended period.

Better regional coordination also offers several benefits to dental education. Over time, regional planning for dental education can begin to analyze the interregional movement of students, graduates and practitioners. Well-designed regional programs have the potential to improve the efficiency of dental education and to control costs. Regional programs create opportunities to sharing of faculty and resources among schools, expand distance-learning programs, and explore novel approaches to dental education. One promising approach is for students to receive some of their basic science education at a local academic center, and then receive intensive clinical preparation at the dental school, before returning to their local communities for further clinical experience. The potential cost savings of such an arrangement can be considerable, and such strategies may

encourage dental students to consider locations that most need their services.

While each chapter addresses a different topic relevant to the economics of dental education, almost every contributor raised the issue of efficiency and suggested that dental education programs consider strategies to become more efficient. In Chapter 12, empirical data based on a 2003 online survey of dental school deans are provided to guide program changes. Most of the survey's 47 respon-

dents indicated that they had undertaken an efficiency-enhancing program during the past five years. Clinical initiatives addressed off-site clinics and outreach programs, curriculum, patient care, and productivity. Deans also reported many other efforts as well, including improvements in information technologies, laboratory procedures, and use of space.

Next Steps

As demonstrated in this monograph, dental education functions within an economic framework. Most dental care provided in the U.S. is financed privately. Patients, businesses, and third-party carriers financially support private market dental services through their purchasing and payment decision-making. As a result, the dental delivery system, functions, by and large, as a nationwide arrangement of interrelated dental practice and dental education markets. These markets have national, regional, state and local dimensions, and they respond to economic factors from both the demand and the supply sides of the market.

The chapters in this monograph analyze the key economic issues facing dental education. Dental education is experi-

encing fundamental stresses on both the revenue and cost sides of the enterprise. One of the main findings of this monograph is that dental education has experienced a financial hardship. Public support, in particular, has slackened. This trend has resulted in the increasing privatization of the funding of dental education. With this shift in funding, public schools will begin to behave more like private schools. Costs have increased substantially at the same time that revenues have been difficult to expand. These trends are likely to continue. As a result, dental schools will continue to be under severe pressure to control costs. These economic forces driving dental education are likely to continue and the full community of practitioners, educators, researchers, and the public must jointly engage in responding to their effects.

While this monograph analyzes the major economic issues in dental education, it cannot provide a full blueprint to solve all of these problems. That blueprint will have to be designed along the way. Fundamental changes in the structure and management of dental education will be required. Sound management and business principles will need to be implemented. The monograph describes several promising options for addressing these issues. These need to be expanded. New and novel strategies will need to be developed. As these options develop, different models should be piloted.

Initial steps should be incremental to allow unforeseen complexities and unintended consequences to become apparent. Moreover, the political consensus for fundamental change in dental education does not currently exist. It will have to be carefully and prudently built. Before more dramatic initiatives are undertaken, smaller steps should be attempted. While all of these potential pitfalls will cause the prudent to be cautious, one thing is clear — dental education is experiencing severe systemic difficulties. These difficulties are unlikely to disappear on their own. **CDA**



DENTAL FACULTY RECRUITMENT AT LOMA LINDA UNIVERSITY SCHOOL OF DENTISTRY

Charles Goodacre, DDS, and William Loveless, EdD

ABSTRACT

This article addresses the dental faculty shortage as reported by the American Dental Association in its publication *The Future of Dentistry* and the *Journal of Dental Education* report on the demand nationally for dental school faculty. Budgeted full-time faculty vacancies in U.S. dental schools stand between 300 and 400 with present and anticipated state and federal shortfalls forecasting even further cuts or at least lack of government support. Acknowledging various reasons for, and responses to, the shortage, the School of Dentistry at Loma Linda University is seeking to deal creatively with a faculty shortage. A survey of newly hired full-time faculty indicates the issues that concern them and their colleagues. Loma Linda University School of Dentistry's response to the shortage includes a routine invitation to students, particularly seniors and residents, to consider teaching at the school. In addition, a simple alumni recruitment form is used for personal relationship building with alumni. A student loan reimbursement program for new faculty is a successful program in recruiting new, young full-time faculty. To provide for the long-term future of the research function of the school, a new program focusing on hiring doctoral (PhD)-prepared individuals who will be trained in the predoctoral DDS program at the expense of the school is in place. This article suggests further steps that can be taken to enhance the cause and reputation of the school's educational program.

The signs of growing faculty shortage in U.S. dental schools and, in fact, for the world, have been highlighted both in the first Global Congress on Dental Education at Prague in 2001 and in two national studies published by the *Journal of Dental Education* in 2002 and 2004.^{1,2} The latter study reported that whereas no adverse effects have been identified by the perceived shortage, "foresight and planning and necessary steps need to continue" to ensure the preparation and continuity of a quality dental faculty work force. A significant factor in this study was the finding arising from a new question added to the ADEA survey of faculty educators: 51 percent of the new faculty came from private practice to fill full-time or part-time positions in a ratio similar to that which had been maintained with departing faculty members. These results are based on a survey of 52 responding dental schools reporting a total of 296 vacant budgeted positions in 2002-2003 — 270 full-time



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and 26 part-time positions. Budgeted positions remain a tricky concept to define because of varying interpretations of the term. A Loma Linda University Dental School administrator said, "Sure, we need more faculty. No, we don't have budgeted vacancies because of funding limitations."

A growing concern on the Loma Linda campus is the aging of full-time dental faculty and the difficulty of securing qualified replacements for those who retire or who have reached retirement age. Faculty recruits for specialty graduate programs are especially sparse. Reporting its national survey of all-American dental schools in *Future of Dentistry*, the Health Policy Resource Center of the ADA emphasized the facts of a growing shortage of qualified dental school faculty. This study reported figures close to those reported in the 2002 study; it identified 300 to 400 budgeted full-time faculty vacancies and a shortfall in clinical faculty totaling 244.³

Major Factor in Faculty Shortage

The primary reason for shortage, according to the *Future of Dentistry* study, "appears to be related to the significant disparity in income available" in faculty appointments with that achieved through the private dental practice. In the past, dental school retention efforts focused on the school's holding its faculty against competition from other dental schools. All of the recent studies (2002-2004) portray today's faculty retention issues relating to more financially attractive opportunities in the private sector.^{1,2,4} It would seem to follow, then, that if salaries were enhanced in dental schools, the faculty shortage would go away. Maybe.

Issues Contributing to the Shortage of Full-time Faculty

Over the past decade, the gap between private practice and den-

tal faculty income has perceptibly increased. The numbers are revealing. Annual salaries of clinical faculty holding the academic rank of assistant professor and above have risen an average of 25 percent to 30 percent during the past decade. During the same time, the average net income of solo private practitioners has increased 78 percent.^{1,2}

Student debt continues to increase and is a major factor affecting decisions regarding both choice of location and postdoctoral work opportunities.

Dental faculty retirements are accelerating, and dental schools expect higher levels of scholarship with the obvious

demand for ever-better educated and trained faculty.

Combined with these patterns is another different situation for the nation and all of the states.

Budget cuts from city, state, and federal sources have been and will continue to adversely affect dental school operations as part of the educational enterprise. In a 2003 survey of state financing of dental education, the conclusion was reached that "a significant number of state and state-related dental schools receive so little state support that they function as private schools, operationally."⁴ Dental schools are expected to meet the academic expectations of the parent university while at the same time caring for the clinical needs of the service area, which is ever widening to include teaching and service — in many cases, on another continent. The faculty need is a global issue, which the 2001 Global Congress on Dental Education highlighted.

Possible Solutions for the Full-time Faculty Shortage

The ADA's *Future of Dentistry* offers several suggestions for alleviating the challenge of faculty recruitment. For example:

- Add to the school's already overloaded curriculum, with tracks for training dental practitioners to be faculty,
- Develop a debt forgiveness program for graduates who return to faculty positions (many schools are doing this now),
- Beseech the federal government to allocate more funds to underwrite research, specialty training, and teaching scholarships and fellowships, and
- Test "alternate, less faculty-

"SURE, WE NEED MORE FACULTY. NO,
WE don't HAVE BUDGETED VACANCIES
BECAUSE OF FUNDING LIMITATIONS."

dependent models for educating dental students."³

Faculty Recruitment/Retention Efforts at LLUSD

At Loma Linda University Dental School, it was decided to examine faculty recruitment over time.

Funding Advanced Education

The primary faculty recruitment strategy began with an invitation to alumni and other dentists to teach at the school and to offer the possibility of graduate education as a bonus. This strategy seemed to work relatively well until the 1990s, when the school, like all other dental schools, became acutely aware of the difficulty of attracting qualified faculty. Although providing graduate education had proved to be a major asset in faculty recruitment, it was clear something more was needed.

Recruitment Strategies

As the concept of recruiting new, younger faculty became a matter of discussion in the faculty and among the students, it became apparent that most of the faculty recruitment had been informal, following no predictable pattern.

Word-of-Mouth Recruitment

Recruitment had depended on who knew who, largely limited within specialties, and was a word-of-mouth phenomenon. The school did not have a database to refer to when a faculty need arose, so the "Do you know anyone who might be interested and would qualify?" question was floated around. Amazingly, in many instances, the word-of-mouth "search" produced a candidate. Though the recruit was not always as well qualified as hoped for, it seemed to work out much of the time. The faculty and administration is now facing the fact that the past practice of faculty recruitment is no longer adequate.

Faculty/Student Loan Reimbursement Program

Like many other schools, Loma Linda has had a semblance of a faculty loan reimbursement program in place for some time. Recently, the school administration decided to make a concerted effort over time to use a reimbursement program for attracting young qualified faculty to teach by contributing to a pay down of their dental school debt. The dean's office has an annual \$150,000 line item in the budget dedicated solely to a faculty loan reimbursement program. While teaching on campus, young faculty recruits receive up to \$30,000 a year for five years to aid in debt payment. Since the 1988-'89 school year, 11 full-time teachers have joined the faculty in the school. This program is providing a small but steady stream of promising young faculty members.

The PhD/DDS Research and Teaching Track

The school has ongoing needs for broadly trained faculty who also have dental school training and experience. The concept is to find PhD-prepared individuals who have already attained significant skills in research at the doctoral level and to sponsor them through the DDS degree so that they may serve in both the academic and clinical programs as well-trained and competent faculty. This program is young, but the prospects seem bright with two new faculty members in place and several more beginning in mid-2005 with training that will provide faculty custom-educated to perform specific roles in the school.

Funding for the Recruitment Program

At present, the faculty recruitment program has become a line item in the school's budget, with data entry performed by Information Technology Services and primary screening of responses to recruitment efforts channeled through the Office of the Restorative Dentistry chair.

New Faculty Survey

It has been decided that recently hired full-time faculty would be good sources for determining why they accepted an appointment at the school. A survey instrument with five questions was devised and hand delivered to 21 full-time faculty who have been hired in the past four years. Nineteen completed and returned the survey. Twelve of the respondents participated in one-on-one 60-minute in-depth interviews.

Written and oral responses to the

THE FACULTY and ADMINISTRATION IS NOW
FACING THE FACT THAT the PAST PRACTICE
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questionnaire are recorded here of at least three of the 19 subjects mentioned. Because the responses were spontaneous instead of being selected from a list, all responses were considered to be worthy of consideration as the strategy was planned.

1. What factors and persons influenced you to become a dental school educator?

- Faculty member contact and invitations
- Commitment to the spiritual mission of the school
- Enthusiasm for teaching
- Desire to give back

2. Why did you choose Loma Linda University School of Dentistry?

- "It's my alma mater."
- Commitment to values and foci
- Spiritual environment
- Geographic location
- Personal invitation

3. What keeps you in the teaching profession?

- Interaction with positive, motivated students
- Stimulating academic/clinical environment
- Enjoyment derived by continually learning
- Opportunity to use talents

4. What can we learn from you about recruiting faculty at LLUSD?

- The importance of personal contact
- The need for support of administrators and those who oversee our activities
- The importance of vital faculty practice opportunities
- There needs to be a better faculty

- orientation program
- e. Salaries should be higher

4. What changes do you recommend at LLUSD?

- a. Less hiring paperwork
- b. More in-service training
- c. Administrators present in the clinic
- d. More minorities and women
- e. Increased use of electronic resources and technology
- f. More time for administrative duties
- g. Increased faculty-to-student ratio

In summary, the responses suggest that successful recruitment requires listening, learning, and action. The recruits responded to these approaches and conditions:

- a. Clear mission and foci of action
- b. Administrators' presence clinically
- c. Maintenance of an energizing environment
- d. Faculty orientation/in-service training
- e. Minority/female recruitment
- f. Electronic education resource development
- g. Streamlined hiring paperwork

Survey Results

In analyzing the responses to the survey instrument, several factors stood out in the data.

The importance of personal relationship topped the list. "No one ever asked me to teach before," repeatedly emerged as a compelling incentive, a simple but profound finding. Potential faculty are more likely to respond if invited by a school faculty member or administrator to look seriously at teaching rather than simply reading a notice or sensing an impulse to inquire about a faculty position.

A second finding was that there are more dentists than it was imagined who actually entertain the idea of full-time or part-time teaching. The survey turned up a good number of practicing dentists, even younger dentists, who genuinely enjoy the challenge and rewards of working with students. Dental school

debts and practice expenses are a major deterrent to those who would enjoy and be capable teachers.

A third finding concerns a skill set of enhanced faculty qualifications.

New faculty have come with a personal dimension that is crucial in the new clinical group practice model at Loma Linda and is being adopted in a number of dental schools. When students work in a group with underclassmen, hygiene students and coordinators, new challenges emerge for dental faculty. The skills of mentoring and coaching become crucial for faculty and students. The ability to listen, question, and stimulate critical thinking becomes important in the

faculty recruitment program. The idea of joining the faculty is mentioned in class beginning in the freshman year. Exit interviews with seniors routinely include a question regarding their interest in teaching. At a recent "farewell" dinner for orthodontic residents, six responded to a questionnaire inquiring into their suggestions for the program. One of the questions explored their interest in teaching. All six responded favorably; two preferred full-time; two chose part-time; two selected visiting status. The faculty members have been happily surprised by the robust response of seniors indicating their interest in teaching.

The alumni and dentists practicing

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teaching enterprise. Schools have more paperwork and, seemingly to some faculty, more policies and procedures than are necessary. The ability to tolerate what some faculties openly ignore highlights the importance of being a team player in today's dental school. The clinic floor is no place for the "brilliant lone eagle" faculty member who ignores what she or he pleases all the way from quality assurance forms to treatment plans. A dental school, after all, is a combination school, business, and clinic at least; therefore, it requires checks and balances that can safely be minimized in private practice.

A Fresh Look at Practicing Dentists at Loma Linda University School of Dentistry

Taking a tip from the findings of the summary of new full-time faculty, the school set in place a formal data-based

in the service area of the school comprise a rich source of possible faculty for the dental school. Included here is a simple survey being used now with alumni. It is crucial to note that a personally submitted survey to a prospective recruit by a school representative with an invitation to "think about it" has considerably more impact than simply mailing it to the hundreds of alumni. The survey is introduced this way:

Faculty Interest Gleaner

The Loma Linda University School of Dentistry Faculty Recruitment Project is a conscious effort on the part of the School of Dentistry to build the best possible faculty and to make its own alumni a major source for faculty members.

School of Dentistry alumni would make ideal faculty for a number of reasons. First, we believe we turn out some of the best dentists in the country, from

a clinical perspective, and would love to tap that skill for the next generation of graduates. Second, alumni have observed, understand, and have often contributed to the special mission of the Loma Linda University School of Dentistry, with its emphases on spiritual values and service ethic. Third, alumni have recently seen the world from the students' perspective and are likely to have constructive, fresh ideas for how to improve the student experience. Fourth, alumni are already familiar with the operations of Loma Linda, making orientation and adjustment a shorter, more efficient process.

Given the previously mentioned information, and the fact that a number of alumni have indicated no one ever broached the subject of potential service as faculty members, it seems appropriate

to initiate this process to begin assessing interest in such service. The faculty-prepared survey appears below.

What else can dental educators do to interest qualified faculty? The dental school can give detailed and regular support to a first-class faculty practice facility, professionally managed so that faculty can enhance their income. In some instances, this is enough to attract and retain quality faculty; 2) develop a debt-reduction plan for new or younger faculty who desire and are qualified to teach; and 3) support a development program with professional staff that can cultivate donors, write grant proposals, and present the needs of the dental school to a wide array of constituents.

The faculty shortage in dental education is a global issue. There seem to be no questions about that, but the haunting

response to the new faculty survey at Loma Linda remains instructive: "No one ever asked me before."

Summary

There is no question there is a global shortage of dental school faculty. Various explanations include the growing financial gap between private practice income and faculty salaries, budget woes in all states, and the rapidly expanding roles that dental schools play in teaching and providing clinical dentistry to their service areas.

Concerned, as are most other dental schools, about the supply of qualified future faculty, LLUSD in the fall of 2004 reviewed past and present strategies used in faculty recruitment. They had consistently included paid graduate training and word-of-mouth recruiting. A more

Survey

Welcome to the first official faculty recruitment survey! It would be extremely helpful to the school in launching this project if you would respond as briefly (or comprehensively) as you wish to the following questions. Thank you for participating.

1. Would you be interested in serving as a faculty member of the LLU School of Dentistry?

2. If so . . .

a. On a scale of 1 (least) to 5 (most), how interested are you in serving as faculty? _____

c. Is there a particular specialty you would be interested in teaching?

If so, please name the specialty. _____

d. How soon would you be interested in serving (an approximate date)? _____

3. If not . . .

a. Why not? _____

b. Is there anything that could have been, or could be, done to turn your response into a positive interest? _____

c. Are there any other ways that you could envision being of service to the Loma Linda University School of Dentistry? _____

4. Do you have any postdoctoral advanced education in dentistry or in a dental specialty? If so, please name them. _____

5. Would you be willing to pursue specialty education (sponsored by LLUSD) prior to serving on the faculty? _____

coordinated recruitment effort was instituted, which the school's recruiters now see as promising for schools with similar recruitment concerns. The current approach includes a systematic faculty loan reimbursement program, an energetic personal recruitment program with seniors, students, alumni, and practicing dentists in the school's service area, which has resulted in an active, up-to-date database. The preliminary results are a happy surprise in that a healthy number of dentists, both young and older, view interaction with dental students as a new and stimulating aspect of their career path. More responses came than were imagined, with dentists willing to look carefully at themselves as faculty; some have joined the school as this article is penned. **CDA**

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n and observation. *v.t.* to make (dī'æg-nō'sis), *n.* [*pl.* DIAGNOSIS], a distinguishing, discriminating, to distinguish; *dia-*, through, to know], 1. the act or process of a diseased condition by examination or investigation of the facts to determine something. 3. the decision or opinion after examination or investigation. *ic* (dī'æg-nōs'tik), *adj.* [Gr. *diagnōsis*, instituting a diagnosis. 2. of value, significantly characteristic. *n.* in medicine, 2. a symptom. *-cal-ly* (dī'æg-nōs'ti-k'l-i, dī'æg-nōs'ti-k'l-i), *adv.* with regard to diagnosis. *-cate* (dī'æg-nōs'ti-kāt'), *v.t.* to diagnose (-id), DIAGNOSTICATING], to diagnose. *-cian* (dī'æg-nōs-tish'ən), *n.* a

out; up, ūse, fūr; get; joy; yet; ch
u in focus; ' as in able (ā'b'l);

How Does a Dental School Ensure the Currency of Practitioners Who Graduated Some Years Ago?

William R. Yancey, DDS

Can a dental school convince people they will have to be continuous learners throughout their careers?

We've probably all heard the old quote that "success is a journey." Can dental schools prepare people for this journey in a predictable manner or must we wait for them, as adult learners, to ask us for more? Probably all dental schools, as we do here at the University of California at Los Angeles strive to inculcate the sense of continuous learning as part of the responsibility of being a health care provider. Unfortunately, there is no current system that can absolutely ensure this "sense" among practicing dentists. There is no doubt that in California, there are multitudes of educational opportunities for any dentist, at any level. Everyone these days, it seems, is in the continuing education business. The range of providers is wider than ever before: educational institutions, the dental industry, private educational entrepreneurs, state organizations, local dental societies, the list goes on. In fact, the amount of "overload" in this arena may be pushing practitioners away from advanced courses rather than stimulating them to participate. So what can we do that will be effective?

Maybe the only thing we can do both in our dental schools and in our continuing education departments is to try to understand what it is like to practice dentistry "in the real world," then develop courses that address those needs, and be totally prepared to truly help those that do come back.

So what is it like for a dentist in private practice today?

It's in a state of flux — great change, which presents a good news/bad news scenario for every practitioner today. The good news for a young practitioner is that the number of dentists are aging and declining. We now find that 40 percent of practicing dentists are over the age of 50. It is estimated in the next few years that about 4,000 dentists will leave the profession annually. This shrinkage started in the late 1990s and will continue to grow in the future. Therefore, a young dentist can conclude that he/she will have plenty of patients to choose from in their career. That's a good business outlook.

So what is the bad news? The patient pool has changed dramatically over the past 15 years, and the way we practice dentistry keeps changing to stay up with the shift. Therefore, each dentist will need to change their practice to keep up with these dynamics. They will have to

find new ways to develop competencies in multiple areas. How will they do that?

The dental profession used to be a needs-based industry. The patient needed something, mainly because of pain or decay, and they would wait to come see us when those needs surfaced. That scenario is now disappearing because of the widespread use of fluoride in our nation's water supply. Whereas most Americans 50 years ago lost their teeth by middle age, now, middle-age Americans expect to keep their teeth throughout their lifetime. That translates into many more people needing dental care much longer in life.

Therefore, dentistry has become a wants-based industry, rather than a needs-based industry. In the past, the No. 1 reason patients came to the dentist was for pain. In the mid-1990s, pain was finally replaced as the No. 1 reason by appearance-related issues. Now, patients come to us with wants and desires that are appearance-related. That opens the door to many new techniques and procedures that weren't being done before. Our patients are starting to dis-

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cover we can make them look better, which directly translates into career advancement issues for them, and we can make them look younger, which directly translates into how they feel about themselves. You can't turn on the television these days or pick up a current popular magazine that doesn't refer to some sort of makeover. Whether we like that or not, whether we think it's good or bad for the profession — it has without a doubt, changed the profession forever. An article in the *Los Angeles Times*, "Elective Services Boost Dentists'

are constantly changing and much more difficult to master. Many years before the 1990s, there were two materials that stood the test of time and were the mainstays of dentistry: amalgam and gold. They are not very technique sensitive, in fact, they are both quite user friendly, but if you mastered these two materials, you were indeed a master dentist. Now, two new materials show up in the marketplace almost every month. Some of the time, although not nearly as much as the dental industry would like us to believe, they are better than the material that

of time to be consistent throughout the three or four years of dental school. As previously mentioned, in four years — we might go through five or six generations of new materials and techniques. The only place that can keep up with that pace is some form of advanced continuing education. Which is exactly what we do; we're in the keep up business. For a dentist to stay ahead now, they need to be part material scientist and part artist. Those two skills were never taught in dental school, nor were necessary in the past, but they are today.

The modern dentist needs to find a place to go for advanced training with established experts in their field as instructors, and should look for one that offers hands-on workshops, with continuums that allow for multiple visits to try things out in the office in real-life situations, and then return for more answers and refinements. Using this advanced education model, a dentist cannot only keep up and learn to deliver care at the very highest level, but will actually separate themselves from the mainstream, allowing them to enjoy their profession again as an artist and modern comprehensive health-care provider.

We, as advanced educators, also have to learn how to keep up. We need to embrace the concept of "learner-centered" education rather than instructor-based. Our educators need to become "facilitators" rather than just teachers. New courses need to be developed, then constantly customized and refined (sometimes even during a current course), to keep dentists competent and up to date.

UCLA continuing education has tried to learn from the many surveys that have been distributed over the years to alumni, what subjects were going to be "hot." Those surveys revealed that yes, the subject matter, although highly varied, was important; however, respondents felt that the teaching methods of any proposed course was

DENTISTRY HAS CHANGED FROM a MATERIALS-BASED DENTAL PROFESSION TO a TECHNIQUE-BASED PROFESSION.

Income," stated that "50 percent of a general dentist's income is now from cosmetic work." So it stands to reason that the dentist who can address and serve their patients on these issues will thrive, and those who can't — won't.

Here's the current dichotomy. In the past, patients came in to our office and we told them what treatment they needed based on our exam, diagnosis, and treatment plan. Dentists frequently tell us that one of the biggest changes in their practice is a new type of patient. Some patients now walk through the door and tell us exactly what they want done, and bring pictures to show us what they should look like when we finish. So even if dentists realize what patients want, why is it that so few practitioners know how to deliver that level of esthetic dentistry to their patients? Because dentistry has changed from a materials-based dental profession to a technique-based profession, meaning the good news is we have vastly superior products to help our patients. However, the bad news is they

preceded it. But each of these materials is very technique-sensitive. Now, one small detail left out or not done correctly can ruin the entire procedure. If you haven't perfected these new techniques, then you can't master these new materials, which means you can't offer your patients the results they seek.

In that needs-based practice model, most dentists used to practice repair dentistry. They would fix the one thing that was wrong in a patient's mouth, send them home, and wait for them to show up in the future with the next problem. A patient today may come in with nothing broken, yet desire multiple procedures, some rather complex, but most all technique-sensitive. Therefore, today's dentist needs to be constantly upgrading their knowledge and techniques to deliver the type of high-level wants-based dentistry that patients now desire. That same set of circumstances makes it almost impossible for any dental school to teach at this level. Curriculums have to be in place three or four years ahead

just as important. In other words, dentists wanted hands-on continuums that replaced many of the former lecture courses to better satisfy their needs as an adult learner. Therefore, it becomes paramount to find the right kind of educators, using the facilitator model, to teach these types of courses.

To address the currency of practitioners who graduated some years ago, we need to start in our dental schools to make sure every student knows and understand the following:

■ That no dental school can teach them everything they will need to know as a practicing health care provider in today's ever-changing world. If this is admitted and taught up front by every

dental school, then it becomes a fact rather than an excuse we only admit when they come back wondering why.

■ That to be a continuous learner is the norm for our profession — in truth, it is mandatory. Everyone should strive to be a self-directed learner and we should find ways to help them, even throughout their dental school years, enjoy this journey.

■ That competency is an ongoing process; that it is not bestowed by any dental school, by any residency program, nor by any one continuing education course.

Given the fact they will have to go somewhere to complete this journey, we owe it to every practicing dentist to be the best adult learning center avail-

able. Which means offering the types of courses where they can learn techniques and procedures, rather than ideas and concepts that will actually improve the care they can offer their patients when they return to their office.

Is this task easy and predictable? No, but it is essential. It is not any different than the task facing every practicing dentist in that it is a work in progress, a continuous process — a journey. But a journey worth taking. **CDA**

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CHANGING FINANCIAL BASE FOR DENTAL EDUCATION

Julian Ponce, CPA, JD, MBA

ABSTRACT

In recent years, there have been material changes in the manner in which U.S. dental schools are funded. This fact has had profound ramifications for the practices, operations, and culture of the schools. The kinds of programs supported, patients treated, and students admitted all are affected by the sources of available revenue as schools can only do that which does not jeopardize their economic viability.

Changes in revenue sources was one of the major themes of the monograph on the economics of dental education recently published by the American Dental Association.¹ Of particular interest is Chapter 4 of that work by Dr. James Hardigan of Virginia Commonwealth University School of Dentistry.² In the table of his contribution, Hardigan showed, using data from the ADA's annual publication *Surveys of Predoctoral Dental Education*, that for the period fiscal year 1991 to fiscal year 2001, there had been a material drop in support from both the federal and state governments for both public and private institutions. In response, schools have had to make up the resulting deficits by raising tuition, seeking more donations from alumni and other friends, and increasing clinic revenues by raising fees and changing the demographics of patients treated. A summary of the table is presented, along with an update using fiscal year 2002 information from the ADA survey (Table 1).

As the data demonstrates, while federal, state, and local governmental support for U.S. dental schools continues to drop, there has been an accompanying rise in tuition charged to students.

As noted in the article, there has been an especially pronounced rise in the tuition of public institutions. Although the tuition of all dental schools is reported as having raised an inflation adjusted

60.1 percent during the period fiscal year 1991 to fiscal year 2001, when broken down between public and private institutions, the inflation adjusted increase is 74.9 percent and 53.0 percent, respectively. Additionally, for the most recent year reported by the ADA, fiscal year 2002, total reported tuition revenue for public schools increased from \$163.24 million to \$179.31 million, or 9.8 percent; and for private schools, from \$297.12 million to \$315.71 million, or a more modest 6.3 percent. Anecdotally, UCSF has seen dental student enrollment fees more than double from \$9,964 in fiscal year 2001 to \$21,778 in fiscal year 2005, an increase of 119 percent. It should be noted there has been no increase in the number of students, and that since 1991, the UCSF School of Dentistry's state budget allocation has been cut more than 25 percent. In fiscal year 2005, the state portion of UCSF's total campus budget is about 10 percent. In order to adapt to these changes, the UCSF School of Dentistry has had to close its clinic on the grounds of San Francisco General Hospital, which it had opened in 1979, and also eliminate its AEGD and baccalaureate dental hygiene program. At



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Table 1**Changing Financial Base of Dental Education**

All U.S. dental school revenue sources (thousands)

	FY 1991		FY 2001		FY 91- FY 01		FY 2002		FY 01- FY 02
		% of total		% of total	% of change	Adjusted for inflation		% of total	% of change
Tuition and fees	\$221,177	24.8%	\$460,363	30.9%	108.1%	60.1%	\$495,027	31.2%	7.5%
State and local govt.	\$426,086	47.8%	\$489,394	32.8%	14.9%	-11.7%	\$486,065	30.6%	-0.7%
Federal govt.	\$10,924	1.2%	\$11,387	0.8%	4.2%	-19.8%	\$10,947	0.7%	3.9%
Patient care	\$153,211	17.2%	\$329,578	22.1%	115.1%	65.4%	\$368,337	23.2%	11.8%
Gifts and endowments	\$28,876	3.2%	\$87,858	5.9%	204.3%	134.0%	\$112,259	7.1%	7.8%
Recovery of indirects	\$24,842	2.8%	\$42,429	2.8%	70.8%	31.4%	\$50,168	3.2%	18.2%
Other	\$25,815	2.9%	\$70,412	4.7%	172.8%	109.8%	\$65,021	4.1%	-7.7%
Total	\$890,931	100.0%	\$1,491,421	100.0%	67.4%	28.7%	\$1,587,824	100.0%	6.5%

Hardigan JE, The Financing of Dental Education's Future. In: Brown LJ, Meskin LH, editors. The Economics of Dental Education. Chicago: American Dental Association, Health Policy Resources Center; 2004. © 2004 American Dental Association. Reprinted by permission.

this time, the regents are considering raising fees an additional \$2,000-plus for fiscal year 2006. It should also be noted that the school's administration fully supports this increase as these funds are necessary to counteract the effect of state budget cuts and unfunded increases in operating costs.

As shown by the ADA data, in response to materially reduced government support, the schools have done what they could to increase patient care revenues. This has been accomplished despite material federal and state cuts to Medicaid (Medi-Cal/Denti-Cal in California) and Medicare reimbursements. Medicare supplied significant monies to dental schools via the graduate medical education program, which provided resident and faculty salary support to postgraduate education programs in clinical specialties such as orthodontics and periodontics. Shortly after it was decided that the Medicare trust fund would be the source of funding for the \$400 million to \$600 million in new prescription drug benefits, and

that there would be no new Medicare taxes levied, a change of regulations was promulgated by the federal government, resulting in the disqualification of about half the graduate dental programs in the United States from any further graduate medical education support.

Further, due to budget cuts to the Medicaid program, many states, like California, have reduced the number of procedures covered and the reimbursement rates for those procedures. Some states, like Massachusetts, have even eliminated Medicaid adult dental services altogether. As most U.S. dental schools' student clinics serve as safety net providers, this has had the effect of forcing schools to consider changing their patient base away from persons on public assistance and toward those who have dental insurance or can afford to pay fees. Because of low reimbursement rates and elimination of procedures covered, some schools have felt compelled to put a limit on the number of Medicaid patients they schedule for appointments.

It should be noted that a main driver

for the decision of governments at all levels to cut back on educational funding is decreased revenues caused by tax cuts. As there is presently no meaningful discussion on the need to restore these cuts at either the federal or state levels, it can be presumed that decreased government support for education and patient care will be a reality for U.S. dental schools for at least the foreseeable future.

The success that schools can show in increasing their patient care revenues has come about by being diligent about raising fees, improved marketing to increase patient flow, scheduling more faculty and student clinic hours, improving collection efforts, and reducing the number of indigent patients. It is worth mentioning that given the increasing administrative burdens associated with insurance billings, many schools, like many private practitioners, have begun to require patients to pay their own bills and take personal responsibility for seeking reimbursement from their insurance companies. As an example, at UCSF over the past five years, it has seen its cash receipts portion of

Table 2**Changing Financial Base of Dental Education**

Changes in average student-debt burden

Type of school	FY 1992		FY 2002		Total increase		Percent increase	
	Nominal	Real	Nominal	Real	Nominal	Real	Nominal	Real
All	\$55,550	\$71,229	\$107,503	\$107,503	\$51,953	\$36,274	93.5%	50.9%
Public	\$42,700	\$54,752	\$85,840	\$85,840	\$43,140	\$31,088	101.0%	56.8%
Private	\$75,166	\$96,382	\$136,060	\$136,060	\$60,894	\$39,678	81.0%	41.2%

Hardigan JE, The Financing of Dental Education's Future. In: Brown LJ, Meskin LH, editors. *The Economics of Dental Education*. Chicago: American Dental Association, Health Policy Resources Center; 2004. © 2004 American Dental Association. Reprinted by permission.

annual clinical revenue go from \$3 million of \$13 million to more than \$5 million.

In response to reduced funding, U.S. dental schools have also materially increased their efforts to solicit donations from alumni, grateful patients, and persons friendly to the cause of dental education. As shown by the ADA figures, in general, schools have been very successful in increasing this source of revenue and are suitably grateful to the many donors who have stepped forward to assist in this time of need. It should be mentioned, however, that soliciting donations is an ongoing, labor-intensive activity that requires appreciable time and effort by a school's senior administrators and staff. Further, many gifts come with well-defined donor restrictions that reduces the flexibility with which the money can be used.

The category "Recovery of Indirects" describes the administrative portion of contracts and grants for research paid to the university doing the work. As the data shows, U.S. dental schools have increased somewhat the research activity of their faculty and have benefited thereby.

The "Other" category relates to miscellaneous school revenues generated by such activities as offering continuing education classes for licensed practitioners and rental of facilities for national and state board exams. As the data

shows, although only a small part of total revenues, there has been some strong growth in this sector.

With materially increased tuition comes, of course, increased student debt loads. The best source for gauging the extent of this phenomenon is the annual survey of graduating dental students conducted by the American Dental Education Association.^{3,4} This source was relied upon by Hardigan in his Chapter 4 of the ADA monograph previously cited to prepare his Table 4.3 which is reproduced but relabeled as **Table 2**.

As the data shows, not surprisingly, student debt is rising as fast as tuition. Also, as with tuition, debt levels are rising faster at public as opposed to private schools. The ramifications of rising student debt levels have, of course, been a matter of great concern for some years now. There are obvious implications for access to a professional school education for people of low-income backgrounds, the ability of our graduates to accept lower-paying positions in the public health or nonprofit sector upon graduation, and the ability of graduates to finance the purchase of practices from retiring practitioners.

Conclusion

Barring some drastic change in public policy, which will result in raising taxes to generate revenues and

which governments can then use to better fund higher education and patient care for the underserved, dental schools will have to continue to raise student tuition and develop entrepreneurial initiatives to raise revenues. Public schools especially will have to accept de facto privatization in order to survive economically and also accept the fact that there will be certain populations that can no longer afford to attend these institutions nor seek care there.

Also, schools will have to examine their academic programs and support those which can either attract outside funding or generate their own sources of revenue. Those that can do neither will have to be eliminated in order to maintain the economic viability of the school. **CDA**

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EDUCATING THE PRACTICE-READY DENTIST

Nader A. Nadershahi, DDS, MBA, and David B. Nielsen, DDS, MA

ABSTRACT

The mission of the University of the Pacific, Arthur A. Dugoni School of Dentistry is to graduate competent beginning dentists in a humanistic environment. As the first American dental school to incorporate competency-based education, it takes very seriously the understanding that competency means having the skills, understanding, and supporting values to begin independent practice. Competency is defined by the demands of dental practice, not by what professors know. The university's mission statement is to "provide a superior, student-centered learning experience integrating liberal arts and professional education, and prepare individuals for lasting achievement and responsible leadership in their careers and communities."

Because dental practice is changing, the curriculum at Pacific changes to remain in step. The sidebar enumerates a number of the ways dental practice differs now from even a few years ago (**Sidebar**).

This article will review some of the changes and challenges faced by the University of the Pacific, Arthur A. Dugoni School of Dentistry in preparing graduates for tomorrow's dental practice. Today's graduates need to be prepared for the changing landscape of practice in the future. That is why it is critical to graduate practice-ready dentists.

The changes in the field are complex and comprehensive. Not only are cavity preparations different, so are the materials used to complete restorations. Patients want new procedures, and some are able to pay for extensive cases, while others find basic care slipping further out of reach. Patients have more to say about what goes in their mouths; so do third parties. The treatment options for any oral condition have multiplied, and patients with special needs and polypharmacy are seeking mainstream care. Educational debt is now more than \$120,000 nationally, significantly higher for private as opposed to state-supported schools, and for every \$1 students borrow for school, they borrow \$1.50 to start their practice. Dentists increasingly work for other dentists. They need to be savvy about business from the start.

Being competent to begin practice is a greater challenge today than at any time in the past. In the 1950s and 1960s, three-quarters of a dentist's work time was devoted to restorative dentistry and that fell to just under one-half by the 1970s and 1980s. During this time, other disciplines such as endodontics, periodontics, diagnosis, and preventive treatment more than doubled. Surveys of Pacific graduates during the 1980s to the 1990s support this information, as they indicated that about one-third of the time and income in the dentist's office comes from diagnosis and prevention.¹ At the same time, recent graduates reported that the least remunerative part of practice, the part generating the smallest income to time ratio, was elective procedures.

Clinical Competence

The total curriculum hours at Pacific are 92 percent of the national average, despite the fact that students complete a four-year program in 36 months. The clinical hours are actually slightly more



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than the national average, and students rank fifth or sixth among American dental schools in total (fee-adjusted) productivity. The comprehensive patient care clinical model ensures that students learn patient management as well as technical skills.

Students are expected to show readiness to practice by means of a series of competency evaluations and test cases throughout their clinical career. In addition to these evaluations, the average student will complete 60 complete examinations, 50 periodontal procedures, 140 surfaces of operative, 18 fixed units, 10 pieces of removable, 10 root canal procedures, and 40 surgical procedures.

The students are also exposed to most of the latest developments and changes in the practice of dentistry so

they may function at a high level when placed in the community. They are using laptops with electronic records including digital radiography, photography, and educational programs such as CASEY. There is an esthetic clinic and students also have the opportunity to treat patients in more advanced procedures such as implants and Invisalign.

Practice Management

The curriculum in dental management sciences extends through all years of the curriculum. Modules on the art and science of communication and patient management are introduced in the first year in the "Introduction to Clinic" course. An intensive, seminar-based course on ethics with guest practicing dentists at every session is scheduled during the second year.

Many of today's current topics: discrimination, patient and dentist autonomy, reporting requirements regarding child abuse and gross and negligent treatment, advertising, informed consent, and dual relationships are introduced. In the senior year, courses in dental law and dental practice are presented. In the practice management course, students are required to develop a business plan for opening and operating a solo dental practice. Demographic and economic information are required. A course in critical thinking has been introduced to equip graduates to be able to evaluate research and the science behind the marketing of dental products.

The course on dental practice runs for six months during the senior year and includes several topics and projects directed at helping students succeed in the practice of dentistry whether in private solo practice, military service, or public health. Topics covered in this course include communication, staff management, financial management, and operations. In the most recent survey of seniors, a national questionnaire administered to graduating students across the country, 27 percent felt that they were not prepared for practice management.² Because of this data, Pacific dental students are given this two-quarter course and they are also asked to do several projects like writing an office philosophy and mission statement, creating an updated curriculum vitae, writing a personal budget, writing a business plan, including all of the financial forecasts, such as the pro-forma income statement. Students are learning about balance sheets and beginning to understand what it takes to manage a dental operation. At Pacific, 4 percent feel unprepared in practice management.

This training in practice management prepares graduates for the economic realities of dentistry. In a recent article in the *Journal of the California Dental Association*, it was reported that

Ways Dental Practice Differs Now From Even a Few Years Ago

- Reduced public funding for all health care, including dentistry
- Increased cost of health care
- Public demand for esthetic care
- Increased numbers of the U.S. population with limited or no access to health care
- The explosion of clinical and translated science and the need to integrate into the delivery of dental care
- Diversity of the U.S. population, lack of diversity within the health care professions
- Need for the integration and expansion of resources for clinical and translational research
- The need for better evidence regarding the benefits, risks, and costs of alternative oral health procedures
- Alternative dental delivery systems
- Integration of foreign-trained professionals into the U.S. health care delivery system
- The training, use and integration of auxiliaries, particularly dental auxiliaries, into the delivery system
- Increased cost of dental education and the decrease of qualified faculty
- The supply and distribution of the dental work force
- The increasing annual net income of dentists

there is no relationship between educational debt of Pacific graduates and unusual practice profiles that might be related to overtreatment.³

Leadership

Part of the mission statement at Pacific speaks to the importance of leadership. All professions involve some degree of autonomy and personal responsibility. Dentistry is one of the few that is built on a model of individual leadership in one's practice and collective leadership through organized dentistry.

Students are enrolled in several clinical programs that judge their technical competency and also are graded on patient management and productivity along with clinical judgment. These grades are given through an evaluation of overall management of patient care, continuity, proper follow up, communication, productivity, etc. Each student class is divided into four groups with a group practice administrator who oversees all of their clinical activities and a team of generalists who work with the specialist faculty in overseeing the treatment of patients in their group. In this way, students have a closer relationship with their attending faculty mentors.

Leadership is a topic that is learned outside of the formal curriculum. Students will enter the program with a variety of skills, but they are all exposed to the fact that they will be expected to fill a leadership role at some point in their career. The support of student government is strong with the associate dean for Administration as the main adviser. The students are actively involved in various activities throughout their program in school and they are also strong leaders outside in a local and national setting. Some recent examples have included:

- American Student Dental Association speaker of the house,
- American Student Dental

Association administrative extern,

- American Student Dental Association national delegate of the year,

■ American Student Dental Association editor-in-chief,

■ Seventeen students participating in American Student Dental Association Lobby Day,

■ Student member of California Dental Association 1201K holding company,

■ Students presenting at national meetings, such the Hinman, and

■ Students winning top three positions in California Dental Association and national research competitions.

ties such as screenings, presentations and educational sessions for children, families and senior citizens in the San Francisco Bay Area.

SCOPE's objectives as stated in their mission are to:

■ Organize and implement student-initiated projects designed to improve the students' knowledge and experience in serving the diverse community members and their oral health needs,

■ Promote involvement of students, residents, dental school faculty, dental school alumni, and community dentists in oral health community service projects,

PROGRESSION TO the **PROFICIENT** and **EXPERT LEVELS**
WILL HAVE to TAKE PLACE IN a **LARGELY SELF-DIRECTED LEARNING**
ENVIRONMENT AFTER GRADUATING from
DENTAL SCHOOL.

Learning Community Involvement

Professionals serve. The most noteworthy of these activities for teaching service at Pacific is the community outreach group called SCOPE. The student-run community outreach program at Pacific was started in 1993 with the help of a small group of students, staff, and faculty who were interested in giving back to the community and making that a part of their professional development. There were a few health fairs for children with the focus being on educating the public in proper oral care. The Student Community Outreach for Public Education program is a student-run organization at the University of Pacific, Arthur A. Dugoni School of Dentistry in San Francisco. The mission is to involve students and faculty in oral health projects directed toward community needs. Today, students take an active role in selecting and organizing activi-

■ Establish a peer-mentoring system at the dental school for students to lead, prepare and to continue outreach projects year after year,

■ Provide disease prevention, oral health education, screening, and preventive services to underserved members of the San Francisco Bay Area community, and

■ Emphasize the life-long role of dental professionals in the promotion of oral health at both the individual and community level.

SCOPE also helps foster a sense of community health awareness and civic pride in Pacific dental students, a characteristic that will follow them through graduation into private practice. Students are also enrolled in a course during their third year that includes more than 20 extramural rotations to expose them to a more diverse group of patients and communities. These rotations also expose students to different techniques and shorter

appointments. Students complete these rotations and perform a reflective exercise and participate in pre- and postrotation seminars to help process and internalize the learning experiences.

Pacific students, according to the ADEA's survey of seniors, value their extramural experiences and believe they affect practice intentions. They are one-third to two-thirds as likely, compared to dental students nationally, to rate their extramural rotations as poor in quality or to find problems with the quality of care provided there. They are 10 percent more likely to strongly agree that access is a major problem for patients and feel prepared and willing to treat diverse patient populations.

Ready for an Ever-Expanding Profession

The challenges facing dentistry are expanding at an ever-increasing rate. In

today's world, learning cannot stop at the competency level which is achieved at graduation. If anything, learning has been found to be a continuous process. Progression to the proficient and expert levels will have to take place in a largely self-directed learning environment after graduating from dental school. We must, in the future, develop a system after dental school based upon curriculum, competencies, and measured outcomes, which can become the basis for continued competency and quality assurance. Learning paths and programs after graduation will become just as important as curriculum in dental school for this lifelong process we call "continuous professional development."

The challenge for dental education is to evaluate and foresee these trends and then translate this into curriculum to prepare the graduate to operate and be

successful in this changing environment. The professional of the future must be prepared to identify, analyze, and internalize changes in the profession. **CDA**

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EMERGING SCIENTIFIC ADVANCES: HOW DO THEY ENTER DENTAL CURRICULA AND THE PROFESSION?

Charles F. Shuler, DMD, PhD

ABSTRACT

What is meant by emerging scientific advances? In brief, this terminology is equivalent to new research findings, however, the term "research" is often associated with scientific investigations that have very limited direct clinical relevance. Unfortunately, basic dental research and dental clinical practice have, in many instances, been considered to have nonoverlapping spheres of existence. The existence of mutually exclusive domains is rapidly changing with considerable translational activities between basic research investigation and clinical application developing.

There is a growing emphasis at a national level for the importance of moving basic biomedical research laboratory findings into clinical patient-related applications to realize improvements in health based on the research findings.^{1,2} Ultimately, new approaches to diagnose, treat, and prevent disease will be available and represent the translation of the best scientific evidence into clinical applications. It is critical at this time to prepare our dental graduates to be members of the dental profession who will understand the implications that new scientific advances will have on their approach to patient care. The patterns and practices of oral health care delivery will undergo major changes during the careers of our new dental graduates. They need to be prepared to respond to these changes to the benefit of their patients.

Students graduating from dental school this year will be completing their predicted 40-year careers in 2045, and there is no doubt the profession will be vastly different from the one they entered upon graduation. The likelihood of these dramatic changes can be appreciated when the state-of-the-art of dentistry in 1965 is compared to 2005, a time-frame reflective of a typical dental career. **Table 1** lists some of the products advertised in the *Journal of the American Dental Association* in 1965. Each of these products was important in dental care for patients and included in the dental curricula of the time, yet, during the past 40 years, new advances have replaced each one. Reviewing any current dental journal, it is clear there exists new diagnostic aids, new dental materials, new strategies for prevention, and new therapies that could not have been envisioned by dental curricula or dental practice 40 years ago. During this time, dental practitioners have been required to make informed decisions to change their approach to patient care based on the best scientific evidence. Importantly, each prod-



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uct or technique, both old and new, was developed on a base of scientific investigation that supported their use in oral health care. Basic research and translational clinical research were necessary to validate the technology and introduce it into routine oral health care. Establishing a basis for incorporating new approaches to patient care requires that dental curricula provide the foundation for understanding the implications of scientific advances and interpreting the claims made for new approaches to improve oral health. Continuous review of dental curricula

by faculty and curriculum committees is essential to ensure the curricular content is current and at the cutting edge of evidence-based knowledge. Dental curricula also needs to establish the importance of lifelong learning and the critical-thinking skills required to make the decisions to incorporate a new finding into routine practice following graduation. Thus, dental curricula need to address both specific curricular content areas and individual professional behaviors that will facilitate adaptation to the changes occurring throughout a professional career.

Why Should Dental Curricula Prepare Graduates for a Future of Change?

In 1965, Dr. A.R. Baralt wrote, "There is no question the new dentist is capable of conducting himself professionally and ethically while he sets about establishing a practice, but he does not believe for one minute that he has learned everything he needs to know. He must continue to learn."³ He also quoted Dr. P.E. Blackerby that "With the continual expansion of knowledge brought about by research, the dental practitioner must strive constantly to keep himself and his practice methods fully up to date, in order that his patients may receive the modern dental service to which they are entitled."³ Both of these individuals recognized that changes in dentistry were inevitable and dental professionals needed to continue their learning to provide oral health care at the highest standards. It becomes clear dental curricula must provide the content that will serve as a foundation for understanding the scientific advances that will occur. This can be achieved by continuous curricular review and comparison of the content with the evidence base that has been created through scientific investigation. Similarly the curricula should be continuously reviewed to ensure the behaviors of lifelong learning and critical-thinking skills are included to prepare graduates for the changes that will occur during their careers. Determining the foundation content that should be included in the dental curriculum requires careful attention to the likely growth areas in scientific understanding that would be applicable to oral health care. An important resource for predicting future research findings is to examine the planning completed by federal agencies that have responsibility for public health and federally supported research to improve health. The U.S. surgeon general in 2000 completed a landmark analysis of

Table 1

1965 Advertisements in the *Journal of the American Dental Association*

Luxene vinyl crown and bridgework
"Cold" sterilization trays
Belt-driven dental handpieces
Achatite — silicate restorative material
Steele's facings
Electro-mallet gold foil condenser
Unacaine anesthetic (metabutethamine HCl)
Karidium fluoride tablets
DI-LOK trays for dies
Zactirin analgesic tablets (ethoheptazine citrate and aspirin)

Table 2

Major Findings of *Oral Health in America: A Report of the Surgeon General*

Oral health is more than healthy teeth.
Oral diseases and disorders in and of themselves affect health and well-being throughout life.
The mouth reflects general health and well-being.
Oral diseases and conditions are associated with other health problems.
Lifestyle behaviors that affect general health such as tobacco use, excessive alcohol use and poor dietary choices affect oral and craniofacial health as well.
Safe and effective measures exist to prevent the most common dental diseases — dental caries and periodontal diseases.
There are profound and consequential oral health disparities within the U.S. population.
More information is needed to improve America's oral health and eliminate health disparities.
Scientific research is key to further reduction in the burden of diseases and disorders that affect the face, mouth and teeth.

oral health, "Oral Health in America: A Report of the Surgeon General" that contained nine major findings (Table 2).⁴ Importantly, the last two of these findings, "More information is needed to improve America's oral health and eliminate health disparities," and "Scientific research is key to further reduction in the burden of diseases and disorders that affect the face, mouth and teeth," are directly linked to the generation of new scientific evidence that will be applied to oral health problems. In 2003, the surgeon general developed the "National Call to Action to Promote Oral Health" that established a plan to address the oral health needs identified in the 2000 report.⁵

Five action items were identified (Table 3) and the generation of new knowledge through scientific investigation was deemed critical to achieve the goals of the "Call to Action." The U.S. surgeon general has now identified the importance of oral health and the necessity for new scientific advances to improve the oral health of Americans. These observations have been embraced by the National Institutes of Health in the development of their roadmap.^{1,2} As stated, "The NIH roadmap is an integrated vision to deepen our understanding of biology, stimulate interdisciplinary research teams and reshape clinical research to accelerate medical discovery and improve people's health."^{1,2} The NIH roadmap consists of three themes and multiple specific emphases within each theme, which illustrate the commitment of the NIH to translating basic biomedical research findings into clinical therapies (Table 4). Future research funding provided by the NIH will be focused on these roadmap themes, with new scientific advances sure to follow and fundamentally change the ways in which disease is diagnosed, treated, and prevented. The management of dental curricula requires a process to ensure this new knowledge is included. This means there will be a need to incorporate the

Table 3
National Call to Action to Promote Oral Health
Action 1. Change perceptions of oral health.
Action 2. Overcome barriers by replicating effective programs and proven efforts.
Action 3. Build the science base and accelerate science transfer.
Action 4. Increase oral health work force diversity, capacity and flexibility.
Action 5. Increase collaborations.

Table 4
NIH Roadmap Themes and Thematic Emphases
New pathways to discovery
Building blocks, biology pathways and networks
Molecular libraries and molecular imaging
Structural biology
Bioinformatics and computational biology
Nanomedicine
Research teams of the future
High-risk research
Interdisciplinary research
Public-private partnerships
Re-engineering the clinical research enterprise
Clinical research networks/NECTAR
Clinical research policy analysis and coordination
Clinical research work force training
Dynamic assessment of patient-reported chronic disease outcomes
Translational research

appropriate foundation knowledge so that graduates are able to understand the implications of new discoveries, and an emphasis of the development of learning behaviors applicable during a professional career.

What Types of New Scientific Advances in Oral Health Care Will Require Changes in Curricular Content?

It is impossible to completely predict the future, but there is information that allows judgments to be made with respect to likely new advances. Using this information as a guide, the curricular content areas can be identified to assist the students to build a foundation of scientific information suitable for their professional careers.

Faculty on curriculum committees and during the periodic process of dental school accreditation consider the directions of the profession and the impact new knowledge will have on dental education. In this regard, the planning activities of the National Institute of Dental and Craniofacial Research represent an excellent resource to anticipate new developments in research that will lead to new approaches to patient oral health care. The NIDCR works with scientists and clinicians to develop research concepts that will represent the focus for grant funding in the future (Table 5). The 10 concepts generated by the NIDCR in 2004-2005 represent a range of oral health topics related to diagnosis, pathogenesis, therapeutics, and prevention. Many of these new

Table 5**NIDCR Research Concepts Generated in 2004 and 2005**

Drug delivery systems for treatment of orofacial disease
Protein profiles of the oral mucosal tissues in the context of HIV/AIDS
Sjögren's Syndrome: A model complex disease
Development of technologies for saliva/oral fluid-based diagnostics
Building a tooth: Bridging biology and materials science
Role of neuronal/glia cell interactions in orofacial pain disorders
Validation of new technologies for clinical assessment of tooth surface demineralization
Clinical research on osseointegrated dental implants
Oral complications of cancer treatment
Novel approaches to study polymicrobial diseases

research initiatives will investigate the specific problem areas using molecular genetic techniques and, in some cases, examine the problem using embryonic stem cells. The availability of the DNA sequence of the human genome represents a remarkable achievement that has provided a wide range of new opportunities to advance oral health care.^{6,7} Evaluation of genetic etiologies and genetic risks in patients will ultimately allow patient care to be planned that is unique for each individual and based on both the specific genetic background of the patient and the molecular pathogenesis of the disease. Already it has been shown that saliva is a valuable diagnostic medium and that genetically induced changes in the constituents of saliva can alter the risk for dental caries.⁸ Genetically based diagnostics, such as tests of saliva will be available soon. The use of any specific future test is difficult to incorporate into a current dental curriculum. However, since the genetics represents the foundation many types of tests that will be developed in the future, it becomes ever more important that foundation knowledge in genetics be integrated throughout dental curricula. The development of new diagnostic tests will be valuable for diagnosis, treatment, and prognosis, however, the NIDCR has therapies based on scientific advances. One remarkable example is

a new research initiative launched by the NIDCR with the goal to regenerate a tooth, an interdisciplinary program of research that will include molecular biologists, biomedical engineers, materials scientists, and clinical investigators. The potential results from this initiative include the production of a vital tooth that could be used to restore edentulous areas and the development of biomimetic restorative materials consisting of dental enamel. Additionally, California has created a remarkable opportunity with the stem cell research initiative to use these unique cells to create cells, tissues, and organs that could lead to dramatic new approaches to patient treatment.⁹ These diagnostic and therapeutic advances are made possible by the availability of the human genome and represent only the initial steps to tap this remarkable resource. The future use of the human genome to address the health needs of patients requires that dental curricula include a foundation in human genetics, and cell and molecular biology sufficient to understand the basic principles for new diagnostic and therapeutic modalities. It will also require that students develop expertise in finding recent, relevant literature and interpreting the outcomes to make the critical decisions to incorporate new approaches into routine practice.

Which Behavioral Skill Sets Will a Dental Graduate Need for the Future to Evaluate Scientific Advances?

There has been an explosion in new knowledge in the past decade, and the growth in information technology ensures an ever-more rapid dissemination of scientific advances. As information sources have progressed from books to journals, and now Internet-based materials, the ease of posting findings has created another problem, critically evaluating the material. While the availability of information has never been greater, the quality of the information is not always either consistent or reliable. This requires students and professionals to conduct careful reviews of the information and make informed judgments, yet these skills may not necessarily have been developed in current curricula. The linkage between scientific evidence and clinical care was a point of concern identified in the IOM report of 1995, "The basic and clinical sciences do not adequately relate the scientific basis of oral health to clinical practice."¹⁰ Finding and critically evaluating information becomes a professional behavior to be included in the curriculum and skills that will be necessary throughout a professional career. Developing curricular elements that require students to review literature as an integral component of the pedagogy becomes a key consideration as curricula are updated. The National Academy of Sciences has completed an evidence-based analysis of learning, "How People Learn: Brain, Mind, Experience and School" that provides considerable insight into the development of effective learning skills.¹¹ The power of learning through inquiry has been shown to be an effective strategy to help students learn to ask the appropriate questions and identify the best sources to answer these questions. Often, students rely principally on textbooks during the course of study, however, even the very best textbooks may be two

or more years out of date due to the publishing lag time. It will become increasingly important for students to develop learning behaviors that move away from the static nature of textbooks to the much more dynamic environment of journals and online resources.

Curricular revisions to include the dynamic aspects of information will be critical to developing the appropri-

been shown to be a very powerful method.¹¹ The professional behaviors necessary to adapt to the future changes in the profession can be developed simultaneously with the growth in basic content foundation knowledge. The graduates would then understand the limits of current knowledge and have the skills to continue to identify the most current scientific advances.

can be predicted. It is essential dental students develop the foundation content and the professional behaviors that allow them to provide the finest quality oral health care to their patients during their career. **CDA**

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ate behaviors for a professional career. Patients have access to this information and will be searching for information and answers, which requires the oral health professional to be prepared to respond to the patient's queries. Structuring a curriculum using real-life patient problems as the stimulus for inquiry and the foundation for learning begins to build the skills necessary for a career.¹² One approach to utilize potential future clinical encounters as the prompt for inquiry-based learning is through the use of a problem-based learning pedagogy.¹³⁻¹⁶ PBL requires the students to learn to ask relevant questions about a clinical situation they have never previously encountered, identify the resources to answer the question, and apply the new information to better understand the patients signs and symptoms. Decisions about the patient case being analyzed are based on the best available evidence and it becomes clear that the state of knowledge is dynamic. Learning curricular content in a manner that best approximates the future use and application of the knowledge has

The rate of change in the dental profession in the next 40 years is certain to exceed that of the past 40 years. Advances in diagnosis, treatment, and prevention are certain to arise from new discoveries in cell and molecular biology based on the information contained in the human genome and the potential of embryonic stem cells. To allow future practitioners to adapt to the coming changes requires they possess foundation knowledge in genetics and cell biology in order to understand the scientific evidence that will be produced. The changes in the future also will require oral health-care professionals to find and evaluate information. This will require the development of inquiry skills and critical-thinking skills that can be generated during the dental school curriculum by using a pedagogy that allows students to appreciate the dynamic changes in knowledge. It is not possible to absolutely predict the specific scientific advances that will occur in the future, but based on the best available information, the areas most likely to have impressive advances

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Can We Talk?



A \$900 root canal treatment can never compete with almost anything else.

entists love to talk. Even though we don't get paid for it as lawyers or talk show hosts do, we can't help it. There are three reasons for acquiring information: some people want to know it, some want to use it, but most want to tell it, or think they have to. No sooner does a newly minted dentist, keen as mustard, get a captive, fee-paying audience, than the eight years of accumulated dental lore bursts forth like a breached Louisiana levee.

Dentistry can be a hard sell. A \$900 root canal treatment can never compete with almost anything else. Gum surgery appeals only to masochists. Salesmen for cemetery plots have an easier pitch. As a rule, patients are of one mind, i.e., get in, get it over and get out. We are not their bosom buddies, our offices are not a Starbucks in which to hang out. If the new dentist hasn't already learned this in school, his patients will soon make it clear.

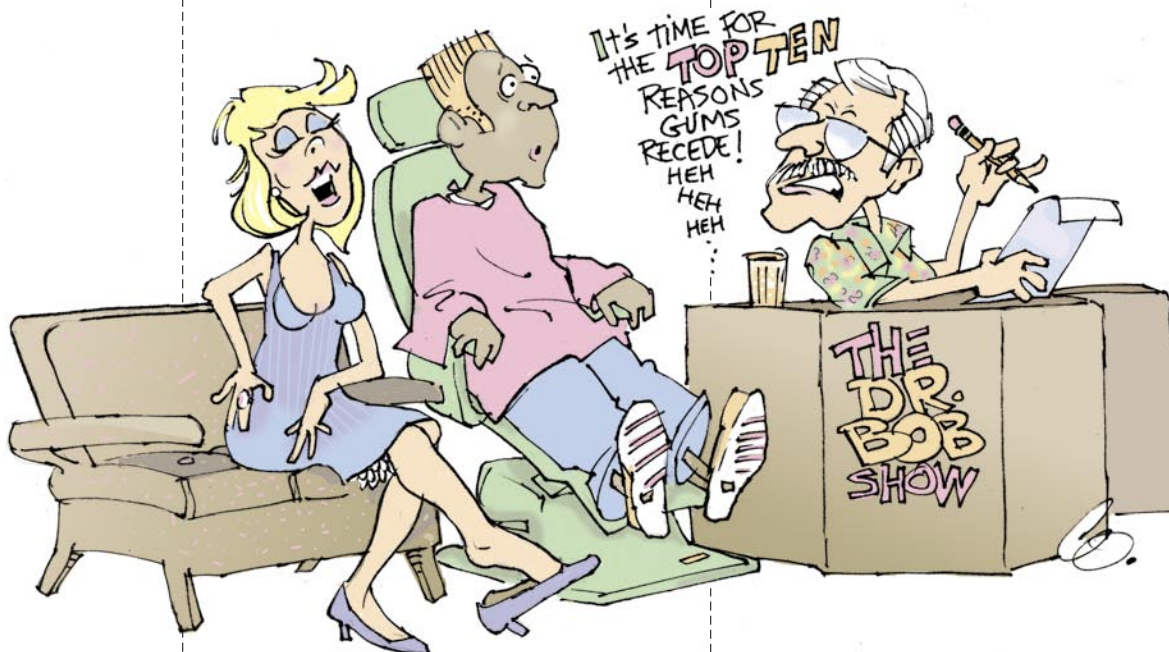
"How does that feel when you bite together?" he asked anxiously.

"Just fine," mumbled the patient, briefly aroused from his catatonic silence. "Fine, fine, feels just fine," he bleated like a sacrificial lamb as he used both hands to debib himself in a transparent effort to hasten the exodus.

There was a time in our history when dentists cut an authoritative figure. Marketing was a chore done on Saturday to lay in groceries for the week. It was a time when there were fewer modalities, therefore fewer explanations. We wore white coats and serious frowny expressions. If we said something was needed and this was the way we were going to handle it, then, by the authority invested in us under the laws of the State of California, that was it. Now, of course, that is *not* it.

As Jefferson once noted, "It is the trade of lawyers to question everything, yield

Continued on Page 829



Checking the patient's eyeballs for evidence of TMI glazing is as important as checking his other vitals.

Continued from Page 830

nothing and to talk by the hour." Two legal concepts have forced even those few taciturn dentists clinging vainly to their vanishing Olympian position to babble on like a filibustering senator.

"Informed Consent" and "Second Opinion" are the twin progenitors of the current source of TMI (too much information) in the dental office. Take a relatively simple requirement of restoring a molar with a least three surfaces involved. Obviously, the patient cannot give his informed consent until we've outlined every available option known to present-day dentistry, including the nature of the restorative materials, their cost, durability and chances of taking 10 years off his or her age. A conscientious dentist with a genius for inducing tedium can spend upward of two hours just getting through the basics and that precludes the patient asking questions. The "Q and A" session could easily add another hour of interrogation during which he might ask for the key to the restroom and never return. This is an unacceptable risk.

Checking the patient's eyeballs for evidence of TMI glazing is as important as checking his other vitals. He has to be sufficiently conscious to sign the informed consent form, to initial the take-home brochure that expatiates in depth everything we have already said, plus fetching candor of all the down-

sides to every option.

If our narcotized patient, visibly bleeding from both ears and staggering under the labyrinthine information overload, should have the temerity to plead, "You're the doctor. Do whatever you think is right," we are in big trouble. The white coat and corduroy forehead are not going to cut it anymore.

Time to recommend the second opinion option. Get him out the door and into the hands of another practitioner. This worthy effort may offer the same information, in which case the patient might just as well stay in that office since we are both in agreement. Or he might get an entirely new set of recommendations that now indicate a third, or even a fourth consult if he is to be really, really informed. One doesn't give one's consent lightly.

We know few dentists who are paid to just consult. We know even fewer patients who are willing pay for information without the accompanying laying on of hands. "Billable hours" is a concept not readily adaptable to dental offices. Why not? Because insurance companies say so and because dentists love to talk and would feel guilty for taking money without implementing thousands of dollars worth of dental equipment. We need to find out how lawyers get away with this. If it weren't

for the palpable uneasiness of having a lawyer for a patient, we might learn if billable hours could work for us. **CDA**