

COUNCIL ON DENTAL EDUCATION AND LICENSURE

2011 PERIODIC REVIEW
OF
DENTAL SPECIALTY EDUCATION AND PRACTICE

**COUNCIL ON DENTAL EDUCATION AND LICENSURE
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TO THE ADA HOUSE OF DELEGATES**

Background: In 1992, the ADA House of Delegates adopted Resolution 144H-1992 directing the periodic (every 10 years) review of dental specialty education and practice beginning in 2001. In 2001, the Council on Dental Education and Licensure conducted the review and forwarded its recommendations to the House of Delegates. The 2001 House of Delegates accepted the report and adopted the following resolutions:

20H-2001. Resolved, that the appropriate Association agency continue to conduct a periodic review of dental specialty education and practice at ten-year intervals, and be it further

Resolved, that the next periodic review of dental specialty education and practice be presented to the 2011 ADA House of Delegates.

21H-2001. Resolved, that the sponsoring dental specialty organizations and ADA recognized dental specialty certifying boards be urged to continue to monitor the number of specialists who are board certified and identify ways to increase the percentage of specialists who seek and achieve board certification in light of dental specialty faculty shortages and the Commission on Dental Accreditation's standard requiring that program directors of advanced dental specialty education programs be board certified.

In carrying out the House directive for such periodic reviews, the Council hopes to gather strategic information that will be of value to the Association, the dental specialty organizations, the profession and the public. This review focuses on changes occurring within the specialty education and practice environments, e.g., disease trends, technology, scope of practice, program enrollments, and demographics. It addresses the current environment as well as potential trends for the future and how these may impact the public and the profession. The Council believes that the input and self-assessment presented by each of the specialty organizations was essential in providing this report to the House of Delegates.

CDEL Activities: For the 2011 Periodic Review, members of the Council and its Committee on Recognition of Specialties and Interest Areas in General Dentistry began by reviewing with the leadership and staff of the recognized dental specialty organizations and certifying boards the purpose of the 2011 Periodic Review of Dental Specialty Education and Practice. They shared the template used by the Council in the conduct of the 2001 Review and indicated that a similar format would be followed for the 2011 Review. Representatives of the specialty organizations had few comments on the review process and were pleased to learn that the format used in 2001 would be repeated.

The following dental specialty organizations submitted reports: American Association of Public Health Dentistry (AAPHD), American Association of Endodontists (AAE), American Academy of Oral and Maxillofacial Pathology (AAOMP), American Academy of Oral and Maxillofacial Radiology (AAOMR), American Association of Oral and Maxillofacial Surgeons (AAOMS), American Association of Orthodontists (AAO), American Academy of Pediatric Dentistry (AAPD), American Academy of Periodontology (AAP) and American College of Prosthodontists (ACP).

At its November 2010 Meeting, CDEL conducted a preliminary analysis of the reports. The Council noted that overall membership in the dental specialty organizations has increased in the

last ten years. The increase appears to be due to several reasons, including growth in the number of advanced specialty education programs and increase in the number of program graduates. However, the increase also may be due to the establishment of new membership categories within the dental specialty organizations. The Council noted that some of the organizations have a myriad of membership categories for non-dentists and non-specialists. The Council considered the potential implications of the organizations' broad membership eligibility categories in relation to Requirement 1(a) of the Requirements for Recognition of Dental Specialties (appended), i.e., the specialty "must be represented by a sponsoring organization (a) whose membership is reflective of the special area of dental practice..."

The Council also considered a letter from Dr. Robert Bitter, president-elect of the Illinois State Dental Association. Dr. Bitter raised several questions about the membership categories and numbers of dental public health dentists who are members of the American Association of Public Health Dentistry.

In January 2011, CDEL contacted each specialty organization requesting additional information by February 28, 2011. The Council requested definitions of each membership category, privileges (voting and holding office) of each category and the number of members in each category. The Council asked that each organization provide information on the total number of practitioners of the specialty in the United States, the total number of members in the specialty organization who are specialists and the total number of specialty members who are diplomates in the specialty (Table 5). Lastly, the Council urged the organizations to review their initial reports related to strategic planning and research and submit any updates, as appropriate.

In April 2011, the Council carefully reviewed the supplemental information submitted by the organizations. The Council approved the following 2011 Periodic Review of Dental Specialty Education and Practice and directed its transmission to the 2011 House of Delegates.

I. GENERAL INFORMATION AND DEMOGRAPHIC DATA OF THE SPECIALTIES

History of Dental Specialties: As noted in Table 1, in 1947, the ADA formally recognized five dental specialties, oral and maxillofacial surgery, orthodontics (now known as orthodontics and dentofacial orthopedics), pedodontics (now known as pediatric dentistry), periodontics and prosthodontics. Oral and maxillofacial pathology was recognized shortly after in 1949, followed by dental public health in 1950. Endodontics was recognized in 1963; oral and maxillofacial radiology in 1999.

Table 1: History of ADA Recognized Dental Specialties and Dental Specialty Certifying Boards

	Date Specialty Recognized by ADA	Date Specialty Re-Recognized by ADA	Date Specialty Board Recognized (by CDEL)	Founding Date of Certifying Board
Public Health Dentistry	1950	1986	1951	1950
Endodontics	1963	1989	1964	1964
Oral and Maxillofacial Pathology	1949	1987	1950	1948
Oral and Maxillofacial Radiology	1999	N/A	2000	1979
Oral and Maxillofacial Surgery	1947	1988	1947	1946
Orthodontics and Dentofacial Orthopedics	1947	1989	1950	1929
Pediatric Dentistry	1947	1990	1948	1942
Periodontics	1947	1988	1948	1940
Prosthodontics	1947	1987	1948	1946

Source: ADA Annual Reports and Transactions 1947-2000

Professionally Active Dental Practitioners: Since the 1940s, the dental profession has recognized the value of dentists who seek advanced education, specializing in one area of

dentistry. Today, approximately 20% of dentists identify themselves as dental specialists. Based on ADA Survey Center data, there has been little change from 1991 - 2008 in the percentage distribution of all professionally active dentists in the U.S., as illustrated in Table 2. The data reflects that the ratio of general dentists to specialists has remained constant over the last two decades. The number of specialists most likely will increase, but not dramatically, in the near future.

Table 2: Percentage Distribution in U.S. of All Professionally Active Dentists*

GP/SPECIALISTIST	1991 N=150,762	1998 N=149,337	2008 N=181,774
General Practice	79.4%	79.4%	78.9 %
Public Health Dentistry	0.82%	0.7%	0.8%
Endodontics	2.0%	2.3%	2.6%
Oral and Maxillofacial Pathology	0.25%	0.2%	0.2%
Oral and Maxillofacial Radiology			0.1%
Oral and Maxillofacial Surgery	4.2%	4.0%	3.9%
Orthodontics	5.9%	5.8%	5.6%
Pediatric Dentistry	2.4%	2.5%	3.2%
Periodontology	2.9%	3.0%	2.8%
Prosthodontics	2.2%	2.0%	1.8%

Source: ADA Survey Center—"Distribution of Dentists in the U.S. by Region and State"—1991, 1998 and 2008

*Includes private practitioner, dental school faculty or staff, armed forces dentist, government-employed dentist, graduate student, intern or resident, or other health and dental organization staff member. Further, the distributions reported in this table reflect dentists' self-reported area of practice rather than whether they were specialists in an ADA-recognized special area of practice by virtue of meeting licensure, education, diplomate or grandfather requirements.

Specialty Membership and Certification: Overall, membership in the specialty organizations increased from 42,264 members in 2001 to 53,422 members in 2009, representing an overall increase of 26% in membership. Four of the nine organizations require their dentist-members to be members of the American Dental Association:

Organization	ADA Membership Required?
AAPHD	No
AAE	Yes Active, Associate, Educator
AAOMP	No
AAOMR	No
AAOMS	No
AAO	Yes
AAPD	Yes
AAP	Yes Active, Associate, Educator
ACP	No

Several of the organizations have redefined the criteria for membership to include residents, retired specialists and various dentist, non-dentist or non-specialist categories. These changes have expanded each specialty's base and strengthened each organization. Table 3 reflects the

nine recognized specialty organizations' general membership figures over the last ten years, as reported by the organizations.

Table 3: Overview of Membership in Dental Specialty Organizations

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000-09 change
AAPHD	616	605	761	713	917	809	901	911	1113	1265	100%
AAE	5,337	5,718	6,204	6,468	6,586	6,665	6,947	7,008	7,063	7,219	35%
AAOMP	640	642	632	632	634	630	598	575	593	586	(8%)
AAOMR	345	347	335	312	328	319	274	294	301	317	(8%)
AAOMS	7,622	7,757	7,965	8,163	8,192	8,290	8,476	8,583	8,805	9,008	18%
AAO	13,649	13,678	13,811	14,372	14,732	14,907	15,261	15,437	15,594	15,972	17%
AAPD	4,528	4,620	4,841	5,724	5,905	6,311	6,547	7,007	7,374	7,665	69%
AAP	6,970	7,290	7,342	7,619	7,745	7,804	7,856	8,014	8,085	8,098	16%
ACP	n/a	2,718	2,499	2,641	2,535	2,779	2,812	3,025	3,141	3,292	21%

Three of the specialty organizations, AAPHD, AAE and AAPD experienced significant increases in membership. Membership in AAPHD has doubled in the last ten years and the organization attributes its increase to the establishment of student chapters. AAPHD's "primary" membership category, open to any qualified dental health professional with a primary commitment to dental public health practice, may also be a contributing factor. AAE cites the increase in advanced specialty education programs in endodontics and the creation of new membership categories as reasons for its membership growth. The growth in AAPD's membership is attributed to its merger with the American Society of Dentistry for Children (ASDC) as well as expanded membership categories that include predoctoral students and non-dental professionals.

Two associations have experienced a decrease in membership, AAOMP and AAOMR. AAOMP explains the decline in membership as a result of lost academic positions due to dental school closings and lack of funds to hire faculty who are oral pathologists. However, the AAOMP believes the trend will end as more new dental schools open in the next five years. AAOMR did not offer an explanation for the decrease in its membership.

The Council requested information on the gender and ethnicity of the membership in each of the specialty organizations. Six of the nine specialty organizations provided gender information (Table 4). Males represent the majority of members in the specialty organizations ranging from a low of 58% in AAPD to a high of 96% in AAOMS. Very little data was available related to ethnicity of each specialty organization's membership and not worthy of including in this report. The ADA is committed to increasing diversity in its membership, in dental education and in the profession as a whole. Accordingly, CDEL will encourage the dental specialty organizations to routinely track and report gender and ethnicity data.

Table 4: Gender of the Membership in the Dental Specialty Organizations

2009	Gender	
	Male	Female
AAPHD	NA	NA
AAE	80%	20%
AAOMP	73 %	37%
AAOMR	NA	NA
AAOMS	96%	4%
AAO	NA	NA
AAPD	58%	42%
AAP	81%	19%
ACP	81%	19%

The Council monitors ADA recognized specialty certifying boards' compliance with the ADA Requirements for Recognition of National Certifying Boards for Dental Specialists through annual reports provided by each recognized certifying board. The Council provided each

specialty organization with certification trend data collected via these annual reports. Each specialty organization was requested to review the certification data and provide comment on significant trends.

Table 5: Active Diplomates from 2000 - 2010

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2000-10 change
ABPHD	141	144	146	152	152	157	155	157	157	160	159	13%
ABE	725	744	707	739	762	776	792	788	815	831	846	17%
ABOMP	268	265	272	276	289	295	296	301	302	306	313	17%
ABOMR	95	95	95	93	94	96	97	98	100	106	110	16%
ABOMS	4,220	4,245	4,224	4,399	4,506	4,552	4,417	4,620	4,616	4,904	4,983	18%
ABO	1,933	1,922	202	2,008	1,994	2,640	3,111	5,139	5,164	5,034	4,858	151%
ABPD	1,177	1,221	1,278	1,337	1,355	1,404	1,668	2,056	2,383	2,726	3,100	163%
ABPerio	1,384	1,432	1,492	1,669	1,710	1,915	2,111	2,267	2,381	2,506	2,544	84%
ABProsthodontics	720	717	715	724	724	736	1,068	1,056	1,085	1,141	1,147	59%
Total Diplomates	10,663	10,785	9,131	11,297	11,586	12,571	13,715	16,482	17,003	17,714	18,060	70%

Source: CDEL's Annual Reports of the ADA-Recognized Dental Certifying Boards 2000-2010.

While not all specialists seek board certification, this number is increasing. The number of active diplomates grew from 10,663 in 2000 to 17,003 in 2008, representing a 59% increase. Four specialties, orthodontics and dentofacial orthopedics, pediatric dentistry, periodontics and prosthodontics have had significant increases due to changes in their board certification processes (Table 5).

In general, eligibility for board certification is based on the completion of an advanced specialty education program accredited by the Commission on Dental Accreditation (CODA) and experience in the field. To achieve diplomate status, all certifying boards require successful completion of a written examination; all but the American Board of Oral and Maxillofacial Pathology (ABOMP) require successful completion of an oral exam; six of the boards require either a case history presentation or clinical examination.

Specialty certifying boards are committed to increasing the number of specialists who are board certified and have made a number of changes in the eligibility pathways. Several boards have developed pathways to assist those specialists who have been in practice for many years to pursue diplomate status. All boards have made changes to make the certifying process more appealing to new graduates. In addition, the following boards have certification pathways for internationally trained specialists who are not graduates of CODA-accredited advanced specialty education programs: American Board of Dental Public Health (ABDPH), ABOMP, American Board of Oral and Maxillofacial Surgery (ABOMS) and American Board of Pediatric Dentistry (ABPD).

Maintaining the highest standards of practice is a goal of all nine dental specialty boards. Recertification of diplomates provides a mechanism to assure these standards are maintained throughout the specialist's career. Today, all of the certifying boards require recertification with each specialty certifying board determining its own process.

The Council believes positive steps have been taken by specialty organizations and certifying boards to increase the number of board certified diplomates in response to Resolution 21H-2001. All of the certifying boards have taken steps to make the certification process more user friendly. Further, all dental specialty certifying boards have policies in place requiring recertification.

After considering the overall membership and certification data, the Council then requested each organization to provide supplemental information on membership categories, membership privileges (voting and holding office) for each category and the number of members in each category. The Council asked that each organization provide information on the total number of practitioners of the specialty in the United States, the total number of members in the specialty organization who are specialists and the total number of specialty members who are diplomates in the specialty. Table 6 provides an overview of data collected. Table 7 notes that almost all of the organizations have non-specialist/non-dentist membership categories. Two organizations, the AAPHD and AAOMR, permit non-specialists/non-dentists to vote and hold office.

Table 6: Overview of Professionally Active Specialists, Members of Organizations and Diplomates

	Estimated Number of Specialists in US*	Total Membership of the Specialty Organization	Number of members who are US Specialists	Percentage of members who are US Specialists	Total Number of Members who are Diplomates	Percentage Of Members who are Diplomates
AAPHD	1,391	1,265	520	41%	168	32%
AAE	4,757	7,219	4,625	64%	1,082	23%
AAOMP	369	582	352	60%	285	81%
AAOMR	106	317	147	46%	93	63%
AAOMS	7,015	9,008	8,988	99%	5,146	57%
AAO	10,108	15,972	9,525	94%	4,858	51%
AAPD	5,800	7,665	5,239	68%	2,635	50%
AAP	5,136	8,098	5,058	62%	2,140	42%
ACP	3,293	3,292	2,685	82%	955	36%

*ADA Survey Center, Table 3a, Distribution on Dentists, 2008

Table 7: Membership Categories and Privileges

	Non-Specialist Membership Categories	Non-Dentist Membership Categories	Are Non-specialists/Non-Dentists eligible to vote?	Are Non-specialists/Non-Dentists eligible to hold office?
AAPHD	Yes	Yes	Yes	Yes
AAE	Yes	Yes	No	No
AAOMP	Yes	Yes	No	No
AAOMR	Yes	Yes	Yes	Yes
AAOMS	Yes	No	No	No
AAO	No	No	No	No
AAPD	Yes	Yes	No	No
AAP	Yes	No	No	No
ACP	Yes	Yes	No	No

The Council believes that the supplemental information provided by the dental specialty organizations and presented in Tables 6 and 7 indicates that the sponsoring organizations considered continue to meet the conditions set out in Requirement 1(a) of the Requirements for Recognition of Dental Specialties:

- (1) In order for an area to be recognized as a specialty, it must be represented by a sponsoring organization: (a) whose membership is reflective of the special area of dental practice; and (b) that demonstrates the ability to establish a certifying board.

The Council noted that while 46% of AAOMR's membership is comprised of oral and maxillofacial radiologists and 41% of AAPHD's membership is comprised of dental public health

dentists, AAOMR and AAPHD meet the spirit of the requirement. They are the sponsoring organizations representative of the specialties of oral and maxillofacial radiology and dental public health, respectively.

Strategic Planning: In order to understand what each specialty area envisions as its future role in improving and providing oral health services to the public, each ADA-recognized specialty was requested to provide its organization's mission statement, goals and strategic plan. The organizations were also requested to include a brief summary highlighting the specific areas and efforts undertaken to promote quality in the discipline over the last ten years.

The Council found each specialty organization's plan well conceived, providing direction for continued growth and development. The focus of the strategic plans is the promotion of education with the goal of increasing the quality of patient care. In addition, each specialty organization has unique goals related to its current practice environment, expanding technology and growing knowledge base.

The Council commends the dental specialty organizations for the leadership they have shown in their strategic planning efforts. Each of the specialties demonstrated that it has a process in place to secure its future viability. The Council urges the sponsoring organizations to continue these efforts.

II. MAJOR RESEARCH CHANGES AND TECHNOLOGY ADVANCES

Each specialty organization was requested to examine the impact of major dental research and new technology on the specialty over the last decade. Specifically, each organization was requested to list major research changes and major technology advances over the last ten years and provide an overview comment on how these changes and advances have affected the practice of the specialty. A summary of each specialty organization's response follows.

American Association of Public Health Dentistry

- Research on oral health disparities has resulted in the creation of multiple consortia with the aim of addressing high disease levels in numerous populations within the United States.
- There have been important developments in the integration of surveillance data at the national and state levels. At the national level, oral health data is continuously obtained through National Health and Nutrition Examination Survey (NHANES). At the state level, the Center for Disease Control (CDC) and the Association of State and Territorial Dental Directors (ASTDD) developed the National Oral Health Surveillance System (NOHSS) that monitors eight indicators of oral health. The national and state data supported the Surgeon General's Report on Oral Health, Healthy People National Objectives and documentation of disparities and inequalities in oral health status in the nation.
- There has been, and continues to be, an increase in research correlating oral health and systemic health.
- Genome-wide Association Studies (GWAS) of large populations has permitted rapid advances in identifying genetic disease risk.

American Association of Endodontists

- The AAE provided more than \$2.7 million in research grants over the past decade--the major contributing factor to the growth in research related to endodontics.

- The major research changes allow for more predictable endodontic clinical procedures, better outcomes for endodontic surgical and reparative procedures and better pain management.
- Probably no endodontic material has generated as much interest world-wide as mineral trioxide aggregate (MTA). Its uses were recognized from the beginning - root end fillings, perforation repairs, apical plugs and vital pulp protection; however, the properties and characteristics have only recently been more clearly understood. Recognized now as a bioinductive material, its role in stimulating hard tissue development (bone, cementum, dentin) has been elucidated with more clarity. Its application in vital pulp therapy is gaining momentum, to the extent that previous concepts regarding the pulp's ability to recover from bacterial exposure (e.g. carious and accidental exposures) is being re-evaluated.
- Significant data has emerged with respect to pain management and the value of supplemental intraosseous anesthesia and use of articaine.
- Growing understanding of endodontic microbiology has resulted in more effective biomechanical debridement protocols with expectations of improved clinical outcomes.
- Research has shown that the nature of organisms populating infected root canal apices is more diverse than expected.
- Research is ongoing in the areas of regenerative endodontics, revascularization and dental trauma.

American Academy of Oral and Maxillofacial Pathology

- Major research changes and technology advances can be categorized as:
 - a. Those related to applied and basic science aspects of oral and maxillofacial pathology;
 - b. Those related to the clinical management aspects of the specialty; and
 - c. Those related to the diagnostic histopathology aspects of the specialty.
- Molecular genetic studies are providing valuable understanding of oral soft tissue pathology.
- New and more effective pharmacologic agents are being developed to limit and in some cases eliminate a wide range of potentially debilitating autoimmune disease.
- Research has identified several new histopathologic lesions in the oral and perioral regions.

American Academy of Oral and Maxillofacial Radiology

- 2D imaging has had improvements in sensor technology, image processing and image enhancement software.
- 3D imaging--The greatest technologic advance of the last decade in oral and maxillofacial imaging came with the introduction of cone-beam computed tomography (CBCT).
- Current areas of research include image-guided surgical planning and treatment for the implant patient, image segmentation and registration, and CBCT image fusion with 3D photography.
- Systemic disease detection research during the last decade has demonstrated correlation of trabecular and cortical jaw architecture with the presence of systemic diseases such as osteoporosis and sickle cell anemia.

American Association of Oral and Maxillofacial Surgery

- Oral and Maxillofacial Foundation has funded more than 200 awards and projects, totaling \$9,100,000 between 1985-2010.
- Convened a significant number of research programs, included three Research

Summits (2005, 2007, 2009) with a fourth scheduled in 2011; one Young Investigators' Program (2009), with a second planned in 2011; two Clinical Trials Workshops at the University of Michigan (2008, 2010).

- Funded and participated in a major research study investigating the necessity of removing third molars and the affect on overall health.
- The Outcomes Assessment Project, initiated by AAOMS, was created to validate the quality and appropriate care provided by oral and maxillofacial surgeons.

American Association of Orthodontists

- Use of temporary anchorage devices (TADs) for control of tooth movement is one of the most significant changes in treating malocclusion.
- Improved availability of three-dimensional CBCT is providing orthodontists with "better eyes" to plan treatment for severely impacted canines and supernumerary teeth as well as better prediction of skeletal changes needed in craniofacial challenges of all types.
- American Journal of Orthodontics and Dentofacial Orthopedics (AJO-DO) has continued to improve its Impact Factor, while increasing the number of articles published.
- AAO is a specialty determined to be known by its recognition and understanding of "evidence-based practice." AAO participates regularly in ADA's Evidence-Based Dentistry (EBD) workshops, published editorials regarding evaluation of studies and speakers at AAO-sponsored programs are invited to give evidence-based presentations only.

American Academy of Pediatric Dentistry

- Advances in adhesive dental technology have radically changed restorative dentistry. New materials offer the possibility of improved esthetics, more conservative bonded restorations, less intrusive/aggressive preparation designs, fluoride releasing materials used for disease treatment, prevention and restoration.
- Chlorhexidine rinses and varnishes, fluoride varnishes, and remineralizing agents have been found to facilitate more conservative, cost-effective approaches to caries management through microbial control and remineralization.
- Data supporting the safety of conscious sedation with proper monitoring as well as research into numerous sedative agents and combinations of agents have produced a broader array of modalities and supported evidence-based decisions in choosing the proper agent for a given clinical situation.
- Genetic testing and counseling is now part of management of children with multiple missing teeth, enamel and dentin disorders and craniofacial conditions.
- Microbial mechanisms in early caries development and the importance of the transfer of oral flora from care-taker to child has led to research on more focused early prevention.
- Dramatic caries reductions seen in permanent teeth over the past four decades are not matched by caries reduction in primary teeth.

American Academy of Periodontology

- Research has demonstrated that a more significant relationship exists between the periodontal diseases and many systemic conditions than was ever conceived of previously.
- Research advances in bone metabolism (particularly osteoclastogenesis) and in the immunological/inflammatory fields and the recognition of their relationship (osteoimmunology) has led to a paradigm shift in understanding the pathogenesis of the periodontal diseases.
- Significant research and technological advancement has occurred in tissue regeneration.

- Major research and technological advancements include the area of tooth replacement with root form endosseous dental implants.
- Evidence is accumulating that periodontal disease can be viewed as one of many chronic diseases of aging that share inflammation as a common denominator.

American College of Prosthodontists

- The major research and technologic advances over the last 10 years that affect prosthodontics include remarkable changes in 1) (bio) informatics, 2) materials science, 3) imaging technology and 4) digital technology.
- CBCT of osseous structures, video-based imaging of soft tissues, and visible wavelength (and x-ray) based scanning technologies together permit the integrated three dimensional imaging of patients and related study casts.
- The ability to perform guided surgery using stereolithographic surgical guides made from CBCT images is one example of technologies that have the opportunity to improve tooth replacement therapies.
- An international consensus conference has identified the mandibular implant supported overdenture as the standard of care for management of the edentulous mandible.
- ACP sponsored in April 2010 a conference entitled "The Art and Science of Modern Dental Ceramics 2010" where 20 expert clinicians offered scientific fact and expert opinion regarding these matters.

The Council was impressed with the extensive, innovative and ground-breaking research the dental specialties have undertaken in the past ten years. Without exception, each dental specialty is creating new knowledge and new ways to apply this knowledge, resulting in better patient care. All of the specialty organizations reported that they publish journals and/or newsletters containing information on the practice of the specialty as well as scientific, research and educational articles.

III. TRENDS IN SPECIALTY EDUCATION

The Council requested that each specialty organization review summary data collected over the last ten years regarding the number of advanced specialty education programs, program enrollments, and faculty and provide overview comments on past or future education trends. Additionally, based on information provided by CODA regarding specialty education standards, the specialty organizations were requested to provide overview comments on future trends regarding this information.

Programs and Enrollments

Table 7: Number of Dental Specialty Education Programs

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Range
Public Health	18	15	14	13	13	13	13	12	10	10	10 – 18
Endodontics	48	50	51	52	52	53	53	53	53	54	48 – 54
Pathology	12	12	13	14	14	13	13	15	15	14	12 – 15
Radiology	4	4	4	5	5	5	5	5	5	5	4 – 5
Oral Surgery	101	100	102	100	100	100	99	100	100	102	99 – 102
Orthodontics	56	58	58	58	60	61	62	63	63	64	56 – 64
Pediatric Dentistry	57	61	65	65	65	67	69	73	74	74	57 – 74
Periodontics	52	52	52	52	53	53	53	54	54	54	52 – 54
Prosthodontics	48	48	48	47	46	46	44	45	45	45	44 – 48
Total # Programs by Year	396	400	407	406	408	411	411	420	419	422	

Source: ADA Survey Center, *Survey of Advanced Dental Education*, 2001-2010

According to the ADA Survey Center's 2009-2010 Survey of Advanced Dental Education, two-thirds of the 422 specialty programs are housed in dental schools while one-third are housed in facilities such as medical centers, hospitals and Veterans' Administration facilities. The overall number of dental specialty programs increased 7% between 2001 and 2010 from 396 to 422. Six of the specialties saw a small increase in the number of programs, and advanced specialty education programs in pediatric dentistry experienced a 29% increase in programs. Prosthodontics programs experienced a 7% decrease and dental public health experienced a 44% decrease in the number of programs in the specialty. The Council found the decline in dental public health programs concerning. However, enrollment has increased slightly. On the other hand, the renewed interest in training dentists to address access to care issues may lead to a resurgence and potential increase in the number of programs and subsequent specialists in dental public health.

Table 8: Enrollment in Dental Specialty Education Programs

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Range
Public Health	35	41	43	46	41	42	35	38	43	44	35 – 46
Endodontics	406	415	406	420	430	432	445	443	444	433	406 – 445
Pathology	31	34	31	37	36	38	33	34	37	40	31 – 38
Radiology	5	12	13	22	23	24	19	24	27	31	5 – 24
Oral Surgery	937	939	942	923	964	960	965	1012	1008	1040	923 – 1012
Orthodontics	714	722	736	785	818	859	912	911	903	931	714 – 931
Pediatric Dentistry	442	480	509	543	579	621	658	686	710	733	442 – 686
Periodontics	476	496	507	497	509	514	512	517	535	541	476 – 517
Prosthodontics	378	377	392	398	401	407	425	431	445	451	377 – 431
Total Per Year	3424	3516	3579	3671	3801	3897	4004	4096	4152	4244	

Source: ADA Survey Center, *Survey of Advanced Dental Education*, 2001-2010

The total number of advanced specialty education programs did not increase significantly, but enrollment in all specialty programs increased by almost 24% between 2001 - 2010 from 3,424 to 4,244 residents. While program enrollments tend to fluctuate slightly from year to year, each specialty's enrollment in 2010 was greater than its enrollment in 2001. Notable is the over 500% increase in enrollment in oral and maxillofacial radiology programs and 65% increase in enrollment in pediatric dentistry programs. AAPD expects the number of pediatric dentistry programs and enrolled residents to increase over the next 10 years, assuming federal and local funding continues. Like all the specialty organizations, AAPD is concerned about the continued ability to establish programs needed to meet public demand for services when faculty shortages continue and funding availability is tentative.

Program Directors

Related to the faculty shortages is the need for full-time and board certified program directors as seen in Tables 9 and 10. Existing and projected faculty shortages have and continue to plague all advanced dental specialty programs. With the potential of eight to ten new dental schools in the next five years, the number of specialty programs is likely to grow, increasing the projected shortage of qualified faculty for both predoctoral and advanced specialty education programs.

Table 9: Percentage of Program Directors that are Full-time

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Mean % Directors FT	Range
Public Health	94%	94%	93%	93%	92%	92%	92%	92%	100%	100%	93%	92 – 94
Endodontics	98%	98%	96%	98%	96%	94%	94%	100%	94%	94%	97%	94-100
Pathology	92%	92%	100%	100%	100%	100%	100%	100%	100%	100%	98%	92 -100
Radiology		100%	100%	100%	100%	80%	100%	100%	100%	100%	97%	80 -100
Oral Surgery	95%	98%	98%	100%	99%	99%	96%	100%	98%	99%	98%	96 – 100
Orthodontics	52%	52%	50%	59%	52%	54%	54%	58%	89%	92%	54%	50-59
Pediatric Dentistry	83%	88%	88%	85%	83%	78%	84%	85%	86%	89%	84%	78 – 88
Periodontics	92%	90%	90%	90%	91%	92%	92%	94%	96%	98%	91%	90 – 94

Prosthodontics	91%	92%	96%	89%	96%	93%	89%	93%	93%	93%	81%	89 – 96
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Source: ADA Survey Center, *Survey of Advanced Dental Education*, 2001-2010

Table 10: Percentage of Program Directors that are Board Certified

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Mean % Directors Certified	Range
Public Health	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100
Endodontics	81%	86%	86%	87%	87%	83%	93%	87%	87%	91%	86%	81 – 91
Pathology	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100
Radiology		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100
Oral Surgery	98%	100%	95%	95%	96%	92%	100%	100%	100%	100%	97%	92 -100
Orthodontics	71%	70%	79%	83%	80%	75%	90%	97%	98%	98%	80%	70 – 98
Pediatric Dentistry	78%	75%	81%	83%	80%	76%	87%	90%	89%	91%	81%	75 – 91
Periodontics	87%	92%	94%	92%	85%	89%	94%	94%	96%	93%	91%	85 – 96
Prosthodontics	89%	90%	91%	88%	83%	89%	98%	98%	98%	100%	91%	83-100

Source: ADA Survey Center, *Survey of Advanced Dental Education*, 2001-2010

The Council recognized the challenges facing the dental specialties in meeting faculty shortages in its 2001 Report to the House of Delegates. This crisis will continue, particularly as new dental schools are established. Several specialty organizations cited their concerns about faculty shortages that could ultimately result in a decrease in the number of specialty programs and a shortage of qualified, board certified program directors and faculty and predoctoral program directors and faculty. The Council urges the ADA as well as the dental specialty organizations to continue to monitor these trends and the ultimate impact they may have on accredited advanced specialty education programs.

IV. CHANGES IN SCOPE OF PRACTICE

The Council requested that each specialty organization highlight recent epidemiological data or studies that establish the incidence and/or prevalence of major conditions routinely diagnosed and/or treated by practitioners in the specialty and describe how these changes have affected the practice of the specialty. Information regarding referral patterns and how they may have changed over the past ten years was also requested.

American Association of Public Health Dentistry

For dental public health specialists, “patients” served are defined as populations and communities rather than individual patients. Services provided by public health dentists include programs that emphasize primary prevention and oral health education as well as those that extend care to the underserved. Dental public health specialists continue to work with community leaders and stakeholders interested in preventing oral diseases and/or extending dental care to a broader base of their constituencies. Most dental public health specialists work for the government (44%) or in academic settings (36%). Issues facing public health dentistry include the erosion of state Medicaid programs, increased interest in mid-level provider models, high profile tragedies related to poor access to oral health services and recently enacted health care reform legislation.

American Association of Endodontists

The conditions treated routinely in clinical practice by endodontists continue to be pulpal and periapical disease. Patients on IV bisphosphonates are at greater risk for complications with oral surgical procedures making endodontic treatment the procedure of choice for this patient group. The increased use of surgical microscopes has provided greater understanding of root anatomy, leading to better treatment planning and treatment results. Research on and the use of mineral trioxide aggregate (MTA) has improved treatment outcomes. The number of teeth

treated by endodontists has increased by about 3% in the last decade. New materials are allowing for treatment of more complex disease and anatomical problems.

American Academy of Oral and Maxillofacial Pathology

The principal services provided by oral and maxillofacial pathology include clinical diagnosis, management of oral abnormalities, as well as the microscopic diagnosis of oral and maxillofacial surgical tissue/cytology specimens. Oral cancer and bisphosphonate-related osteonecrosis of the jaw (BRONJ) and conditions associated with older patients such as lichen planus, burning mouth/tongue syndrome, and even oral squamous cell carcinoma, will likely become more numerous as the aging U.S. population grows.

Slightly more than 63% of all surgical pathology specimens originate from oral and maxillofacial surgeons. There has not been a significant change in the settings where the services of an oral and maxillofacial pathologist are customarily provided - 54.8% in dental schools, 21.4% in hospital/medical centers; 4.8% in medical schools, 2.4% in government facilities. However, the specialty is entering a new phase in its development, namely a substantial expansion of participation in private, independent practice settings.

American Academy of Oral and Maxillofacial Radiology

Most oral and maxillofacial radiology services have been provided through dental school radiology departments, medical school radiology departments, and hospital radiology departments. Recent technological advances (for example, CBCT and tele-radiology) have increased the opportunities for oral and maxillofacial radiologists to operate outside of the academic health center. As technologies improve and the costs decrease, private practice will become a destination for oral and maxillofacial radiologists, which in turn, will improve public access to these vital diagnostic services.

During the past ten years, perhaps the greatest opportunity for referrals and changes in scope of practice for oral and maxillofacial radiologists has been the dramatically increased need for implant site assessment and post-operative imaging. Oral and maxillofacial radiologists are frequently involved in the diagnostic assessment of patients with obstructive sleep apnea. CBCT is having a significant impact on the three-dimensional analysis necessary for orthodontics and in evaluating osseous pathology, e.g., cysts, benign and malignant tumors, inflammatory conditions, para-nasal sinus disorders, and soft-tissue calcifications. Specialty-level services, provided by oral and maxillofacial radiologists, are helpful when traditional services (intra-oral and panoramic radiographs) are inadequate. Imaging studies are a critical component of assessment of temporomandibular joint (TMJ) disease.

Most referrals are made by general dentists, followed by oral and maxillofacial surgeons and orthodontists, primarily for implant site assessment (40%), pathology (24%) and for TMJ analysis (16%). The AAOMR anticipates that referral patterns will grow at a significant pace over the next decade as the specialty continues to evolve.

American Association of Oral and Maxillofacial Surgeons

The principal health services provided to the public by oral and maxillofacial surgeons are dentoalveolar surgery, implants, anesthesia with an increase in management of pathology, genioplasty and obstructive sleep apnea. Epidemiologic studies showed an increased demand for anesthesia, obstructive sleep apnea and oral cancer. Placement of dental and cranio-maxillofacial implants is increasing.

Oral and maxillofacial surgery services continue to be provided in outpatient and inpatient facilities. Medically compromised patients and select oral and maxillofacial surgical procedures are provided in hospitals.

American Association of Orthodontists

Orthodontists provide diagnosis and comprehensive orthodontic care for patients of all ages, with the largest number in the adolescent age group. Adult treatment has continued to increase in the last 10 years. An emphasis has continued to be placed on early diagnosis and treatment of functional problems that may reduce future treatment needs. Advanced craniofacial training is an important change in practice with its link to the dental specialties of oral and maxillofacial surgery and pediatric dentistry. Increasing numbers of consumers are using the American Board of Orthodontic's website to find a board certified orthodontist. Education materials for general dentists and other health care providers have increased referrals from other healthcare professionals.

Most orthodontic care is provided in private, individual or group practice settings; some in company-owned offices and some in orthodontic education program clinics.

American Academy of Pediatric Dentistry

As an age-defined specialty, the services provided by pediatric dentists relate primarily to populations rather than specific procedures. The very young, the developmentally disabled and medically-compromised patients, and children with complex dental, medical, or communication needs form the basis for pediatric dental practice. The condition most routinely diagnosed and treated by pediatric dentists is dental caries. Dental caries rates in children are still on the rise and caries is still the most common chronic disease of childhood. Nationally, nearly 30% of all child health expenditures are devoted to children's oral health care.

Pediatric dental care continues to be offered in private and public clinics as well as in hospital outpatient clinics and operating rooms. There is an increasing trend for deep sedation or general anesthesia for children to be performed in freestanding surgical centers and/or in clinics served by anesthesiologists and anesthesiologists.

The main sources of referrals to pediatric dentists are general dentists, pediatricians and other health care providers. In 2007, AAPD entered into a contract with the Office of Head Start to partner at the national, state and local levels to develop a national network of pediatric and general dentists to link Head Start children to establish dental homes.

American Academy of Periodontology

The principal health services provided to the public by periodontists include evaluation and diagnosis of oral conditions and assessment of risk for future disease; non-surgical treatment and the management of periodontal diseases, oral mucosal diseases, and periodontal inflammation associated with systemic conditions; surgical care to correct oral hard and soft tissue defects; and surgical placement/management of dental implants. Periodontal disease is now viewed as a critical inflammatory disease in the body. Links between periodontal diseases and systemic conditions have been strengthened by research on inflammatory conditions, such as diabetes and cardiovascular disease.

Four recent reports have suggested that the prevalence of periodontitis in the United States may be declining. An individual's susceptibility to periodontal disease may be more important than their age as a risk factor for the disease. Race and ethnicity are social constructs that can strongly influence socioeconomic status, access to health care, educational levels, and frequency of dental visits. There is a well established and documented relationship between

smoking and development and/or severity of periodontitis. The AAP believes that the specialty of periodontics needs to place increasing emphasis on early diagnosis, early and appropriate treatment of periodontitis, and education of the profession and public regarding potential associations between chronic oral inflammation and systemic complications.

General dentists provide most of the referrals to periodontists, followed by patient self-referrals and patient-to-patient referrals. Periodontists historically have provided the majority of their services in the clinical office setting.

American College of Prosthodontists

Prosthodontists replace missing teeth and the structures that support them. The scope of services provided by prosthodontists has remained similar during the past ten years but the frequency of certain services has shifted during this timeframe. The six procedures requiring the largest percentage of the prosthodontist's time include fixed prosthodontics, implant services, complete dentures, operative care, diagnosis and partial dentures. The increased demand for referral based services in the area of maxillofacial prosthodontics, temporomandibular disorders and sleep apnea have all impacted prosthodontic practices.

The data related to tooth loss and tooth retention will have a significant impact on the specialty of prosthodontics. Based on the data related to edentulism, tooth loss and the condition of remaining teeth, as well as other factors such as abrasion, attrition, erosion, and the need for esthetic improvement (Douglass, 1992) coupled with the increase in the adult population, there is an increased need for complex prosthodontics services. NHANES III data also indicates that 20% of adults between the ages of 18 and 74, representing 35.7 million civilian, non-institutionalized Americans, wear some type of removable prosthesis. Selected indicators on denture use among persons 18-74 years reveal no differences in patterns of denture use between 1981 and 1991. The need for complete dentures would decline more slowly than the rate of edentulism due to the replacement needs for existing edentulous persons. The number of patients who are partially edentulous will increase significantly. Therefore, the need for more complex fixed prostheses, implant prostheses and removable partial dentures will increase. The need for complex prosthodontics will increase substantially in the adult population. As the population continues to grow, the need for prosthodontic services will also grow, at least for the next 25 years. A significant increase in referral based demand for sleep disorders, maxillofacial prosthodontics and temporomandibular disorders has been noted in practice.

The ACP notes increased demand for services because of innovative technology, shifting demographics, changing epidemiology and emerging diseases. Examples of each include a) the evidence based merit of implants for all edentulous patients, b) the aging population who are partly dentate and likely to lose more if not all teeth, c) increasing prevalence of root caries, erosive disorders affecting enamel, and the static level of oral cancers in the U.S. and d) polypharma-induced xerostomia, sleep apnea and bisphosphonate osteonecrosis of the jaws. These changes reflect matters that may be best managed by specialists for diagnosis and treatment, as well as life-long care and prevention.

The largest source of patient referrals to prosthodontists is patients, followed by general practitioners (18%), periodontists (14%), patient self-referrals (13%) and oral surgeons (13%). The primary setting for prosthodontic services has predominately been in and will continue in private practice.

Overall, the scope of practice for each recognized dental specialty has not changed dramatically. Advances in technology and science have provided specialists with the knowledge and skills to provide patients with a better diagnosis and treatment plan and a

greater array of treatment modalities. Each dental specialty has adapted to new and changing environments and continues to define itself within its scope of practice.

The Council noted several trends that have impacted specialty practice and will continue into the next decade. Some of these trends affect multiple specialties while others directly impact just one or two particular specialties. These trends include but are not limited to disparities in oral health, tooth retention awareness, the aging population, expansion in prescription drug therapy, a shift in health care delivery from a hospital setting to an ambulatory/office facility, continued high dental caries rates in some children and the link between periodontal disease and other systemic conditions. These changes have also led to an expansion in the scope of practice of some specialties. Such changes are appropriately reflected in the education and training requirements for the specialties.

CONCLUSIONS: In reviewing all of the information submitted by each specialty for the 2011 Review comparing it with the 2001 Review, the Council concluded that each specialty is unique. However, the information submitted demonstrates that the specialties also share common issues and concerns. An overview of these issues follows.

Faculty Shortage. Unfilled faculty positions, resignations, projected retirements, and the shortage of students being prepared for the faculty role pose a threat to the dental workforce in the coming years. Faculty shortages at dental schools across the country may compromise student learning at a time when the public need for dentists continues to grow.

Every specialty organization is concerned about the growing faculty shortage and is looking to find ways to assist dental and advanced specialty education programs in recruiting and supporting potential faculty members. The Council commends the dental specialty organizations for their leadership in addressing issues related to dental specialty faculty shortages.

Movement to Increase Number of Board Certified Diplomates. As noted elsewhere in this report, most of the specialties have experienced an increase in the number of board certified, active diplomates over the last ten years. The Council believes that this demonstrates the specialty organizations' commitment to increasing the number of individuals who achieve board certification and to maintaining competency levels for specialty practice. Further evidence of this commitment is the establishment over the last ten years of recertification policies by all dental specialty certifying boards. More attention is also being directed to making the certification process more candidate-friendly. Some specialty certifying boards offer educational consultants and mentors to assist candidates as they work through the examination process. Some boards have adjusted the examination process and others continue to identify innovative approaches to recruit new applicants into the board certification process.

Lack of Significant Changes in Referral Patterns. The Council noted that referral patterns over the last ten years for most of the specialties have changed only slightly with the source of most referrals continuing to come from general dentists, patients and/or their families, other specialists and physicians. An exception exists for dental public health where the referral pattern is often reversed. Patients identified in screening programs are often referred by DPH dentists to private general and specialty dental practitioners. It was also noted that Periodontists anticipate a change in the future in their referral patterns. The Council continues to believe that if stronger links are established between periodontal disease and systemic conditions, more referrals might come from physicians and other health care providers.

Membership Categories and Privileges. Membership in the specialty organizations increased 26% over the last ten years. The number of new specialty programs as well as an increase in class size has contributed to the membership increases. In addition, specialty organizations have redefined the membership eligibility criteria to include residents, retired specialists and various dentist and non-dentist categories. The Council carefully reviewed the membership categories and corresponding privileges (voting and right to hold office), and concluded that all of the sponsoring organizations have memberships reflective on their respective specialties, continuing to meet Requirement 1(a) of the Requirements for Recognition of Dental Specialties.

FINAL COMMENTS: The Council wishes to acknowledge the cooperation, participation and contributions of the dental specialty organizations and the national certifying boards for dental specialists in providing critical information for CDEL's 2011 Periodic Review of Specialty Education and Practice.

After thoroughly reviewing all of the information submitted by the dental specialties, the Council believes that all of the recognized specialties have documented evidence that they continue to be in a healthy and viable state. From information provided related to each discipline's scope of practice, the Council has concluded that there continues to be a need and demand by the public for the recognized specialties' oral health services. The Council believes that over the last two decades, the recognized dental specialties have demonstrated ongoing efforts to improve the quality of advanced specialty education, research and practice. Further, they are committed to continuing to deliver quality oral health care services.

The dental specialty organizations and recognized certifying boards provided for this study valuable information that is highly beneficial to the entire profession. The format of the study served to facilitate each sponsoring organization's internal review by highlighting specific areas of growth and accomplishments over the last decade and provided the opportunity for each organization to note ongoing and future challenges. In broader terms, the format of the review allowed the organizations to note past and future trends, new research and crosscutting issues such as faculty shortages, potential membership and program enrollment increases/decreases and efforts to increase the number of board certified specialists.

The Council believes the format used was effective and not overly burdensome to the specialty organizations and certifying boards. As a result of the overall benefits derived from this review, the Council believes that this periodic review of the ADA-recognized dental specialties and certifying boards continues to be valuable to the profession. The periodic review should continue to be provided to the ADA House of Delegates at ten-year intervals.

Requirements for Recognition of Dental Specialties
Approved by the ADA House of Delegates, October 2001

A sponsoring organization seeking specialty recognition for an area must document that the discipline satisfies all the requirements specified in this section.

- (1) In order for an area to be recognized as a specialty, it must be represented by a sponsoring organization: (a) whose membership is reflective of the special area of dental practice; and (b) that demonstrates the ability to establish a certifying board.
- (2) A specialty must be a distinct and well-defined field which requires unique knowledge and skills beyond those commonly possessed by dental school graduates as defined by the predoctoral accreditation standards.*
- (3) The scope of the specialty requires advanced knowledge and skills that: (a) are separate and distinct from any recognized dental specialty or combination of recognized dental specialties; and (b) cannot be accommodated through minimal modification of a recognized dental specialty or combination of recognized dental specialties.
- (4) The specialty must document scientifically, by valid and reliable statistical evidence/studies, that it: (a) actively contributes to new knowledge in the field; (b) actively contributes to professional education; (c) actively contributes to research needs of the profession; and (d) provides oral health services for the public; all of which are currently not being met by general practitioners or dental specialists.
- (5) A specialty must directly benefit some aspect of clinical patient care.
- (6) Formal advanced education programs of at least two years beyond the predoctoral dental curriculum as defined by the Commission on Dental Accreditation's Standards for Advanced Specialty Education Programs must exist to provide the special knowledge and skills required for practice of the specialty.

* Predoctoral accreditation standards are contained in the Commission on Dental Accreditation's document Accreditation Standards for Dental Education Programs.

