

Anticipating the Forces of Change In Orthodontics

Southern Association of Orthodontists

2005 Environmental Scan

By The

Institute for Alternative Futures



September 20, 2005

About the Southern Association of Orthodontists

Founded in 1921, the Southern Association of Orthodontists is one of eight regional subgroups of the American Association of Orthodontists. The purposes of the non-profit organization are:

- To advance the art and science of orthodontics,
- To encourage and sponsor research,
- To strive for optimal standards of excellence in orthodontic education and practice, and
- To make significant contributions to the dental health of the public.

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About the Institute for Alternative Futures

The Institute for Alternative Futures is a nonprofit futurist think tank consulting to nonprofits, associations, governments and businesses. The mission of IAF is to help communities and organizations more wisely choose and create the futures they prefer by:

- Providing techniques for organizational and social transformation that will instill vision and integrity;
- Sharing insights gained from leading-edge futures research with a constantly expanding body of integrated knowledge;
- Creating networks of relationships among leaders for more strategic, systemic, global and humane decision-making;
- Developing practices that sustain organizational success in the present while consciously investing in endeavors that expand opportunities for future generations.

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Anticipating the Forces of Change In Orthodontics

Executive Summary

Leaders who anticipate the forces of change that make the future very different from the past are better able to guide their organizations, communities and society to a preferred future. Orthodontists can work with the forces of change in education, treatment practices, technology and business models to secure a desired outcome for patients and practitioners. Over the next 10 years, they will face many adjustments in their thinking and practices to turn challenges to tradition into opportunities for progress.

The Southern Association of Orthodontists (SAO) commissioned the Institute for Alternative Futures (IAF) to stand outside the profession and ask where orthodontists should expect significant change. IAF did an environmental scan of current trends and issues and interviewed 10 thought leaders to frame 11 forecasts about how different the profession may be in 10 years.

Most of these forecasts are logical extrapolations of major forces that are already changing the profession. Taken individually, these forecasts may not be that surprising. Their storyline is easy to follow, and people agree with the general direction of the basic plot even when they may differ with specific developments. When these extrapolative forecasts are studied together, they create a picture of a very different profession than orthodontists know today.

The three provocative forecasts are at the edge of disruptive innovation. As the interviews confirmed, they are also plausible, but people can easily list the reasons why these forecasts are less probable. Since they represent the greatest amount of change, they will be important to consider when the SAO leaders and invited experts meet in the October 22 summit in Phoenix to think about what these forecasts could mean for the profession. From their understanding of the implications of these forecasts, IAF will create four scenarios or alternative stories about the profession in 2015.

This report sees a bright future for orthodontists who can adapt with the forces of change. Americans are increasingly pursuing better dental health and an improved facial aesthetic. New technology is improving care and reducing the time and cost of treatment, making orthodontics attractive to new patient markets. Evidence-based orthodontics will shift the profession closer to a science than an art, but this will mean better outcomes for patients and reliable knowledge for students and practitioners.

One of the challenges to be overcome is educating a sufficient number of orthodontists to meet demand. Dental schools are struggling to retain qualified faculty. New technologies will make it easier for orthodontists and possibly others to provide low-cost and convenient care. This is not only a competitive threat, but it will certainly raise questions about what constitutes quality orthodontic care. New business models and structures of practice will move the profession from a marketplace dominated by small solo and partnership practices to a market where they are competing for patients with franchises and corporations. The ultimate wildcard to consider is what orthodontics would be like if someone succeeds in finding the alternative to braces.

Extrapolative Forecasts

Preparatory Education: Making extensive use of communication technologies, a small number of star professors teach across schools supplemented by adjunct professors who mentor residents in their clinics. Schools find a new source of revenue in short intensive courses to educate dentists in basic orthodontic treatments.

Continuing Education: Corporations that have developed new technologies and appliances find it quite lucrative to educate and certify orthodontists and extender professions in using their technologies and products. Associations will supercede schools as sources of continuing education in business, marketing and technology not covered by corporate providers. Information technology will also make it easier for orthodontists to continue their training from their offices and homes.

Evidence-based Orthodontics: Consumers who have learned to choose their healthcare providers based on evidence of effectiveness, value and safety to help control costs will want to select their orthodontists on the same basis. Electronic dental records and digital images will create a gold mine of data for academics to evaluate what orthodontic treatments get better results for different patients and their conditions.

Licensure: Orthodontic licensing is harmonized across the states. Some states also allow the licensure of foreign dentists and specialists to meet growing demand. However, regulations lag behind new technologies and discoveries in evidence-based dentistry.

Practice Management Technology: Specialized software automates routine aspects of treatment plans, billing and scheduling. Other office functions are outsourced to low cost areas in the southern region or overseas. These advances improve orthodontist productivity. Outcomes data and other consumer report card information are easy to capture and use in marketing and quality control programs.

Appliance Technology: Not only are braces less invasive, but they are also better concealed and more attractive. There are also more customized and accelerated treatment plans. New implant and treatment techniques will also make treatment faster and easier, but will require orthodontists to either update their skills or work in cooperative teams with other providers.

Imaging, Modeling, and Simulations: Orthodontists use in-office imaging, models and simulations to illustrate a suite of treatment options patients can review in choosing the perfect image for their face. They use these technologies to monitor treatment progress and document outcomes. Patients can track their progress online and simulate desired outcomes.

Patient Markets: Three markets are growing as significant alternatives to the middle class adolescent market in orthodontics: image-conscious adults who can afford high-end cosmetic dentistry; re-do adults whose teeth have naturally moved or who failed to comply with retainer plans; and low-cost, basic services patients.

Provocative Forecasts

Accelerated Professional Education: Motivated dental students welcome an accelerated approach to dental school and specialty training. They fast-track into orthodontic courses after two years and complete the dental school curriculum and orthodontic specialty education in five years.

Structure of Practice: Corporate and franchise practices will employ economies of scale, effective branding and convenience to compete with existing practices and gain a dominant market share in vanguard cities. Larger practices, both franchises and independent, are more common.

No Braces Alternative: Appliance technology changes radically, removing traditional braces as the most common method of orthodontic treatment. Independent wires and mouth-guards are the most common form of treatment. Made of smart materials, these appliance technologies are less visible and can detect changes in alignment and adjust themselves with more force than traditional braces.

Anticipating the Forces of Change In Orthodontics

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Introduction

This report is the first in a series of reports and workshops to help the orthodontic community think strategically about the future. SAO and the other constituent and component associations of the American Association of Orthodontists have built a proud and successful profession providing a valuable service to millions of Americans. By investing time and resources in this futures process, the orthodontic community intends to assure that the profession builds on this legacy and creates a future full of meaning and surprising success for the men and women who have chosen orthodontics as their life work.

The Institute for Alternative Futures (IAF) first conducted a broad scan of the literature in summer 2005. This included a number of academic journals both inside and outside orthodontics, statistical surveys and studies, news magazines and databases, patient and company websites, and IAF's knowledge of business, health and technology trends. IAF identified a number of trends, or patterns of change over time, and developed ten provocative forecasts for 2015 to put current thinking to the test. These provocative forecasts stimulated the thinking of ten thought leaders SAO selected for their insights. Based on those interviews and follow-on research, IAF revised the forecasts, removed a few and created a few new ones. These forecasts provide the basis of this report.

There are eight **extrapolative forecasts** describing what IAF believes to be the "expected" future for orthodontics. The reasoning behind each forecast is explained and footnotes direct the reader to supporting material. The future is uncertain, but IAF believes these forecasts have a high probability of occurrence.

IAF also included three **provocative forecasts** for the future of orthodontics. One of the stated goals for this research is to anticipate important changes outside the profession's traditional worldview. Futurists use such methodologies as provocative forecasts and scenarios to open people's eyes to important "what ifs" they may not be considering. These forecasts have a lower probability of occurrence, but if they occur, they will have a profound impact on the profession.

Forecasts are an important futures tool for thinking through the implications of significant change for a business, profession or organization. After each forecast is explained in this report, IAF poses a few questions to help the readers begin to evaluate the implications. Indeed these forecasts may prompt many more questions for specific individuals and organizations as they assess these changes against their current situation. Individual orthodontists can decide where they face the greatest challenges and opportunities and how they may want to respond in their own practices. Association leaders can use these forecasts to anticipate where their leadership will be needed and where member priorities and needs may well change.

These forecasts will be presented at a futures summit with leaders of the profession October 22 in Phoenix. These forces of change do not respect regional boundaries. SAO agrees and invited leaders from other regions to participate in both the interviews and the futures summit.

This report is not the last word on the 2015 future for orthodontics, but it is the beginning of an important national conversation. These forecasts and the four scenarios to be created after the futures summit are SAO's contribution to a national conversation the entire profession must have to create and pursue a shared vision for a preferred future.

Extrapolative Forecasts

The following extrapolative forecasts are what IAF considers to be probable developments in orthodontics over the next ten years. They are based on the environmental scanning research conducted by IAF and interviews with selected leaders in orthodontics. These forecasts are designed to provide a reference point for thinking about the future based on current trends.

Included after the forecasts is more analysis on the trends described in the forecasts, as well as supporting evidence from our environmental scanning and interviews. One trend that cuts across multiple forecasts is the future supply and demand for orthodontists. On the supply side, there are systemic limitations on the capacity of the educational system to grow. The number of positions available at US and Canadian orthodontic residency programs is static and not at replacement level. The 292 new orthodontists who graduated in 2002 are not enough to sustain the current number of practicing orthodontists, given attrition from retirement.¹ Various estimates have projected the number of US and Canadian orthodontists to decline from 8,900 today to anywhere from 6,500-8,000 by 2015.²

On the demand side, the population of the United States is expected to grow by 15-20 million people over the same time period.³ In *Patient Markets*, IAF forecasts that demand is likely to grow beyond that number as more people seek orthodontic care. Based on these two trends, a shortage of orthodontists is likely.

A countervailing trend that influences the demand for orthodontists is technology. Based on trends explained in the *Practice Management Technology, Appliance Technology, and Imaging, Modeling and Simulations*, orthodontists will be able to see more patients in a day. This will lower the demand for orthodontists and might affect the fees for orthodontic services. However, to capitalize on the ability to see larger numbers of patients, orthodontic practices will need to be in larger population centers that can afford their services. This means that there is likely to be an oversupply of orthodontists in large affluent urban and suburban areas competing to fill empty time slots and an undersupply of orthodontists in rural and immigrant communities that do not have the market to support a high volume practice. The ramifications of this shift are explored in the *Structure of Practice* and *Licensure* forecasts.

¹ Paxton, D. (Fall 2003) Postgraduate Orthodontic Program Update. *Pacific Coast Society of Orthodontists Bulletin*, p. 33-35.

² Pracht, Terry. (January 2002) Practice Modalities and Transitions: Current Dilemmas and Future Challenges. *Presentation to the College of Diplomates of the American Board of Orthodontics 2002 Winter Meeting*. Review by Dr. Tucker Haltom. Retrieved online 6/10/2005 at <http://www.cdabo.org/meetings-winter.html>

³ IAF projection extrapolated from US Census Bureau numbers. Retrieved 5/5/2005 at <http://www.census.gov/population/www/projections/regdivpyramid.html>

Preparatory Education

Forecast: Making extensive use of communication technologies, a small number of star professors teach across schools supplemented by adjunct professors who mentor residents in their clinics. Schools find a new source of revenue in short intensive courses to educate dentists in basic orthodontic treatments.

Shortage of professors to meet orthodontic demand: Given the increasing demand for orthodontic services, and the demographic trends leading to fewer practicing orthodontists over the next decade, dental schools and residency programs must adapt to increase the number of graduates entering the field. Schools are scrambling to find the resources to triple or quadruple their residents. However, there is not enough staff members qualified to teach in the programs. As of 2003, it was estimated that 100 staff positions remained unfilled, and as many as 10 dean chairs were empty in the US alone.⁴ These faculty shortages are common throughout dentistry and its specialties.

There are two primary reasons these positions fail to attract and retain acceptable teaching staff. First, traditional academic limits on outside income mean that professors of orthodontics must give up large amounts of income to remain in education. Second, the education system does not reward or encourage orthodontic studies. The very research, publish and reward system designed to compensate for lack of outside income punishes orthodontists as no orthodontic journal is ranked in the top two tiers of scientific publications. The best orthodontic journals are aimed at practitioners, not researchers, and therefore fall lower on the citation reference scale so crucial in academic promotion decisions. It is difficult, therefore, for dedicated researchers to gain the *curriculum vitae* needed for academic promotion and reward. Academic researchers are left with a difficult conundrum: publish where they can benefit their careers or where they are more likely to shape the knowledge in the profession.

Communication technologies and adjunct professors ease the shortage:

Two major changes could address the shortage of professors. First, using ever faster and more detailed high speed communications technologies, small numbers of professors can reach ever greater numbers of students, without regard to geographic distance. The rapid growth in speed and broadband capabilities, currently symbolized by Internet2, will lead to perfectly viable, high definition, interactive communications. No longer will a professor need to be in the same room with a student; they can both see and hear everything that the other does in real time. Residency programs within geographical regions could collaborate in selecting and recruiting high quality specialists to teach classes

⁴ White, Larry (June 2001) A Historical Time Line. *The Orthodontic Cyberjournal*. Retrieved 7/10/2005 at <http://www.oc-j.com/june01/WhiteEssay.htm>

across the region. While the professor is based on one campus, he or she could easily travel, on a semi-regular basis, across the region to visit each and every member school.

Local professors are still needed to help with hands on experience. These positions will be filled by more traditional adjunct professors, who combine a strong academic record with a full or part-time practice outside the classroom. The orthodontists get the honor and opportunity to be a professor, while still retaining the great income possibilities of private practice. This model has worked in medical schools, business schools, law schools, and public policy schools, and engages the students and the school with the community. This allows more schools to expand the number of residents, perhaps by two or three times, without a massive infusion of new resources.

More and more orthodontic programs may explore extending to full three year programs not because they want to emphasize research, but because they want to expand their curriculum in related disciplines. Students will need more instruction in business practices, social science and marketing to prepare for the more competitive world of orthodontics. Professors from other disciplines will supplement the dental faculty in this multidisciplinary learning.

In order to attract greater revenue, and add value to traditional dentistry, more dental schools without orthodontic programs will establish a series of short, intensive sessions common in continuing medical education to train dentists in orthodontic practices.⁵ These dentists will be able to meet some of the excess demand by performing simple tasks traditionally done by orthodontists, including simple alignment, imaging and using branded alignment systems. This education will be especially popular for dentists in less populated regions that may be unable to support a thriving orthodontic practice, but still require a level of service. As this model proves itself, more and more urban and suburban dentists will pursue this lucrative training. Orthodontists will seek more specialized knowledge and skills to continue differentiating themselves from dentists to ensure the added value of their practices.

Key Questions for Practitioners

- Would it make sense for individual practitioners to teach as an adjunct professor in an orthodontic program if they could retain their practice?
- Given the competition for professors in residency programs, and the inability of many schools to attract and keep top notch professors, how can the

⁵ Currently, the dental schools at: Boston University, Tufts University, University of Louisville, Oregon Health Sciences University, University of Pittsburgh, among others, offer orthodontic specialty training to dentists who wish to expand their practices. As demand increases, it is likely that others will follow. There are also several non-affiliated programs that instruct dentists in these techniques.

profession make education and research a more valuable aspect of the profession?

- As star professors emerge, how can institutions that do not have star professors remain important, and not become secondary institutions, even with the link ups to the better known programs?
- How can smaller schools retain their identity and independence as other schools gain prominence with star professors, large residency programs, and communication technologies? Should they attempt to, or simply grow larger to compete?
- Should the entire curriculum be overhauled to include related disciplines?

Key Questions for Association Leaders

- As dental schools without formal orthodontic programs begin offering intensive courses in basic orthodontic skills, how can associations adapt to the needs of dentists practicing orthodontics?
- How can associations and the orthodontic community become involved in preparatory education to influence the linkages between schools and ensure the continuing quality of emerging orthodontists and the prominence of the profession?

Continuing Education

Forecast: Corporations that have developed new technologies and appliances find it quite lucrative to educate and certify orthodontists and extender professions in using their technologies and products. Associations will supercede schools as sources of continuing education in business, marketing and technology not covered by corporate providers. Information technology will also make it easier for orthodontists to continue their training from their offices and homes.

Continuing education for general practitioners: The decreasing number of orthodontists in practice over the next 10 years will continue to feed the demand for non-specialty dentists to perform orthodontic tasks. In 1983, the ADA recommended that general practice dentists expand their clinical skills and services to the public and improved technologies are making that extension into orthodontics possible for the first time on a large scale.⁶ A 1997 study found that

⁶ American Dental Association. (1998) The Future of Dentistry.

64% of dentists thought their roughly 110 hours of orthodontic training was 'inadequate.'⁷

It is not reasonable to expect untrained dentists to adequately perform orthodontic procedures, yet the demand for these services has already created several courses dedicated to increasing their training to acceptable standards.⁸ Combined with the increasing ability of technology to assist these professionals, new continuing education models will arise to facilitate their training. Schools of dentistry that have attached orthodontic programs are the prime opportunity for this type of continuing education, but the professional obligations to their graduates makes resistance to such programs highly likely. Therefore, it is likely that non-orthodontic schools will begin to generate revenue by conducting continuing education programs, on a weekend or week-long basis, to accommodate the demand.

Continuing education extends into proprietary technologies: In addition, corporations will extend into direct to consumer marketing programs, and develop training models for proprietary technologies. This is already happening among non-specialists with the Invisalign appliance. Corporations are combining marketing directly to dentists with this training to gain market share. As large practices and franchises become more prominent across the country, they may have the resources and interest to offer workshops and seminars in the latest techniques, adding to the value of higher profile practices.

Traditionally-trained orthodontists will find new ways to more efficiently conduct continuing education seminars. Increased use and speed of broad-band communications and interactive multi-media will enable successful practitioners to learn new practices and techniques remotely. This may prove to be especially popular in multi-partner practices, who can share in the initial expense and continuing costs of the new technology. Corporations interested in reaching orthodontists will use remote technologies to train orthodontists in their own practices on new techniques and equipment.⁹

Corporate marketing will make this specialized training even more important for the next generation of orthodontists. It will be crucial to be seen as up to date on the latest technologies and skills in order to attract the greatest number of patients from affluent, transient populations.

Opportunities for related education grow. Traditional, site-based continuing education will decrease in importance, but remain an option for orthodontists for

⁷ Schlossberg, M. (March 2003) Orthodontics. Where does it fit for the GP? *AGD Impact*, Vol. 31, No. 3 retrieved 7/18/2005 from: http://www.agd.org/library/2003/mar/200303_schloss.asp

⁸ For example, the Academy of General Dentistry offers courses across the nation to teach general practitioners orthodontics (http://www.agd.org/cde/cde_source).

⁹ Bearn, D. and C. Lowe (December 2001) Computer aided learning in Orthodontics: is there any out there? *Journal of Orthodontics*, Vol. 28, No. 4, 314-316. December 2001 review of current technologies in CAL.

networking and professional development purposes, especially in practice development, financial management and marketing, all issues of growing importance. Most of this training will be offered by the professional associations, who can draw on a wider scope of talents than the over-stressed dental schools and residency clinics.

Key Questions for Practitioners

- How can independent practitioners differentiate themselves from non-specialty dental practices that provide orthodontic services?
- How can orthodontists use continuing education to differentiate their value in the marketplace?

Key Questions for Association Leaders

- How can organized orthodontics work with orthodontists to keep continuing education as a way to maintain standards in the profession without allowing it to become another vehicle for advertising and marketing from corporations?
- How can the orthodontic community help its members to avoid high profile orthodontists-educators that create a cult of personality rather than help orthodontists become better practitioners?
- How can the orthodontic community help patients choose between orthodontists that may be poorly trained and more highly trained orthodontists?

Evidence-Based Orthodontics

Forecast: Consumers who have learned to choose healthcare providers based on evidence of effectiveness, value and safety to help control costs will want to select their orthodontists on the same basis. Electronic dental records and digital images will create a gold mine of data for academics to evaluate what orthodontic treatments get better results for different patients and their conditions.

Standard of care defined through evidence. Orthodontics has evolved as an art where practitioners exercise individualized preferences in therapeutic strategy and make subjective judgments about what will provide the desired outcome. If a patient today seeks advice from 10 orthodontists he might receive 10 different treatment plans. Although they may all produce satisfactory outcomes, it is likely

one or two alternatives would best achieve the patient's unique functional, esthetic and psychological needs.

By contrast for the last decade, medicine has focused intensely on safety, outcomes and cost-effectiveness and evidence-based medicine is sweeping away long established practices of questionable clinical value. This movement to use evidence to revise medical practice is starting to spill over onto the practice of dentistry.¹⁰

Because third-party payers are not a significant factor in orthodontics, there has not been an organized challenge to the widely held belief that outcomes depend more on the art of the practitioner than any norms that science might identify. It is only a matter of time until the public is sufficiently accustomed to questioning the value of treatment options in other aspects of healthcare before consumers begin applying a similar standard to orthodontics. Change could accelerate because well informed consumers do personally pay for the services and will want explanations for long and costly treatments.

The standard of care will demand the best outcome, and not just a satisfactory solution. Researchers will mine digital images and electronic databases for objective criteria to evaluate techniques, clinical courses and outcomes to discern underlying principles of how to best manage individual patients. This scientific evidence will be applied to orthodontic practice in the next 10 years.¹¹

Evidence-based dentistry gains acceptance. The American Dental Association (ADA) defines evidence-based dentistry as an approach to oral health care that requires the judicious integration of systematic assessments of clinically relevant scientific evidence, relating to the patient's oral and medical condition and history, with the dentist's clinical expertise and the patient's treatment needs and preferences.¹²

The evidence-based dentistry process has four steps:

1. Define a clinically relevant and focused question of interest,
2. Systematically search all studies and databases and make qualitative or quantitative analyses with conclusions, including knowledge gaps needing further research,
3. Translate the findings for use by practitioners,
4. Practitioners assess healthcare outcomes achieved from following the guidelines.

¹⁰ Peer Review & Quality Assessment. http://www.ada.org/prof/prac/tools/peer_statement.asp

¹¹ Ackerman, Marc. (2004) Evidence-based orthodontics for the 21st century. *Journal of the American Dental Association*;135:162-167.

¹²ADA Policy on Evidence-Based Dentistry. <http://www.ada.org/prof/resources/positions/statements/evidencebased.asp>

Evidence-based dentistry is a way to assess the quality of research and integrate the findings from multiple studies into simple rational approaches to treatment. In August 2004, the ADA convened a symposium exploring eight clinical questions of utmost importance and brought together major stakeholders to collaborate in collecting and analyzing the evidence under ADA's leadership.¹³

Objective research clarifies treatment options: As empowered consumers try to sort out which professional disciplines are more qualified to deliver the results they want, they will want objective measures of good results. The orthodontics profession will see the competitive advantage of having rigorous evidence and will encourage its use in treatment decisions.

With the advent of electronic dental records and serial digital images to provide objective data, evidence-based orthodontic research will become a goldmine for academic careers. Academic orthodontic programs will do more clinical research on evidence-based orthodontics, and associations will support research for the competitive advantage of their members.

The time when the 'art' of orthodontics is good enough will no longer satisfy referring colleagues or discerning parents. Outcomes and report cards may become important in marketing. Objective documentation of method and outcome might prove essential in defending a rare malpractice suit.

In the process some cherished beliefs will change. For example, data now suggests that intervening in pediatric patients under the age of seven is not beneficial in shortening the treatment time. Many other concepts will be vigorously scrutinized over the coming years as the profession evolves to hold itself accountable to standards of care.

Key Questions for Practitioners

- What can individual practitioners do to incorporate evidence-based orthodontics in their practice?
- How will private practice orthodontists use evidence-based orthodontics as a way to improve outcomes, encourage high standards and differentiate themselves from competitors?
- Will orthodontists participate in evidence-based clinical research with academic institutions and supply blinded patient electronic records and imaging data for those studies?
- How will orthodontists educate consumers about their options in choosing effective treatment plans?

¹³ Berthold, Mark (10 September 2004) Evidence-based dentistry comes of age. *ADA News*. Retrieved 7/10/2005 at <http://www.ada.org/prof/resources/pubs/adanews/adanewsarticle.asp?articleid=1046>

Key Questions for Association Leaders

- What steps can the orthodontic leadership take to accelerate understanding and acceptance of evidence-based orthodontics through continuing education?
- Does the orthodontic leadership have a role in facilitating clinical research studies?
- As good evidence-based orthodontics data becomes available, how might organized orthodontics use it in consumer education and marketing for orthodontists?

Licensure

Forecast: Orthodontic licensing is harmonized across the states to increase mobility to high demand areas. Some states allow the licensure of foreign dentists and specialists to meet growing demand. However, regulations lag behind new technologies and discoveries in evidence-based dentistry.

Steady march to national licensing: Orthodontists are licensed dentists that are, in some states, certified as orthodontist specialists. Most states in the southern region recognize dentists as orthodontic specialists if they meet the standards outlined by the American Dental Association and graduate from an accredited orthodontic program.¹⁴

The push for standardization will affect licensure and certification laws in dentistry and orthodontics. Fewer states will offer their own licensure examinations for dentistry in favor of regional exams. A national licensure exam administered by the states is very likely within the next 10 years. Whether it is a comprehensive exam that includes one set of standardized content or a more modular exam that can be modified with content relevant to a state or region remains to be seen.¹⁵ The harmonization of state laws regarding specialties also makes sense on a regional and national basis to encourage more mobility.

Standardization is likely to extend to auxiliary professions. Dental and orthodontic assistants are not licensed, but do have voluntary national

¹⁴ State Boards of Dentistry have significant latitude in setting standards and criteria for certification. For example, Kentucky's Board of Dentistry conducts its own written examinations and reviews applicants' case histories.

¹⁵ Low, Samuel B. (May 2005) The National Clinical Licensure Exam: Don't Shoot the Messenger! *Today's FDA*.

certification¹⁶ and some state certification programs. A few states in the US and Canada have formal certification and education requirements for dental and orthodontic assistants.¹⁷ Dental and orthodontic assistants are likely to push at the state and national level for formal certification and education requirements.¹⁸ This is likely to improve the quality of dental and orthodontic assistants while raising the price of their services.

Greater mobility into growing states: A more mobile orthodontic workforce will allow orthodontists to migrate to faster growing states in the West and South at the expense of slower growing states in the Midwest and Northeast.¹⁹ This will be advantageous for fast growing southern states, such as Florida, Georgia and North Carolina, who need more orthodontists for their growing populations. Slower growing states in the South such as West Virginia, Alabama, and Mississippi may lose orthodontists to faster growing states in the region.²⁰ This may mean more patients in southern rural areas will not have access to care.

Orthodontists and dentists in fast growing states may resist changes in licensure laws that invite more orthodontists into their states to compete for patients, especially in lucrative urban and suburban markets. However, state policy-makers and national leaders in dentistry may want to encourage mobility to respond to shortages of dentists and orthodontists in those states.

Access to care relaxes licensing: Concern about access to care in rural areas and migrant populations also may encourage state legislatures to open up licensure to foreign dentists and specialists. Rural areas remain underserved by orthodontic and dental professionals. Immigration, both legal and illegal, has dramatically increased in the last four years. In 2004, 34.24 million immigrants (legal and illegal) lived in the U.S. This is the highest level in recorded history and a 4.3 million increase over 2000.²¹ Many immigrants are highly concentrated

¹⁶ American Dental Association (2001) *The Future of Dentistry*, pg. 80. Retrieved 7/12/2005 at http://www.ada.org/prof/resources/topics/futuredent/future_chap05_06.pdf

¹⁷ Nelson, Gerard (2001) *Certified Dental Assistants in the PCSO*. *Pacific Coast Society of Orthodontists Bulletin*. Retrieved 7/14/2005 at <http://www.pcsortho.org/bulletin/bulletin01/sueditorial.html>

¹⁸ Dental Assisting National Board (2004) DANB Executive Director Joins Other Leaders on Capitol Hill To Discuss Importance of Certification. Retrieved 7/14/2005 at <http://www.dentalassisting.com/news/legislation.asp>

¹⁹ According to the US Census Bureau, the southern region is projected to grow by 13.3% between 2000 and 2010. The South is second only to the West (14.2%) in projected growth. U.S. Census Bureau, Population Division, *Interim State Population Projections*, 2005. <http://www.census.gov/population/www/projections/projectionsagesex.html>

²⁰ Three member states of the SAO have projected growth rates well above the US average of 9.8%. Three states have particularly high projected growth rates including Florida (20.5%), Georgia (17.1%), and North Carolina (16.1%). In the SAO region there are also states with much lower projected growth rates including West Virginia (1.2%), Alabama (3.4%), and Mississippi (4.5%). U.S. Census Bureau, Population Division, *Interim State Population Projections*, 2005. <http://www.census.gov/population/www/projections/projectionsagesex.html>

²¹ Camarota, Steven A. (November 2004) *Economy Slowed, But Immigration Didn't*, *The Foreign-Born Population, 2000-2004*. Center for Immigration Studies. Retrieved 7/15/2005 at <http://www.cis.org/articles/2004/back1204.html>

in a handful of states including Florida, and to a lesser extent, Virginia.²² To encourage better access in rural areas and immigrant communities, state legislatures may find it necessary to provide licensure to foreign trained dentists willing to immigrate and provide services in underserved populations. This could take the form of a new test for foreign trained dentists similar to the Restorative Technique Examination in California or might be restricted to those serving underserved populations similar to the national interest waivers for foreign doctors and nurses.

A feedback loop between licensing and education: A standardized exam will also improve the ability of researchers to collect exam results and identify reasons for failure rates. In many cases, this information will be distributed back to dental schools to address problem areas and improve the quality of education.²³ The content of licensure exams will also shift away from the recall of facts on a written examination to include more emphasis on basic science and clinical decision-making in the delivery of care.²⁴ The content of licensure exams will also need to be updated regularly as evidence-based dentistry continues to demonstrate what are and are not best practices in dentistry and orthodontics. Computer-based examinations using simulations could also become an important part of the licensure process.²⁵

Scope of practice disputes revive: Using licensure and certification laws to define scope of practice and restrict access is a part of the history of orthodontics, as it is for most professions and specialties. Edward Angle, recognized as a founder of the profession, fought legislative battles in California and elsewhere to define orthodontics as a separate profession rather than a specialty of dentistry or medicine.²⁶ More recent examples of scope of practice arguments have occurred between pediatric dentists, who desired orthodontic training at the university level, and orthodontists in the 1970s.²⁷ Scope of practice arguments in dentistry are likely to revive over the next few years and may even expand to include auxiliary professionals. Some of the drivers for this change are: the new technologies allowing more dentists to perform orthodontic care, the push by auxiliaries for licensure, certification, and broader scope of

²² Florida is ranked number four on the list of states with the highest percentage of immigrants (18.4%). Virginia has the next highest percentage in the SAO region with 8.9%. Camarota, Steven A. (November 2002) Immigrants in the United States – 2002: A Snapshot of America's Foreign-Born Population. Center for Immigration Studies. Retrieved 7/15/2005 at <http://www.cis.org/articles/2002/back1302.html>

²³ American Dental Association (2001) The Future of Dentistry, pg. 81. Retrieved 7/12/2005 at http://www.ada.org/prof/resources/topics/futuredent/future_chap05_06.pdf

²⁴ Kalkwarf, K.L. (1999). How the licensure process will evolve. *Journal of the American Dental Association*, 30(12):1737-42

²⁵ American Dental Association (2001) The Future of Dentistry, pg. 83. Retrieved 7/12/2005 at http://www.ada.org/prof/resources/topics/futuredent/future_chap05_06.pdf

²⁶ Shankland, Wilbur Morse (1971) *The American Association of Orthodontics: The Biography of a Specialty Organization*. St. Louis, Mo: American Association of Orthodontics.

²⁷ Curtis, E.K. and American Association of Orthodontists (2000) *Orthodontics at 2000*. St. Louis, Mo: American Association of Orthodontics.

practice, and new treatment techniques that blur the line between different dental specialties.

Key Questions for Practitioners

- Is the benefit of a standard certification system for orthodontic assistants worth a correspondingly higher price for their services?
- How would national licensure affect practices, orthodontists and access to care
- What kinds of practices would be affected by a national licensure system or relaxation of licensing requirements to provide access to large underserved rural areas or immigrant communities?
- Should individual practitioners support changes in the licensure laws that improve access to care, even if it might adversely affect their practice in the future?

Key Questions for Association Leaders

- How can the community work with the boards of dentistry in their region to ensure certification and licensure law reflect advances in technology and evidence-based dentistry?
- Should the orthodontic community push for tighter scope of practice in licensing in order to prevent competition from ortho-dentists and other practitioners?
- Should orthodontic leadership actively support a national licensure exam and/or propose a regional licensure system?
- How can the orthodontic community work with state policy-makers to ensure access to orthodontic care to rural and immigrant communities?

Practice Management Technology

Forecast: Specialized software automates routine aspects of treatment plans, billing and scheduling. Other office functions are outsourced to low cost areas in the southern region or overseas. These advances improve orthodontist productivity. Outcomes data and other consumer report card information are easy to capture and use in marketing and quality control programs.

Computing and automation become everyday convenience: The orthodontic office is becoming better equipped with technology and this trend is likely to continue. Many components of the average office in 2015 are already available and in use. Software already automates many routine aspects of the office including billing, scheduling, and digital records, among others. As ubiquitous computing becomes more common, both in daily life and in the office, these different software programs will become integrated and easily accessible.²⁸

The orthodontic consumer is also better equipped with information technology. They will have the ability to go online and rate their experience with different orthodontists. These ratings will be used by third parties to create consumer report cards for orthodontic practices. Digital imaging will also make it easier to collect outcomes data and assess an orthodontist's track record. Outcomes data will be combined with consumer report cards to provide consumers with a better way to choose their orthodontists. This will lead to disintermediation of the referral relationship between dentists and orthodontists.

Outsourcing, cooperatives and centers boost productivity: Those office functions that are not automated are likely to be outsourced to low cost areas or overseas. These include most back-office functions and technical support. Greater use of digital images will also create new outsourcing opportunities. Orthodontic practices, corporations and cooperatives can save on the cost of expensive imaging technology and software through outsourcing. This includes outsourcing digital imaging to a centralized lab for the development of computer simulations, treatment plans and appliance technology.²⁹ Orthodontists in large urban areas could also avoid the large sunk costs of new imaging technology by sending patients to an imaging center and having the digital images sent to their office.

These improvements will boost productivity by allowing orthodontists and their staff to work more efficiently, and either devote more time to patients or see more patients. Both will be important as patients look for more interaction with their

²⁸ Many companies already offer business management solutions that are integrated with imaging and other technology. For example, the Kodak OPMS Practice Management System integrates Kodak imaging and other technology in the form of modules.

²⁹ This is similar to the process already used by Invisalign, which collects bite impressions from participating dentists and uses them to develop treatment plans and fabricate the clear aligners.

orthodontists and more patients become interested in orthodontic care. It will also make it easier for orthodontists that serve rural areas to see patients. Advances in digital teleconferencing technology combined with broadband connections will allow orthodontists to check-up patients remotely. However, the patient's desire for face-to-face contact might limit the usefulness of this capability.

Expanding roles for auxiliary staff: New technologies also require new skills to manage them. This includes not only the practice management technologies mentioned here, but the new appliance, imaging, and computer modeling technology mentioned below. Since the orthodontist's time is better spent with the patient, maintenance and use of these technologies will be relegated to auxiliary staff in the office. As these technologies move into the market, already existing staff, such as orthodontic assistants, will handle many functions. More specialized technicians able to repair and reconfigure the technology are likely to come later with offices in urban and suburban areas sharing time and resources.

This opens up opportunities in the education of auxiliary professionals. Orthodontic assistants or laboratory technicians with special training in the use, repair, and maintenance of office technology (including new imaging and appliance technology) will be in high demand. This will put a further demand on the already tight supply of orthodontic assistants, thereby raising wages across the board.³⁰

Key Questions for Practitioners

- What kinds of practices benefit from improved information technology or the outsourcing of office functions?
- What market opportunities exist for third party businesses to provide technology support and outsourcing for orthodontic practices?
- How can individual practices use outcomes data and consumer report cards to attract more patients or establish a reputation for higher quality services?

Key Questions for Association Leaders

- Do advances in practice management technology herald a shift in the profession to larger corporations and cooperatives? If so, how does that change the membership of organized orthodontics?

³⁰ Two thirds of private practitioners felt there was not an adequate supply of dental assistants. The shortage is more acute in orthodontic practice where dental assistants must undergo additional training. American Dental Association (2001) The Future of Dentistry, pg. 42-3. Retrieved 7/12/2005 at http://www.ada.org/prof/resources/topics/futuredent/future_chap03_04.pdf

- Should the orthodontic leadership set up ways for orthodontists to meet and share resources?
- Are there opportunities for organized orthodontics to help members choose and obtain office technologies specifically designed for orthodontists?

Appliance Technology

Forecast: Not only are braces less invasive, but they are also better concealed and more attractive. There are also more customized and accelerated treatment plans. New implant and treatment techniques will also make treatment faster and easier, but will require orthodontists to either update their skills or work in cooperative teams with other providers.

Best technologies improve efficacy and economics: Improved appliance technology has changed the economics and length of treatment for orthodontics, thus opening up orthodontics to more patients than ever before. As late as the 1960s, bands were attached to each tooth and putting braces on could take an entire day. Now, brackets are placed directly on the teeth and wires are looped through them. Heat-activated nickel-titanium wires have reduced the number of visits for patients. These advances have lowered the cost of orthodontic care by greatly increasing the number of patients each orthodontist can see. These changes have opened up orthodontic care to new patients and new markets.

New appliance technologies will continue to open up orthodontic care to new patients and new markets. Concealed and invisible braces are making orthodontic care more attractive to the adult market. Clear aligners, while often not appropriate for more complicated malocclusions; have been successful in opening up orthodontic care to working adults who are concerned with everyday appearance during treatment.³¹ They have also opened up the adult orthodontics market to ortho-dentists looking to expand their practice.

Computer-aided design and manufacture accelerate innovations: Innovative appliance technologies like the Invisalign system will be adapted for a wider range of cases and treatment outcomes. Better computer-aided design (CAD) programs will make it easier to develop and create clear plastic Essex appliances similar to the type that Invisalign creates. Advances in computer- aided

³¹ Following resolution of a court battle between Invisalign, the industry leader, and Orthoclear, competitors are entering the clear aligner market. Competition will improve the technology and service while pushing down price. Clear aligners will become even more competitive with traditional braces. Invisalign: www.invisalign.com; Orthoclear: www.orthoclear.com

manufacture (CAM) could enable orthodontists to create the series of appliances in the office. This becomes more probable if cone beam imaging systems become prevalent in orthodontic offices.

CAM technology will continue to grow as CAD systems become better at forecasting treatment. Better forecasting will allow either Invisalign or the orthodontist to more accurately create the clear aligners and expand treatment options. It will also make it easier to combine treatment technologies for more complex cases.

CAD/CAM is likely to impact archwires and brackets. The manufacture of archwires using CAM technology is also likely to be more common. In-office machines able to produce archwires designed to specifications from CAD systems are already available.³² Brackets customized for patients based on CAD systems are also feasible in the next ten years.³³

Practices embrace implantology: Mini-screw implant technology and techniques will make it possible to make adjustments that would have normally required headgear and more invasive surgery. While this makes orthodontic treatment less burdensome for many patients, it may require orthodontists to either upgrade their skills in implantology or work closely in a multidisciplinary team with an oral surgeon or other dentist with expertise in implantology.³⁴ Either as a service provided by the orthodontist or a part of a team, implants are likely to become a larger part of the orthodontic practice.³⁵

Combination innovations have impact: The orthodontic profession will continue this search for new technologies and techniques that reduce treatment times and are less visible. Any advance that is both safe and effective will be welcomed if it improves patient experience and increases revenues for orthodontic practices. Technology advances often have their greatest impact when they are combined together. New technologies will also be combined with new treatment techniques, even with treatment techniques not usually used in

³² An example is the SureSmile system which combines imaging technology, computer-aided design, and computer-aided manufacturing in one package. The orthodontist can create digital images of the teeth, use them to create a treatment plan, and send the information to a wire-bending robot to design custom archwires. Company studies indicate that the better precision afforded by the system can reduce overall treatment times.

Sachdeva, Rohit C.L. (2001) SureSmile's Promise: Digital Care Solutions for the Orthodontic Industry. *The Orthodontic CYBERJournal*. Retrieved 6/25/2005 at <http://www.oc-j.com/june01/SureSmile.htm>

³³ White, Charlene (2003) An Interview with Dr. David Sarver. *The Orthodontic CYBERJournal*. Retrieved 6/15/2005 at <http://www.oc-j.com/july03/sarver.htm>

³⁴ Ismail, S.F.H. and A.S. Johal (2002) The Role of Implants in Orthodontics. *Journal of Orthodontics*, vol. 29: 239-245. Retrieved online 6/15/2005 at <http://jorthod.maneyjournals.org/cgi/reprint/29/3/239>

³⁵ Nelson, Gerard (Spring 2005) Change Happens and Affects Our Future. *Pacific Coast Society of Orthodontists Bulletin*, p. 13. Retrieved online 6/25/2005 at <http://www.pcsortho.org/bulletin/bulletin05/Spring05pdfs/editorial.pdf>

orthodontics. Such a combination could dramatically change the use of appliances in orthodontics.^{36,37}

Limited R&D makes orthodontics dependent on others: Advances in technology and technique depend to a large degree on the research and development funding available. Orthodontics, as a specialty profession, has fewer resources available to it than the broader field of dentistry. Compared to the medical establishment, and even specialties inside medicine, dentistry does not have the same research base. For example, Congress appropriated \$391.8 million for 2005 for the National Institute of Dental and Craniofacial Research.³⁸ While certainly a significant amount of money, this is at the smaller end of the National Institutes of Health's \$27.9 billion dollars appropriation.³⁹ Because of this limited R&D budget, many technologies will be developed in the medical or other industries and then modified for the orthodontic market. Heat-activated nickel-titanium wires emerged from basic research conducted in the space program and later applied to orthodontics. Orthodontists should watch advances in medicine and other industries for clues on what kind of technological advances, such as Computed Tomography (CT) imaging, they can expect for the orthodontic practice.

Key Questions for Practitioners

- How can independent practices use specific appliance technologies to differentiate their services?
- How will practitioners keep abreast of advances in appliance technologies and understand their merits before considering using them in their practice?

Key Questions for Association Leaders

- Is there a combination of appliance and technique that can change how members practice orthodontics and blur the traditional lines of the profession?

³⁶ An example of a possible treatment and technique combination is combining Accelerated Osteogenic Orthodontics (AOO) with clear aligners. AOO claims to reduce treatment time down to three to nine months without root reabsorption. One orthodontist used the AOO technique on himself in combination with the Invisalign treatment. If such a combination is proven safe and effective, it could dramatically alter standard treatment practices.

Wilcko, W.M., T. Wilcko, JE Bouquot, DJ Ferguson (2001) Rapid orthodontics with alveolar reshaping: two case reports of decrowding. *The International Journal of Periodontics and Restorative Dentistry*, 21(1):9-19.

³⁷ Own, Alfred H. III (2001) Accelerated Invisalign Treatment. *Journal of Clinical Orthodontics*, 35(6):381-5.

³⁸ National Institute for Dental and Craniofacial Research (2005) Director's Report to Council: June 2005. Retrieved 7/12/2005 at

<http://www.nidcr.nih.gov/NewsAndReports/ReportsPresentation/DirectorsReportJune2005.htm>

³⁹ National Institutes of Health (2005) About NIH. Retrieved 7/15/2005 at <http://www.nih.gov/about>

- What resources can organized orthodontics provide our members to help them access the best evidence based studies on different appliance technologies and techniques?
- Should membership and governance policies reflect the growing influence of appliance technology developers and manufacturers?

Imaging, Modeling and Simulations

Forecast: Orthodontists use in-office imaging, models and simulations to illustrate a suite of treatment options patients can review in choosing the perfect image for their face. They use these technologies to monitor treatment progress and document outcomes. Patients can track their progress online and simulate desired outcomes.

Quality imaging available everywhere: Recent advances in imaging technology are making high quality medical imaging affordable to smaller orthodontic and dental practices. Advanced imaging technology will improve the diagnostic capability and the precision of dental implants and devices.⁴⁰ Most of these new imaging technologies are also digital, opening up the possibility of outsourcing imaging.

Cone beam x-ray imaging holds great potential for orthodontics. Cone beam imaging is a type of CT imaging already in use with considerable success in the medical field. It creates a 3D digital image of the craniofacial anatomy of a patient that can be used with advanced application software for diagnosis and the development of treatment plans.⁴¹ The major advantage of cone beam technology is the possibility of creating smaller, cheaper and lower radiation digital imaging systems for the dental office.⁴²

Combining computer-aided design software and computer-aided manufacturing equipment opens up a number of applications for digital imaging of the teeth and face. Examples of applications include developing treatment plans, archiving study models, documenting treatment progress, constructing 3D aligners and prefabricating archwires.⁴³

⁴⁰ Hajeer, M.Y., D. T. Millett, A. F. Ayoub and J. P. Siebert (2004) Applications of 3D imaging in orthodontics: Part I. *Journal of Orthodontics*, 31: 62–70.

⁴¹ Mozzo, P., C. Procacci, A. Tacconi, P. Tináís Martini, IA Bergamo Adnreis. (1998) A new volumetric CT machine for dental imaging based on the cone-beam technique: preliminary results. *European Radiology*; 8:1558-1564

⁴² For an example of a cone-beam imaging system for the dental office you can visit <http://www.xorantech.com/icatfordental.html>.

⁴³ Hajeer, M.Y., D. T. Millett, A. F. Ayoub and J. P. Siebert (2004) Applications of 3D imaging in

Digital images transform practice management and treatment: Digital images have many advantages over plain film in practice management. It is easier to store and archive digital study images and models to review outcomes. Treatment progress is easier to monitor since digital images can be transposed and compared on a single screen. Digital images also make working in multi-disciplinary teams easier since patient records can be easily transferred.⁴⁴ Most importantly, they can be used to create three dimensional models and simulations.

Digital images allow orthodontists to create models and simulations to help develop more precise treatment plans. Digital images also help orthodontists, and possibly others, to move beyond the treatment of malocclusions to consider a fuller facial aesthetic.⁴⁵ Future advances in modeling and imaging technology will allow orthodontists to forecast the development of the teeth and jaw over time and allow them to compare a patient's progress. Combined with better outcomes studies and measures, this could provide a dramatic increase in the quality and efficiency of treatment across the profession.

Digital modeling and imaging technology can be used to involve patients in decision-making about treatment options. Orthodontists will have the ability to do a "smile analysis" of a patient and present a few different treatment options in digital form. Patient compliance could improve as patients monitor their progress online. Digital modeling and imaging technology are powerful tools both for patient empowerment and expanding treatment into the lucrative adult and cosmetic dentistry markets. These tools may also enable ortho-dentists and other competitors to move into the orthodontic care market by offering a "full-package" solution.

Orthodontists may resist this technology at first. A "smile analysis" provides a clear and objective endpoint for patients. They could judge the outcome of their treatment based on the original simulation. If the treatment does not achieve the simulated results, patients may be unhappy. There are also risks for early adopters that use modeling and simulation technology. Orthodontists who over-promise or mislead patients using digital models and simulations face the risk of malpractice or false advertising litigation. As outcome studies, ethical guidelines, education, and regulations catch up with the advancing technology, the likelihood of orthodontists being unfairly caught in litigation decrease. In the short term, enabling patients to see their end results may prove to be a competitive advantage. In the longer term, imaging and modeling technology could improve quality across the board by making it easier for patients to identify poor quality treatment and fraud.

orthodontics: Part II. *Journal of Orthodontics*, 31: 145-162

⁴⁴ Ibid.

⁴⁵ White, Charlene (2003) An Interview with Dr. David Sarver. *The Orthodontic CYBERJournal*. Retrieved 6/15/2005 at <http://www.oc-j.com/july03/sarver.htm>

Key Questions for Practitioners

- Will simulations become a competitive imperative and if so, how will the practitioner manage patient expectations?
- Will digital imaging open up orthodontics to extensive outsourcing of treatment plan development?
- Will digital imaging with computer-generated, evidence-based treatment plans become the standard of care?

Key Questions for Association Leaders

- Are there additional opportunities for organized orthodontics to educate members about advances in digital imaging, modeling and simulations?
- Are there ways that the orthodontic community can bring experts in imaging technology together with orthodontic educators to develop best practice guidelines for imaging and simulation technology?
- Are there potential member services in providing access or affordable purchasing for these technologies?

Patient Markets

Forecast: Three markets are growing as significant alternatives to the middle class adolescent market in orthodontics: image-conscious adults who can afford high-end cosmetic dentistry; re-do adults whose teeth have naturally moved or who failed to comply with retainer plans; and low-cost, basic services patients.

Orthodontic treatment expands beyond adolescence: An estimated 5 million people in North America undergo orthodontic treatment each year, with adolescent patients accounting for the largest market share.⁴⁶ Between 1989 and 2000 the number of adult patients grew by more than 14 percent and now one in five orthodontic patients is an adult.^{47,48} While some adults need to fix

⁴⁶ Kreimer, Susan (5 July 2005) Demand for Orthodontic Assistants is Wide Open. *The Dallas Morning News*, Business and Financial News.

⁴⁷ (26 April 2005) Straighten out your smile: More adults getting healthy makeovers by wearing braces. *PR Newswire Association LLC*. Lexis Nexis.

teeth that have shifted due to retainer non-compliance or wisdom teeth, some simply want adjustments.

Teeth are dynamic and move throughout the entire life of an individual. About two-thirds of people have jaws that will decrease in width and length as they age. Teeth may need to be straightened as often as every 10 to 15 years.⁴⁹ Re-do adults may return for orthodontic care only once or twice during the course of their adulthood for minor low-cost adjustments. Other image-conscious adults, who can afford high-end cosmetic dentistry, may return several times for more extensive and costly treatments.

Image-conscious adults buy into orthodontics: Interest in image enhancement is growing. The American Academy of Plastic Surgeons reports a 40 percent increase in cosmetic procedures just from 2002 to 2004.⁵⁰ According to the American Academy of Cosmetic Dentistry, cosmetic dentistry is experiencing strong growth. Almost 40 percent of the respondents to a survey of 9,000 practices reported an increase of over 15% in the number of cosmetic dental procedures they performed in the past five years; almost half said cosmetic dentistry generated more than \$700,000 each year in their practice. AACD attributes the growth in part to popular television programs like Extreme Makeover.⁵¹

These makeover shows also have boosted consumer interest in image consultants as a way to gain a competitive career advantage. These specialists currently are more likely to focus on visual appearance, verbal and nonverbal communication.⁵² In the future, highly compensated image artists could be the leaders in helping sophisticated consumers navigate their options in personal enhancement. Like a financial advisor who directs clients to the best investments for their particular situation, image artists could become the brokers of a range of personal enhancement strategies for those willing to pay. These artists could coordinate orthodontics, tooth sculpting and plastic surgery procedures for the perfect result. Cosmetic dentists may capitalize on this trend by offering easy access to an affordable version of these high-end image makeovers.

⁴⁸ (3 May 2005) Brace Yourself: Sleek new designs have adults supporting corrective tooth gear. *The Ottawa Sun* Lexis Nexis.

⁴⁹ Dr. Gaspar Lazarra. Personal Interview. Conducted by Marsha Rhea.

⁵⁰ American Society of Plastic Surgeons. National Plastic Surgery Statistics. Available 7/15/2005 at http://www.plasticsurgery.org/public_education/loader.cfm?url=/commonsport/security/getfile.cfm&PageID=16158

⁵¹ American Academy of Cosmetic Dentistry press releases. Available 7/15/2005 at http://www.aacd.com/media/releases/pr2005_05_02.aspx
http://www.aacd.com/media/releases/pr2004_01_08.aspx

⁵² Maher, Kris (2004) Image Makeovers Can Give Candidates an Added Edge. *WallstreetJournal.com*. Retrieved 7/15/2005 at http://www.careerjournal.com/jobhunting/jungle/20040714-jungle.html?home_inside

Americans can pay more attention to their appearance because they have the discretionary income. In the last 30 years American consumers have had more discretionary wealth available to spend on premium goods than ever before. According to Michael J. Silverstein and Neil Fiske, authors of *Trading Up: the New American Luxury*, “Middle-market consumers are more aware of their emotional states and are more willing to acknowledge their needs, talk about them and try to respond to them.” Even the guilt that once inhibited American consumers has been swept away by strong media messages, especially to women, that self-improvement and self-actualization are justifiable purchases.⁵³

Affordable services market also grows: The AAO says up to 75 percent of people may benefit from orthodontic care,⁵⁴ but many are not served. For both adults and adolescents, an appealing physical appearance will be seen as less discretionary and more a requirement for health and success. Many orthodontic treatments are considered elective and therefore have historically been related to household income. Unmet orthodontic treatment need was twice as high among 15-year olds from routine and manual family backgrounds as compared with those from managerial and professional family backgrounds.⁵⁵ Recently, patient financing offered through third-party finance companies has lowered the threshold by providing flexible plans with extended terms.⁵⁶

Increases in immigration will also affect the market for basic services in the future. Currently, 11.5 percent of the US population is immigrants with a continued annual arrival of about 1.5 million immigrants (documented and undocumented). Over the next 50 years it is projected that Florida, California, Texas, and Georgia could double their current populations with the majority of the increase from immigration.⁵⁷ As migrant populations, primarily Hispanic, increase over the next fifty years, orthodontists will need to be more affordable and accessible to these populations.

In today’s appearance driven American society, a healthy smile with straight teeth is becoming necessary for success. Adults will be willing to invest in their own orthodontic maintenance, and less affluent families will want their children to have access to affordable orthodontic treatments. Getting access to orthodontic treatment will shift from a privilege people elect to a “right” they expect.⁵⁸

⁵³ Silverstein, Michael J. and Neil Fiske (2003) *Trading Up: The New American Luxury*. New York, NY: The Penguin Group.

⁵⁴ About AAO Retrieved 7/14/2005 at www.braces.org.

⁵⁵ Child Health News (20 Dec. 2004) Link Between SES and tooth decay. Retrieved 7/15/2005 at www.news-medical.net/?id=6902

⁵⁶ Dalton, John and Shapleigh, Tim. (27 July 2004) Orthodontics Industry Report.” *Practice Bank Financial, Inc.*, p. 6.

⁵⁷ Current Numbers. *Center for Immigration Studies*. Retrieved 7/14/2005 at www.cis.org

⁵⁸ Randall Berning. Personal Interview conducted by Dr. William Rowley.

Key Questions for Practitioners

- As the motivation for pursuing orthodontic treatment shifts from a medical rationale to concerns for appearance, how does this alter treatment strategies, marketing messages, and patient education?
- Can individual practices create business models that can serve low income patients and be financially successful?
- Will other dental specialties be more effective in meeting the expectations of image-conscious adults?

Key Questions for Association Leaders

- Will the orthodontists that pursue these growing markets have different member needs and interests than orthodontists who specialize in the adolescent market?
- How do these new markets alter the professional image of orthodontists and affect how organized orthodontics educates the public about the value of orthodontics?
- Does the profession have an ethical obligation to reach out to lower income families where there is significant need for orthodontic intervention?

Provocative Forecasts

The Southern Association of Orthodontists explicitly entered this futures exploration to anticipate important changes outside the traditional worldview of the profession. Futurists use such methodologies as provocative forecasts and scenarios to open people's eyes to important "what ifs" they may not be considering. To begin the research for this report, IAF used a set of provocative forecasts to push the edges of what could happen over the next 10 years.

To create provocative forecasts, futurists project forces of change they observe operating in other arenas and speculate about what would happen if they became a factor for this profession. Orthodontics is ripe for innovation. It is a lucrative business that is certain to attract new entrants who will differentiate themselves in how they choose to play the game for orthodontic customers. IAF searched for innovative approaches that could dramatically disrupt orthodontic tradition and found three surprising possibilities in education, structure of practice, and treatment alternatives.

Clayton M. Christensen and Michael E. Raynor, experts in disruptive innovation in business, have observed: "Competitiveness is far more about doing what customers value than doing what you think you're good at. And staying competitive as the basis of competition necessarily requires a willingness and ability to learn new things rather than clinging hopefully to the sources of past glory." This is their theory of how disruptors succeed:

- They start with a cost structure that allows them to earn attractive profits at lower price points and then carry that structure up-market to a broader range of customers.
- They count on established competitors to "flee rather than fight" by moving toward high-end customers willing to pay for premium services.
- They focus on a set of customers who have been non-customers and are quite pleased with simpler products.
- They turn to people with the right experience for the new opportunity, rather than rely on those who only know how to succeed in the current circumstances.
- They have the flexibility to respond as a viable strategy emerges and the capital to wait patiently for a return on their new venture.⁵⁹

⁵⁹Christensen, Clayton M. and Michael E. Raynor. (2003) *The Innovator's Solution: Creating and Sustaining Successful Growth*. Boston, MA: Harvard Business School Press.

Accelerated Professional Education

Forecast: Motivated dental students welcome an accelerated approach to dental school and specialty training. They fast-track into orthodontic courses after two years and complete the dental school curriculum and orthodontic specialty education in five years.

Fast track to orthodontic degrees: Orthodontists and their professional associations have argued for more than a century about the content, length and source of orthodontic education. Orthodontists were more likely to train through preceptorships than universities until the 1950s, when professional association membership and licensing requirements began to lock-in the current system of two to three years of post-graduate specialty education.⁶⁰ The system that is now seen as traditional is less than 50 years old. New approaches that take advantage of new theories, technologies, and student preferences are just as likely to become accepted over the next 50 years. Early indicators of change are already evident.

A number of dental schools already invite exceptional undergraduate students into an accelerated seven-year combination BA/BS and DMD/DDS program. Motivated students who want to complete academic training quicker and with less debt would welcome a similar approach to accelerate through dental school into specialty training. One viable way to accelerate professional education is to restructure the dental school curriculum to allow students to track into specialty education after two years.⁶¹ The fast-track student would be able to complete the dental school curriculum and orthodontic specialty education in five years. Bright students who know they want to be an orthodontist early could start on the fast track as an undergraduate and complete their schooling in eight years.

Dual degrees are becoming popular with professionals who want to gain a competitive career advantage. Many medical students choose to pursue dual degrees such as master's degrees in particular sciences, public health and business administration or law.⁶² Medical scientists often have MD/PhDs. Medical business executives are quite likely to have both professional and business education. More orthodontic students are likely to want this kind of high profile specialization.

⁶⁰ Shankland, Wilbur Morse (1971) *The American Association of Orthodontics: The Biography of a Specialty Organization*. St. Louis, Mo: American Association of Orthodontics

⁶¹ Dr. Donald Joondeph, American Association of Orthodontists president-elect and associate professor of orthodontics at the University of Washington. Personal interview, conducted June 17, 2005 by Marsha Rhea.

⁶² Princeton Review (2005) Combined Degree Programs for Med Students. Retrieved 7/14/2005 at <http://www.princetonreview.com/medical/research/articles/find/jointdegree.asp>

New learning processes master the science and art of orthodontics:

Perhaps more profound are potential changes to the learning process. Orthodontists are quick to explain that their field is both art and science. With the rise in evidence-based dentistry, the science is likely to be more transparent, and thus easier to transfer into computer simulations. Problem-based learning straddles both the need to match problems with solutions and to respond to the variability of individual biology. It is learner-centered, collaborative, and accelerates learning through “contextualized problem sets and situations.”⁶³ Returning to some form of the apprenticeships of yesteryear for clinical training would give students access to a wider range of clinical mentors and career experiences than may be available in university-bound clinics. With the growing sophistication of online learning, residency no longer needs to be limited to a university campus.

Key Questions for Practitioners

- What is the role of the individual practitioner in educating and mentoring orthodontic students under a model that incorporates field practice into the academic experience?
- Do individual practitioners regularly communicate with universities about how the core knowledge required to succeed in the profession is changing?

Key Questions for Association Leaders

- Is there a larger role that organized orthodontics can play in the education of young orthodontists that will transition them into active membership?
- Can the orthodontic community facilitate greater communication and interaction between practitioners and academia that refreshes the relevance of the orthodontic curriculum?

⁶³ Rheem, James (1998) *Problem-Based Learning: An Introduction*. National Teaching and Learning Forum, 8:1. Retrieved 7/14/2005 at http://www.ntlf.com/html/pi/9812/pbl_1.htm

Structure of Practice

Forecast: Corporate and franchise practices will employ economies of scale, effective branding and convenience to out-price existing practices and gain a dominant market share in vanguard cities. Larger practices, both franchise and independent, are more common.

Corporate model appeals to transient populations: The growing transience of the US population has led to fewer and fewer people living in the same area as their parents. The average middle class American will move 15 times in his or her lifetime.⁶⁴ The transient nature of the population means few community loyalties to any institutions or services, including orthodontic practices.

The fast-growing cities and suburbs are at the vanguard of this transient movement, because they are made up almost entirely of new populations, with no history of community connections. While the majority of these vanguard cities are in the fast growing West and Southwest, the Southern region has its fair share as well. Of the 100 fastest growing cities, four are in Florida, while North Carolina and Georgia each have one.⁶⁵

These are the cities where a comfortable sense of place is built on well-known national brands and big box retail defines convenience. These national businesses provide consistent service at more convenient times and locations, often at a lower price, and with improved portability of service across a regional or national system.

Orthodontic corporations may use a business model of company and/or franchise offices. Under an alternative business model just launched in 2005, the company finances new offices and relies on graduates who agree to work for the corporation for a set number of years in exchange for a full-ride scholarship. The corporation is using digital imaging combined with electronic medical records to ensure that the offices have a consistently high level of service.⁶⁶

In order to grow faster, some companies will franchise offices in other vanguard cities. Established orthodontic practices can join the company as a franchise for

⁶⁴ Zinsmeister, Karl (November/December 1996) Cures for Lonely Suburbs and Dying Cities. The American Enterprise. Retrieved online 7/18/2005 at http://www.taemag.com/issues/articleid.16262/article_detail.asp

⁶⁵ Coral Springs, Deltona, Davie, and Boynton Beach in Florida are on the fastest growing cities list for 2000 to 2002 as well as High Point in North Carolina and Marietta in Georgia. City Rankings from city-data.com. Retrieved 7/10/2005 at <http://www.city-data.com/top32.html>

⁶⁶ For an example of this business model in action, see Imagine Orthodontics and the non-profit Orthodontic Education, Ltd.

Karkaria, Urvaksh (20 June 2005) Investing in Smiles. *The Florida Times-Union*. Retrieved 7/28/2005 at http://www.jacksonville.com/tu-online/stories/072005/bus_19283794.shtml

a yearly licensing fee and an agreement to abide by the standards of the company. This would include incorporating the company's technology and having their electronic medical records reviewed. In return, they receive the benefits of the company's marketing, assistance in practice management and a built in base of referrals from other company and franchise offices.

As these franchises meet customer expectations and grow their market share, they make it more difficult for new practices, not inside the model, to open in these vanguard cities. Independent practices will move up-market to patients who are more concerned with service and status and are less price sensitive. Other practices will focus on the more complex and difficult cases that require more skill and experience. This consumer pattern can be seen in the optometry market, where specialty and high-end optometrists continue to thrive in urban areas, despite the presence of franchises serving the mass market.

By 2015, the corporate model will have proved successful in dominating the entry-level market in several vanguard cities, leading to increased interest from the rest of the country. The dominance of the corporations in these cities discourages new orthodontists from entering the market. They are unable to compete against the economies of scale and marketing power of the corporation. Younger orthodontists, who want to live in vanguard cities, may find working as an employee a viable alternative for establishing practices where they have no community linkages. In other, more traditional cities, new orthodontists will compete by opening franchise offices or grouping together into large, multi-partner practices or cooperatives.

A sea change in practice structure preferences for orthodontists:

Orthodontists will shift to larger practices, both independent and corporate. Advances in technology will require orthodontic practices to see more patients to recover the sunk costs of technology. Also, practices will need larger numbers of auxiliary staff to handle the increased workload.

Very large practices, both independent and corporate, will look to hire younger orthodontists. Working as an employee allows the younger orthodontist to gain experience. Larger practices also allow orthodontists more freedom to engage in teaching, charity work, family responsibilities and other community activities without a dramatic reduction in income.

The increasing number of women entering the profession will encourage this trend, as family responsibilities begin to take a higher precedence. The number of women in dental pre-doctoral and post-doctoral programs has risen from 23.8 percent and 17.4 percent in 1984 respectively to 40.2 percent and 33.4 percent in 2002 and is likely to rise further in the future.⁶⁷ Working part-time or taking a leave of absence is easier as a salaried employee or a member of a large multi-

⁶⁷ Sinkford, Jeanne C., Richard W. Valachovic, and Sonja Harrison (January 2003) Advancement of Women in Dental Education: Trends and Strategies. *Journal of Dental Education*, 79-83.

partner practice. On average, female orthodontists work 32.6 hours per week compared to 36 hours per week for men. Also, female orthodontists are younger than their male counterparts with an average of 10.5 years of practice compared to 19.1.⁶⁸

In a larger practice, there is also more opportunity to hire and retain assistants, finance technology, operate satellite offices and work fewer hours, all the hallmarks of a financially successful practice. For example, orthodontists with the highest net income had more satellite offices, more full and part-time employees, and saw more patients per day than their lower net income counterparts. They were also much more likely to delegate administrative, record-taking, and clinical responsibilities to their staff.⁶⁹ In addition, the greater number of practice hours available makes it possible to offer evening or weekend hours, which is attractive to working professionals.

Key Questions for Practitioners

- Will market pressures and economies of scale make it more difficult for small private practices to continue to thrive?
- How will the employment expectations of younger orthodontists change the structure of practice?
- Will new business models alter the profitability of dentistry's most lucrative specialty?

Key Questions for Association Leaders

- As more orthodontists become employees, how do their expectations about membership dues change?
- If larger practices or franchises prevail, will they look internally for knowledge and education resources rather than to traditional organizations? What might organized orthodontics do to serve employer needs?

⁶⁸ Gottlieb, Eugene L., Allen H. Nelson, and David S. Vogels III (December 2001) 2001 JCO Orthodontic Practice Study: Part 3 Practice Growth. *Journal of Clinical Orthodontics*, 733-746.

⁶⁹ High net income orthodontists on average employ 7.8 full-time and 2.1 part-time employees compared to 3.6 and 1.4 employees for low net income orthodontists. They have .8 satellite offices on average compared to .5 for low net income orthodontists. They also saw 72.8 patients per day on average compared to 34.7 per day for low net income orthodontists.

Gottlieb, Eugene L., Allen H. Nelson, and David S. Vogels III (November 2001) 2001 JCO Orthodontic Practice Study: Part 2 Practice Success. *Journal of Clinical Orthodontics*, 673-681.

No Braces Alternatives

Forecast: Appliance technology changes radically, removing traditional braces as the most common method of orthodontic treatment. Independent wires and mouth-guards are the most common form of treatment. Made of smart materials, these appliance technologies are less visible and can detect changes in alignment and adjust themselves with more force than traditional braces.

In 1995, the Food and Drug Administration first approved a laser surgery technique for correcting mild to moderate nearsightedness.⁷⁰ Laser surgery moved from initial acceptance to common elective surgery within ten years. LASIK is now the most popular elective surgery in the U.S. Laser eye surgery has not replaced glasses or contact lenses but few would disagree that the procedures have had a revolutionary impact on ophthalmology and optometry. For orthodontists, the most comparable revolution would be widespread acceptance of some alternative to braces. Breakthroughs are inevitable, because consumers are even less fond of braces than eyeglasses. Where that breakthrough will emerge is purely speculative, but important for any futures exploration to ask.

One plausible scenario is that clear aligners developed through CAD/CAM systems could bypass the orthodontist completely. The teeth and face could be scanned at a kiosk in the mall using cone beam imaging technology to create a digital image. That image could then be analyzed by software and compared against a database of previous cases, as well as the latest studies from evidence-based orthodontics. CAM technology would then prepare the aligners while the patient shopped.

This scenario is not without historical precedent. In the 1930s, the orthodontic profession faced a similar predicament. The “Patent Medicine Menace of Orthodontics” occurred when dentists routinely treated malocclusions with ready-made appliances received through the mail. The dentists had little training in orthodontics and the appliances probably did more harm for good.⁷¹ The same argument might also apply for clear aligners, but advancing technology combined with evidence-based dentistry, could create clear aligners that are both safe and effective.

Other dental specialties already offer their own alternative strategies for treating dental and facial irregularities. Orthodontists might have new devices such as a

⁷⁰ Lewis, Carol (1998) Laser Surgery: Is It Worth Looking Into? Food and Drug Administration. Retrieved 7/15/2005 at http://www.fda.gov/fdac/features/1998/498_eye.html

⁷¹ Shankland, Wilbur Morse (1971) *The American Association of Orthodontics: The Biography of a Specialty Organization*. St. Louis, Mo: American Association of Orthodontics

nighttime mouth guard that nudges the teeth through electrical or sonic manipulation. Advances in nanotechnology could lead to smart materials (shape memory polymers)⁷² that use an embedded microprocessor to detect changes in alignment and automatically adjust. And some day in the far future, medical scientists could well find ways to biologically signal the growing jaw and teeth toward a desired outcome.

The issue is less about where and when that breakthrough might come than about the profession's willingness to innovate and adapt to new opportunities. If the single greatest impediment to seeking orthodontic care is not cost but wearing braces, someone will go after those non-consumers with a disruptive innovation that could leave others debating the medical appropriateness while the market moves with the moment.

Key Questions for Practitioners

- What are the most plausible opportunities for disruptive innovations in orthodontics?
- If innovations move orthodontic care out of the office and into the retail shopping environment or home, what will this mean for individual practices?

Key Questions for Association Leaders

- In what ways can orthodontic leadership intentionally keep their members open to innovations they have not yet imagined?
- What role will organized orthodontics play in shaping the direction of potentially disruptive innovations?

⁷² Shape memory alloys are metals that revert back to a specific shape in the presence of heat, electricity or magnetic fields. The Nickel Titanium wires currently used are an example. Shape memory polymers are newer materials that use polymers instead of metals. They have greater elasticity and degrade less. Advances in these polymers, perhaps through nanotechnology, could create clear polymers with more applied force and precision than current materials, and that respond to electrical stimulus. Combined with an embedded microprocessor, it could be possible to create an invisible system that detects alignment and adjusts automatically.

Conclusion

Over the last several decades, the profession of orthodontics has been a success in improving the health and well-being of millions of Americans. It has greatly improved the quality of care, while reducing the cost of care and expending care to millions of Americans. New technologies have the promise of extending orthodontics to even more potential patients and improving the quality of care. The patient market of orthodontics is also expanding as more adults come in for orthodontic treatment. At the same time, quality of care will improve as the evidence base for orthodontics grows and more consumers use consumer advocacy sites and outcome studies to choose their dentists and orthodontists.

There are also many challenges ahead for the profession. The orthodontic education system is having problems retaining faculty and may not produce enough orthodontists for a growing market. This could leave larger service gaps in rural areas and immigrant communities. New technologies are also making it easier for dentists to provide low-cost and convenient care. Also, a corporate or franchise model of orthodontics might emerge to challenge the current model of independent practices.

Orthodontists need to anticipate the coming challenges and work to position their practices to take advantage of them. For example, orthodontists should keep a close eye on the local markets, new technologies, business models and orthodontic research. The future of the profession is bright, but only if orthodontists can anticipate and change to meet the new challenge ahead.

Association leaders also need to anticipate and change to meet the challenges ahead and capitalize on new opportunities. One way they can do this is by acting as an intermediary between their members and other forces of change. They can provide a bridge of information and services that help members learn and adapt to new developments in the profession. They can also act as a liaison between the members and the education, policy-making, and business communities. The forces of change cannot be stopped, but they will yield to a profession wise enough to turn them toward a preferred future.

Acknowledgements

The Institute for Alternative Futures acknowledges the following individuals for contributing to *Anticipating the Forces of Change in Orthodontics*.

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