Summary of Report of IOM Committee on the Future of Dental Education, "Dental Education at the Crossroads: Challenges and Change"

Dental education has arrived at a crossroads. During the last 150 years, it has evolved from a short prelude to apprenticeship into a comprehensive program of professional education. Advances in science, technology, and public health have greatly reduced tooth decay and tooth loss. In addition, dentists are now respected professionals, and dental schools are part of many of the nation's leading public and private universities.

This progress notwithstanding, questions persist about the position of dental education within the university and its relationship to medicine and the overall health care system. The dental profession is at odds with itself on a number of matters including work force policies, licensure, and health care restructuring. These and other issues create tensions between practitioners and educators that can undercut the profession's position within the university. Six dental schools—all private—have closed in the last decade, and enrollment reductions over the last decade and a half are equivalent to the closure of another 20 average-sized dental schools. Of the 54 remaining dental schools, several are vulnerable to closure.

The future of dental education will be shaped by scientific, technological, political, and economic factors that are in part beyond the profession's control. Nonetheless, dental educators—individually and collectively—have important choices to make. They may attempt to preserve the status quo—in effect, a path toward stagnation and eventual decline. Alternatively, they could follow a more difficult path of reassessing and renewing their missions of education, research, and patient care so that they could contribute more—and more visibly—to the university and the community. Taking this latter path would require new vigor in implementing long-standing recommendations for educational reform as well as attention to new issues and objectives. For dental educators to pursue change successfully, they will need the active cooperation of the larger dental community as well as support from university officials and state, local, and national policy makers.

This Institute of Medicine (IOM) study was prompted by concerns that the challenges confronting dental education, although generally recognized, were not adequately understood or appreciated and that effective responses had yet to be identified or persuasively presented. The purpose of the study was "to assess dental education in the United States and make recommendations regarding its future." The study was overseen by an 18-member committee that was appointed after extensive consultation with dental and related organizations. The group included members with expertise and experience in dental practice and education, oral health and health services research, other areas of the health professions and higher education, health care delivery and financing, and public policy. The committee undertook a wide range of information-collecting activities including 11 site visits, three liaison panels, a public hearing, and meetings with leaders of many dental organizations. Eight background papers developed to assist the committee will be published separately in the January 1995 issue of the *Journal of Dental Education*. The committee's report was submitted for outside review in accordance with IOM and National Research Council procedures and policies.

In concluding its work, the committee proposed that the IOM convene a conference or workshop to bring interested parties together, within a year after this report's publication, to assess the report's initial impact. The agenda would include responses from relevant organizations, discussion of initial individual or collective steps to implement recommendations, and suggestions about follow-up strategies. If the spirit of cooperation among dental leaders that led to this study persists, that gathering should find that this study has begun to make a constructive contribution to the health of the profession and the public.

Envisioning the Future

To move successfully into a new century, dental educators and the larger dental community need greater agreement on common purposes and directions for the field. Formulating such agreement requires, in turn, an understanding of how well current modes of thought and operation equip dental education and dentistry in general to face a future that will be quite different from the past. Building understanding and agreement was the major objective of this report.

The IOM committee adopted a set of eight policy and strategic principles (Table 1) that it combined with an extensive analysis of dental education's present and future to form a broad picture of dental education in the 21st century. This picture is not a vision of an ideal world. Rather, it offers a distilled view of what the future will likely bring, combined with the committee's conclusions about how dental educators and others can reasonably, if not easily, prepare the profession to play a constructive role in improving oral health for all Americans in the years ahead.

In the future envisioned in this report, five elements stand out. First, dentistry will and should become more closely integrated with medicine and the health care system on all levels: education, research, and patient care. The march of science and technology in fields such as molecular bi-

TABLE 1
Policy and Strategic Principles

1. Oral health is an integral part of total health, and oral health care is an integral part of comprehensive health care, including primary care.

2. The long-standing commitment of dentists and dental hygienists to prevention and primary care should remain vigorous.

3. A focus on health outcomes is essential for dental professionals and dental schools.

4. Dental education must be scientifically based and undertaken in an environment in which the creation and acquisition of new scientific and clinical knowledge are valued and actively pursued.

5. Learning is a lifelong enterprise for dental professionals that cannot stop with the awarding of a degree or the completion of a residency program.

6. A qualified dental work force is a valuable national resource, and support for the education of this work force must continue to come from both public and private sources.

7. In recruiting students and faculty, designing and implementing the curriculum, conducting research, and providing clinical services, dental schools have a responsibility to serve all Americans, not just those who are economically advantaged and relatively healthy.

8. Efforts to reduce the wide disparities in oral health status and access to care should be a high priority for policy makers, practitioners, and educators.

ology, immunology, and genetics will continue to forge links between dentistry and medicine, as will the needs of an aging population with more complex health problems. The financial strains on universities and academic health centers will likewise encourage consolidation and coordination. Pressures from government and private purchasers of health services will maintain the movement toward integrated systems of care that stress cost containment, primary care, and services provided by teams of professional and allied personnel.

Second, to prepare their students and their schools for change, dental educators will need to teach and display desirable models of clinical practice. Using excellent practice in the community as a model, dental school clinics should seek to be more patient friendly and efficient and to provide students with a greater volume and breadth of clinical experience. All dental graduates should have the opportunity for a year of postgraduate education with an emphasis on advanced education in general dentistry.

Third, securing the resources essential for educational improvement and, indeed, survival will require that dental schools demonstrate their contributions to their parent universities, academic health centers, and communities. These contributions include achievements not only in education but also in research, technology transfer, and community and patient service. Said differently, dentistry cannot afford isolation.

Fourth, dental leaders should cooperate to reform accreditation and licensing practices so that they support rather than obstruct the profession's evolution. Priorities include greater uniformity in licensing, reduced legal barriers to professional mobility, and revision of laws that limit dentists from working more productively with allied dental personnel. A uniform national clinical examination should be developed for acceptance by all states. Voluntary accreditation should focus on dental schools with significant deficiencies and reduce administrative burdens on other schools.

Fifth, continued testing of alternative models of education, practice, and performance assessment for dentists and allied dental professionals is necessary to prepare the dental community—educators, practitioners, regulators, and policy makers—for an uncertain future. In particular, experimentation and learning will help dentistry face one major uncertainty, namely, whether the future supply of dental practitioners and services will match, exceed, or fall below population requirements for dental care. The committee found no compelling evidence to predict with confidence a future under- or oversupply of dental services. Trends in supply and demand should, however, be monitored. Contingency planning is stressful—but essential—given the unpredictable nature of key developments in science, technology, social policy, and other areas. If a shortage in dental services should develop, responses should emphasize more productive use of allied dental personnel, continued elimination of ineffective or inefficient services, and, only if these steps prove inadequate, increased dental school enrollments.

Environmental change and dental education's efforts to respond constructively may exacerbate tensions with dental practitioners, for example, as dental schools experiment with new models of patient care and extend their outcomes research agenda. Thus, efforts to manage and resolve conflicts must also have a high priority. Still, compared to other health professions, dentistry may experience a less rapid restructuring of its place in health care; however, any such respite should be used not as a time to reinforce resistance to change, but as an opportunity to achieve a smoother transition for patients, practitioners, and educators.

Findings and Recommendations

In developing specific recommendations, the committee attempted to be both principled and pragmatic. That is, it tried to be neither so idealistic that its recommendations would be of little use to real-world decision makers, nor so fixated on the practical difficulties of change that it would provide no direction, motivation, or benchmarks to help decision makers move through difficulties toward desired goals. The committee's recommendations individually or collectively may strike some as weighted toward the idealistic and others as weighted toward the status quo. If,

however, a 10- to 20-year horizon is accepted as necessary and reasonable for the more demanding recommendations, then the possible and the ideal draw closer together. The recommendations are not a specific blueprint for the future of dental education. Such a blueprint would not fit the particular circumstances and needs of individual dental schools.

Oral Health Status and Services

The committee emphasized four broad objectives for the effective use of health resources to advance the nation's oral health. These objectives are to:

1. improve our knowledge of what works and what does not work to prevent or treat oral health problems;
2. reduce disparities in oral health status and services experienced by disadvantaged economic, racial, and other groups;
3. encourage prevention at both the individual level (e.g., feeding practices that prevent baby bottle tooth decay, reduced use of tobacco) and the community level (e.g., fluoridation of community water supplies and school-based prevention programs); and
4. promote attention to oral health (including the oral manifestations of other health problems) not just among dental practitioners, but also among primary care providers, geriatricians, educators, and public officials.

Dental education can play a central role in each of these areas. In particular, dental educators should be involved in basic science, clinical, and health services research to distinguish effective and ineffective oral health services, to clarify oral disease patterns and trends and the factors affecting them, and to develop cost-effective strategies likely to help those with the poorest health status and those with limited access to oral health services. In their outreach activities, dental educators and practitioners should continue to encourage physicians, nursing home personnel, public officials, and others to be alert to oral health problems among those they serve and to provide information about good oral health habits.

Public support is critical if disparities in health status and access to oral health services are to be reduced. This committee therefore recommends that all parts of the dental community work together to secure more adequate public and private funding for personal dental services, public health and prevention programs, and community outreach activities, including those undertaken by dental school students and faculty.

The Mission of Education

The problem in reforming dental education is not so much achieving consensus on directions for change, but difficulty in overcoming obstacles to change. Agreement on educational problems is widespread. The curriculum is crowded with redundant or marginally useful material and gives students too little time to consolidate concepts or to develop critical thinking skills. Comprehensive care is more an ideal than a reality in clinical education, and instruction still focuses too heavily on procedures rather than on patient care. Linkages between dentistry and medicine are insufficient to prepare students for a growing volume of patients with more medically complex problems and an increase in medically oriented strategies for prevention, diagnosis, and treatment. The basic and clinical sciences do not adequately relate the scientific basis of oral health to clinical practice. Lack of flexible tenure and promotion policies and of resources for faculty development limits efforts to match faculty resources to educational needs. Despite progress, an insensitivity to students' needs is still a concern.

In the hope of stimulating movement toward generally held goals, the committee proposes that each dental school develop a plan and timetable for curriculum reform. It urges closer integration of dental and medical education and more experimentation with new formats for such integration.

The Mission of Research

Research is a fundamental mission of dental education; however, too many dental schools and dental faculty are minimally involved in research and scholarship. A commitment to research in dental schools is important because research builds a knowledge base for improving the effectiveness and efficiency of oral health services, enriches the educational experience for students, reinforces the school's role as a disseminator of validated practice advice to dental practitioners, and strengthens the stature of dentistry within the university and the broader community.

The committee recognizes the problems facing schools that are trying to build or maintain a strong research program. These are, most notably, limited funding and a dearth of capable researchers. Expanding the oral health research work force is an important priority.

Dental schools will differ in how they define the specifics of their research priorities; nevertheless, all schools need to formulate a program of faculty research and scholarly activity that meets or exceeds the expectations of their universities. To build research capacity and resources, as well as to foster relationships with other researchers, it is important for dental schools to pursue collaborative research opportunities that start with the academic health center or the university and extend to industry, government, dental societies, and other institutions able to support or assist basic science, clinical, and health services research. Throughout this report, the committee has tried to point out opportunities for dental school faculty to participate in clinical, behavioral, and health services research that will support the missions of education and patient care and will help improve voluntary and governmental oversight of the profession.

The Mission of Patient Care

The typical dental clinic, put simply, is not patient centered. A procedure-oriented model of care must give way to a model that is patient and community oriented, focused on outcomes, scientifically and technologically up to date, team based, and efficient.

Current trends in health care delivery and financing are requiring academic health centers to compete for patients and for inclusion in managed care plans of various sorts. Whether the patient care activities of the dental school add to or subtract from the overall institution's market position is likely to be an issue in its future. Over the long term, the committee believes that dental schools have no ethical or practical alternative but to make their programs more attentive to patients as well as more economically viable, and to develop the programs and the data needed to document and assess the quality and efficiency of care. They will have to ensure that their activities

and objectives are compatible with those of their parent institutions.

The Dental School in the University

To fulfill their missions of education, research, and patient care, dental schools need the intellectual vitality, support, and discipline of universities and academic health centers. In return, dental educators must contribute to university life, especially through research, scholarship, and efficient management of educational and patient care programs.

Overall, the world of higher education is likely to become less stable and thus more unpredictable and stressful for its constituent parts. Universities and government policy makers will continue to reevaluate their programs—adding, deleting, and restructuring them. The closure of several dental schools has made the vulnerability of their relationship to the university clear. Reducing the factors that put dental schools at risk in the university is not an overnight task, and some factors are less subject to a school's influence than others. This makes it all the more important that each school assess its own position and develop a specific plan for analyzing and reinforcing that position within the university.

Although education at all levels faces financial constraints ranging in severity from routine to critical, dental education faces particular challenges given its relatively high costs and specialized needs. For most schools, financial health will not be achieved through a single grand solution. Rather, some combination of more modest and difficult steps will be necessary. Schools will need to develop better cost and revenue data if they are to design steps that match their particular problems and characteristics and minimize potential harm to their educational, research, and patient care missions.

Accreditation and Licensure

Accreditation and licensure are components of a broad social strategy to ensure the quality of dental care by protecting the public from poorly trained, incompetent, or unethical dental practitioners. They also account for much of the tension between dental schools and the profession. The dental community has taken important actions to improve licensure and accreditation processes, but further work is needed.

The accreditation process remains too focused on process and too inhospitable to educational innovation. The committee believes that the process tolerates some inferior educational programs, although data to document this are not publicly accessible. Accreditation reform should focus on dental schools with significant deficiencies and reduce the administrative burden on other schools. Improved methods of assessing educational outcomes are as central to achieving accreditation reform as they are to improving predoctoral education, entry-level licensure, and assessment of continued competency. Thus, cooperation and coordination among responsible organizations in each of these arenas should be established to avoid conflicting strategies and costly duplication of effort.

The major deficiencies of dental licensure are concentrated in a few areas: the use of live patients in clinical licensure examinations, variations in the content and relevance of clinical examinations, unreasonable barriers to the movement of dentists and dental hygienists across state lines, practice acts that unreasonably restrict the use of appropriately trained allied dental personnel, and inadequate means of assessing competency after initial licensure. The committee concluded that it is neither practical nor necessary to construct new national systems for licensure and accreditation. A uniform national clinical examination (one that does not include real patients) should, however, be developed for acceptance by each state.

The Dental Work Force

The dental community is characterized by much anxiety and disagreement about whether the nation faces a future shortage or oversupply of dental services. The committee found no compelling evidence that would allow it to predict either outcome with sufficient confidence to warrant recommendations that dental school enrollments be increased or decreased. On the one hand, the ratio of dentists to the general population is declining, and the coverage of dental services under expanded public or private health insurance could substantially increase the demand for such services, especially if additional efforts are made to reach people with significant unmet needs. On the other hand, scientific and technological developments could increase or reduce overall need and demand for dental services depending on whether they promoted prevention or expensive treatments. In addition, the current dental work force appears to have reserve capacity that could be mobilized through better use of allied dental personnel, improved identification and elimination of care with little or no demonstrated health benefit, and more efficient delivery systems.

In the face of uncertainty, the committee believes it is prudent to continue monitoring trends in the supply of dental personnel and developing a better understanding of their productivity, of the appropriateness of dental services, and of the factors that impede access to dental care. This course will require a more sustained investment in a comprehensive oral health data infrastructure than has been evident over the last decade.

Two persistent work force problems involve (1) parts of the country in which dental services are in short supply, and (2) minority representation in the future. The National Health Service Corps (NHSC) and other federal or state programs link the provision of financial assistance to a commitment to practice in an underserved area for a specific period, and thus help both to overcome service shortages and the serious problem of high student debt. The shrinkage in dental positions in the NHSC should be reversed. Efforts to increase the cultural and ethnic representativeness of the dental work force encounter a limited pool of candidates for admission, stiff competition from other professional schools for those candidates, and disproportionate attrition among minority predoctoral students. Building a dental work force that reflects the nation's diversity will require broad-based efforts to reduce attrition and to enlarge the pool of candidates for admission through information, counseling, and financial aid programs; improved precollegiate education in science and mathematics; and other supportive arrangements for precollegiate and collegiate students.

The committee's individual recommendations are listed below. The list generally follows the order in which the items appear in the report; they are

not listed in order of priority. The recommendations underscore that the future of dental education is necessarily linked to its contributions to improving the effectiveness and efficiency of oral health services through education, research, and patient care. It must not only contribute, but also be perceived as contributing—by the dental profession, the university, and society generally. For dental education to meet the challenges that lie ahead will require the support and involvement of the practitioner community as well as researchers and policy makers. The intent of this report is to provide guidance for each of these important groups.

Recommendation 1

To support effective and efficient oral health services that improve individual and community health, the committee recommends that dental educators work with public and private organizations to

- maintain a standardized process in the US Department of Health and Human Services to regularly assess the oral health status of the population and identify changing disease patterns at the community and national levels;
- develop and implement a systematic research agenda to evaluate the outcomes of alternative methods of preventing, diagnosing, and treating oral health problems; and
- make use of scientific evidence, outcomes research, and formal consensus processes in devising practice guidelines.

Recommendation 2

To increase access to care and improve the oral health status of underserved populations, dental educators, practitioners, researchers, and public health officials should work together to

- secure more adequate public and private funding for personal dental services, public health and prevention programs, and community outreach activities, including those undertaken by dental school students and faculty; and
- address the special needs of underserved populations through health services research, curriculum content, and patient services, including more productive use of allied dental personnel.

Recommendation 3

To improve the availability of dental care in underserved areas and to limit the negative effects of high student debt, Congress and the states should act to increase the number of dentists serving in the National Health Service Corps and other federal or state programs that link financial assistance to work in underserved areas.

Recommendation 4

To stimulate progress toward curriculum goals long endorsed in dental education, the committee recommends that dental schools set explicit targets, procedures, and timetables for modernizing courses, eliminating marginally useful and redundant course content, and reducing excessive course loads. The process should include steps to

- design an integrated basic and clinical science curriculum that provides clinically relevant education in the basic sciences and scientifically based education in clinical care;
- incorporate in all educational activities a focus on outcomes and an emphasis on the relevance of scientific knowledge and thinking to clinical choices;
- shift more curriculum hours from lectures to guided seminars and other active learning strategies that develop critical thinking and problem-solving skills;
- identify and decrease the hours spent in low priority preclinical technique, laboratory work, and lectures; and
- complement clinic hours with scheduled time for discussion of specific diagnosis, planning, and treatment completion issues that arise in clinic sessions.

Recommendation 5

To prepare future practitioners for more medically based modes of oral health care and more medically complicated patients, dental educators should work with their colleagues in medical schools and academic health centers to

- move toward integrated basic science education for dental and medical students;
- require and provide for dental students at least one rotation, clerkship, or equivalent experience in relevant areas of medicine, and offer opportunities for additional elective experience in hospitals, nursing homes, ambulatory care clinics, and other settings;
- continue and expand experiments with combined MD/DDS programs and similar programs for interested students and residents; and
- increase the experience of dental faculty in clinical medicine so that they—and not just physicians—can impart medical knowledge to dental students and serve as role models for them.

Recommendation 6

To prepare students and faculty for an environment that will demand increasing efficiency, accountability, and evidence of effectiveness, the committee recommends that dental students and faculty participate in efficiently managed clinics and faculty practices in which

- patient-centered, comprehensive care is the norm;
- patients' preferences and their social, economic, and emotional circumstances are sensitively considered;
- teamwork and cost-effective use of well-trained allied dental personnel are stressed;
- evaluations of practice patterns and of the outcomes of care guide actions to improve both the quality and the efficiency of such care;
- general dentists serve as role models in the appropriate treatment and referral of patients needing advanced therapies; and
- larger numbers of patients, including those with more diverse characteristics and clinical problems, are served.

Recommendation 7

The committee recommends that postdoctoral education in a general dentistry or specialty program be available for every dental graduate, that the goal be to achieve this within five to ten years, and that the emphasis be on creating new positions in advanced general dentistry and discouraging additional specialty residencies unless warranted by shortages of services that cannot be provided effectively by other personnel.

Recommendation 8

To permit faculty hiring and promotion practices that better reflect educational objectives and changing needs,

the committee recommends that dental schools and their universities supplement tenure-track positions with other full-time nontenured clinical or research positions that provide greater flexibility in achieving teaching, research, and patient care objectives.

Recommendation 9

To expand oral health knowledge and to affirm the importance of research and scholarship, each dental school should

- support a research program that includes clinical research, evaluation and dissemination of new scientific and clinical findings, and research on outcomes, health services, and behavior related to oral health;
- extend its research program, when feasible, to the basic sciences and to the transformation of new scientific knowledge into clinically useful applications;
- meet or exceed the standard for research and scholarship expected by its parent university or academic health center;
- expect all faculty to be critically knowledgeable about scientific advances in their fields and to stay current in their teaching and practice; and
- encourage all faculty to participate in research and scholarship.

Recommendation 10

To build research capacity and resources, as well as foster relationships with other researchers, all dental schools should develop and pursue collaborative research strategies that start with the academic health center or the university and extend to industry, government, dental societies, and other institutions able to support or assist basic science, clinical, or health services research.

Recommendation 11

To strengthen the research capacity of dental schools and faculty, the committee recommends that the National Institute of Dental Research

- continue to evaluate and improve its extramural training and development programs;
- focus more resources on those extramural programs with greater demonstrated productivity in strengthening the oral health research capacity of dental schools and faculties; and
- preserve some funding for short-term training programs intended primarily to increase research understanding and appreciation among clinical teaching faculty and future practitioners.

Recommendation 12

To affirm that patient care is a distinct mission, each dental school should support a strategic planning process to

- develop objectives for patient-centered care in areas such as appointment scheduling, completeness and timeliness of treatment, and definition of faculty and student responsibilities;
- identify current deficiencies in patient care processes and outcomes, along with physical, financial, legal, and other barriers to their correction; and
- design specific actions—including demonstration projects or experiments—to improve the quality, efficiency, and attractiveness of its patient services.

Recommendation 13

To ensure that dental education and services are considered when academic institutions evaluate their role in a changing health care system, the committee recommends that dental schools coordinate their strategic planning processes with those of their academic health centers and universities.

Recommendation 14

To respond to changes in roles and expectations for providers of outpatient health services including dental school clinics, the Commission on Dental Accreditation and the American Association of Dental Schools should

- reexamine processes for assessing patient care activities in dental schools and ensuring the quality of care, and
- begin to evaluate new options such as eventual participation by dental schools in separate accreditation programs for their ambulatory care facilities.

Recommendation 15

To consolidate and strengthen the mutual benefits arising from the relationship between universities and dental schools, each dental school should work with its parent institution to

- prepare an explicit analysis of its position within the university and the academic health center;
- evaluate its assets and deficits in key areas including financing, teaching, university service and visibility, research and scholarly productivity, patient and community services, and internal management of change; and
- identify specific objectives, actions, procedures, and timetables to sustain its strengths and correct its weaknesses.

Recommendation 16

To provide a sound basis for financial management and policy decisions, each dental school should develop accurate cost and revenue data for its educational, research, and patient care programs.

Recommendation 17

Because no single financing strategy exists, the committee recommends that dental schools individually and, when appropriate, collectively evaluate and implement a mix of actions to reduce costs and increase revenues. Potential strategies, each of which needs to be guided by solid financial information and projections as well as educational and other considerations, include the following:

- increasing the productivity, quality, efficiency, and profitability of faculty practice plans, student clinics, and other patient care activities;
- pursuing financial support at the federal, state, and local levels for patient-centered predoctoral and postdoctoral dental education, including adequate reimbursement of services for Medicaid and indigent populations and contractual or other arrangements for states without dental schools to support the education of some of their students in states with dental schools;
- rethinking basic models of dental education and experimenting with less costly alternatives;
- raising tuition for in- or out-of-state students if current tuition and fees are low compared to similar schools;
- developing high quality, competitive research and continuing education programs; and
- consolidating or merging courses, departments, programs, and even entire schools.

Recommendation 18

To protect students and the public from inferior educational programs and to reduce administrative burdens and costs, the committee recommends that the Commission on Dental Accreditation involve concerned constituencies in a sustained effort to

- expand the resources and assistance devoted to schools with significant deficiencies, and decrease the burden imposed on schools that meet or exceed standards;
- increase the emphasis on educational outcomes rather than on detailed procedural requirements; and
- develop more valid and consistent methods for assessing clinical performance for purposes of student evaluation, licensure, and accreditation.

Recommendation 19

To improve the current system of state regulation of dental professionals, the committee recommends that the American Association of Dental Examiners, American Association of Dental Schools, professional associations, state and regions boards, and specialty organizations work closely and intensively to

- develop valid, reliable, and uniform clinical examinations and secure acceptance of the examinations by all state licensing boards as replacements for state or regional clinical examinations and as complements to current National Dental Board Examinations;
- accelerate steps to eliminate examinations using live patients and replace them with other assessment methods, such as the use of "standardized patients" for evaluating diagnosis and treatment planning skills and simulations for evaluating technical proficiency;
- strengthen and extend efforts by state boards and specialty organizations to maintain and periodically evaluate the competency of dentists and dental hygienists through recertification and other methods;
- remove barriers to the movement of dental personnel among states by developing uniform criteria for state licensure except in areas where variation is legitimate (e.g., dental jurisprudence); and
- eliminate statutes and regulations that restrict dentists from working with allied dental personnel in ways that are productive and consistent with their education and training.

Recommendation 20

Because the prospects for a future oversupply or undersupply of dental personnel are uncertain and subject to unpredictable scientific, public policy, or other developments, the committee recommends that public and private agencies

- avoid policies to increase or decrease overall dental school enrollments; and
- maintain and strengthen programs to forecast and monitor trends in the supply of dental personnel and to analyze information on factors affecting the need and demand for oral health care.

Recommendation 21

To respond to any future shortage of dental services and to improve the effectiveness, efficiency, and availability of dental care generally, educators and policy makers should

- continue efforts to increase the productivity of the dental work force, including appropriately credentialed and trained allied dental personnel;
- support research to identify and eliminate unnecessary or inappropriate dental services; and
- exercise restraint in increasing dental school enrollments unless other, less costly, strategies fail to meet demands for oral health care.

Recommendation 22

To build a dental work force that reflects the nation's diversity, dental schools should initiate or participate in efforts to expand the recruitment of underrepresented minority students, faculty and staff, including

- broad-based efforts to enlarge the pool of candidates through information, counseling, financial aid, and other supportive programs for precollegiate, collegiate, predoctoral, and advanced students; and
- national and community programs to improve precollegiate education in science and mathematics, especially for underrepresented minorities.