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Oral health for the 21st Century



**Oral
Health**

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Abstract

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The Document reviews the present global situation of oral diseases that occur in and affect the oral cavity. It examines the trends and advances in oral health research, delivery of oral health care, education of personnel for services related to changes in the attitudes and demands of members of the global community. Guiding principles for planning for the future are outlined. These are based on validated oral public health that are not linked to specific circumstances or time periods.

The future scope of oral health care and education of relevant professionals is then discussed; the main elements being the broadening of the responsibilities of oral care personnel and the extension of the use of computers and informatics in oral health care. The main conclusion is that oral health services and education of personnel will need to be radically transformed. There will be less technical/manual skills needed, due in part to new technology, and more special skills in diagnosis, pathophysiology, disease risk assessment and management, and communication. The final section presents a series of recommendations for implementing and promoting the strategies needed to bring about the desired changes.

1. INTRODUCTION

"One of the fundamental advances in oral health care has been the increasing emphasis on its scientific basis. Research has done much to clarify the biological mechanisms involved in oral health and the prevention of disease, and to increase understanding of the nature of the two main oral diseases, caries and periodontal disease. Undoubtedly, this has revolutionized all aspects of oral health care. As a result, a primarily technical profession with a relatively narrow focus has adopted a more appropriate role as a broadly and scientifically based biomedical discipline: (dentistry) has become (oral health care)."

These words are contained in a report prepared by an Expert Committee which met in December 1991 to discuss recent advances in oral health care¹. That report details many of the important advances over the last few decades in prevention, diagnosis and treatment, and the use of informatics in oral health care. This document has been prepared as a companion to that report, at the request of the Oral Health Programme of WHO, by a group of experts who have been prominent in guiding oral health over a wide range of preventive, care, teaching, planning and research activities during the second half of the 20th Century. It is hoped that this document will become essential reading for all those who are concerned with a planned long-term evolution of services, teaching and research, compatible with possible, probable and/or inevitable changes at any community level. Having been considered at any one of those levels and in any socio-economic or cultural setting, the document may be used as an occasional guide for a specific exercise being performed, or used as a major source of guidance. The group believes that even the considered and controversial in parts, the document will have set in motion a process of reflection and planning which will promote ordered management of change rather than the crisis management we know all too well.

For convenience in the discussion, countries are described as either industrialized or developing. However, it is understood that neither group is homogenous and that generalized descriptions mask enormous differences that must be dealt with in different ways. This is especially true in developing countries, where both the extent of oral health problems and the capacity to respond vary greatly.

¹Recent advances in oral health care. Report of a WHO Expert Committee. WHO Technical Report Series No 826, 1992.

2. ORAL HEALTH STATUS

Oral health is the well-being of the oral cavity, including the dentition and its supporting structures and tissues -- the absence of disease and the optimal functioning of the mouth and its tissues, in a manner which preserves the highest level of self-esteem and interpersonal relationships. Retention of functional teeth is clearly the foundation of this state, high quality replacement being the second choice in maintaining adequate oral health and well-being.

Oral health problems negatively affect the quality of human life. Maintaining the most desirable levels of oral health and function, within the context of healthy lifestyle practices, is the goal for now as well as for the longer term.

Positive oral functions include eating (masticating, tasting, swallowing, digesting) communicating orally (speaking, singing, kissing, etc.), breathing, and presenting a pleasing appearance; all of these contributing substantially to one's self-esteem and ability to engage in satisfying interpersonal relationships.

However, the oral cavity may also serve as a vehicle for unhealthy, sometimes stress-related, habits such as the use of tobacco, alcohol and other toxic substances. In addition, some local customs may also be harmful to oral and general health. The need to disseminate health-promoting information to limit these harmful practices which reduce proper function should be included in oral health objectives for the 21st century.

Dental caries: Preventive measures, especially exposure to appropriate levels of fluoride from a variety of sources, have brought about a dramatic decline in the prevalence of dental caries in industrialized countries over the past few decades. In countries that have access to a full range of preventive measures, caries will continue to decline in children and adults, at least to 50-60 years of age by 2025. In the long term, it is anticipated that caries management will be transformed into a prevention and control, rather than a therapeutic, problem.

Although caries will continue to decline in such countries, it may never be eradicated altogether. There will be population groups that for one reason or another will be more susceptible or more exposed to risk factors. These risks should be better categorized, understood, reported and dealt with. For older age groups, root surface caries will remain a problem, but there are still insufficient data to determine either the prevalence of this specific disease or how it can be controlled.

A slight to moderate increase in caries levels is anticipated in many developing countries for the short term, until proven, culturally acceptable, preventive care is implemented effectively. Implementation may require the emergence of new appropriate technologies that differ from those which are now available in the industrialized world.

In order to promote a continued decline in caries levels in the industrialized countries, and to prevent major increases in populations who traditionally have had no or little caries, it is necessary to maintain vigilance and continuous monitoring. New and refined methods for measuring caries should be developed and research on alternative methods of prevention should continue. There is also a need to continue monitoring fluoride abundance and availability from all possible sources.

Periodontal Diseases: Periodontal health is improving in some industrialized countries, especially for age groups below 60 years of age. In the USA for example, fewer than 10 percent of the population experience severe periodontal destruction. This portion of the population may include several categories of individuals at risk (e.g. persons with juvenile periodontitis, diabetics, lower socio-economic groups, etc). These groups should be defined and understood more clearly.

For the population over 60 years of age, there are few reliable data, and, for many countries, it is still unclear whether there is any change in the levels of periodontal diseases, as current national data are not available. However, there is little doubt that the situation, though presently serious, is very likely to improve.

Where improvement has occurred it is believed that better oral hygiene has played a key role. As hygiene continues to improve, and new chemotherapeutic or other methods are introduced for control of the pathogenic microflora, it is expected that the prevalence and severity of periodontal diseases will continue to decline to very low levels by 2025. Additionally, if the risk factors are better understood and appropriate control measures found, the number of people at risk will decrease.

For developing countries, the prevalence and severity of periodontal diseases vary widely. The reasons for this are not well understood and should be investigated. In those countries that have high prevalence and severity rates, it is expected that, as improved oral hygiene or new methods for control of plaque and calculus are introduced, periodontal health will improve. In further investigating periodontal diseases in both industrialized and developing countries, new methods of assessment should be introduced which would continue to enhance our understanding of the magnitude and types of periodontal diseases affecting mankind. We also need more information on the factors that modulate host resistance to the putative periodontal pathogens and how they influence the episodic nature of periodontal diseases.

Oral Soft Tissue Diseases

Oral precancer and cancer: In contrast to other diseases of the oral cavity, cancer can be fatal, and therefore requires special attention. Because there is evidence that the majority of oral cancers are preventable by change of lifestyle, high priority should be given to early diagnosis of both precancerous lesions and unhealthy lifestyles. Tobacco

and alcohol use are the most important etiologic factors. For oral cancers, incidence data are available for many countries ².

Almost all oral cancers are preceded by precancerous lesions which can be differentiated into more innocuous white lesions and those which have great malignant potential. Many of the latter are leukoplakias with superimposed candidal infections. Whereas some prevalence and incidence figures are available from developing countries, such data are largely lacking from highly industrialized countries.

The prevalence of oral cancer differs widely among different populations. In the 1950's and 60's, in a number of countries, a decrease in oral cancer in men was documented, but, in several countries, that trend was reversed in the 1980's. Incidence rates vary in men, from 1-10 cases per 100,000 population in most countries to up to 16-22 cases per 100,000 population in other countries (France, Brazil, Canada and India). Likewise, the proportion of oral cancers among all cancers is highly variable, from very low in some populations to second highest in certain populations which practice multiple habits of chewing and smoking tobacco. In the continuing uncertainty about trends, no clear prediction can, at present, be offered.

Other Oral Mucosal Diseases: In recent years, oral health professionals have shown increasing interest in oral mucosal diseases. Unfortunately, very few studies have provided prevalence data for these diseases which cover a wide range of entities - from local lesions, especially affecting the tongue, to oral infections, to oral manifestations of systemic diseases, e.g. dermatological disorders, auto-immune diseases, blood dyscrasias and drug-induced lesions to oral diseases aggravated by systemic conditions, e.g. Necrotizing Ulcerative Gingivitis (NUG) to noma or cancrum oris. Associated with oral mucosal diseases, salivary gland dysfunction forms an important area of concern for the future. It can be assumed that these conditions will increase in numbers as populations age, and the elderly will present multiple conditions further complicated by associated systemic medications. Furthermore, new care procedures, both preventive and curative, are sure to emerge and should be part of the armamentarium of the next century's oral health personnel.

HIV infections: The recognition of the AIDS disease in 1981 has had an enormous impact upon the health professions. Because the HIV infection frequently becomes clinically manifest in the oral cavity, and these oral lesions are often the first sign of infection, oral health professionals have had an increased responsibility. Researchers have identified over 40 lesions which may be associated with the infection. Most frequently observed, though not pathognomonic, are candidiasis, hairy leukoplakia and periodontal lesions.

² Muir C, et al. Cancer incidence in five continents, vol 5. Lyon:International Agency for Research on Cancer, 1987.

As WHO predicts a massive increase in the global number of cases into the 21st century, especially in developing countries, oral health personnel will have increased diagnostic and care responsibilities in this area. Apart from the well-studied oral lesions of AIDS, the use of saliva for HIV - serological tests will continue to receive increasing attention.

Craniofacial Disorders: Dysfunctions of the masticatory apparatus include problems of the temporomandibular joint (TMJ), bruxism, atypical oro-facial pain and disturbance of other oral motor functions. Functional disorders of the craniomandibular system are associated with unspecific symptoms and signs such as impaired mandibular mobility, headache and facial pain. They result from pathology in the muscles of mastication and/or the temporomandibular joints. In each of these structures, afflictions may be caused by physical strain and overload--often induced by occlusal factors--or may be due to primary diseases.

In the muscles, physical strain causes fibrositis or soft tissue rheumatism associated with pain and tenderness. Symptoms vary from slight inconvenience to unbearable headache and facial pain, depending on the extent of tissue impairment. Primary diseases of the muscles of mastication cover the general pattern of neuropathies and myopathies, but of all muscular affections, only 2-5 percent originate from the muscles themselves.

General diseases of joints, such as rheumatoid arthritis, involve the temporomandibular joints 60-70 percent of the time, and in childhood and adolescence, such diseases have serious adverse effects on facial morphology and dental occlusion. Of all diseases of the temporomandibular joints, about 10 percent result from primary disease, but the symptoms and signs are not easily distinguished from those caused by physical overload.

The frequency of significant functional craniomandibular disorders associated with headache and facial pain rises from 1-2 percent in young children to 5 percent in adolescents, and reaches 5-10 percent in adults. Distinguishing such disorders from other diseases causing pain and discomfort in the head and face requires screening and/or careful examination.

Without appropriate diagnosis and therapy, craniomandibular disorders may lead to severe pain and mobility impairment, and the confusing psychological consequences of ongoing pain.

Dentofacial malrelations: While considerable variation exists in the estimated prevalence of malocclusion within a society or across societies, it is clear that the criteria used to differentiate need for treatment depend upon the rater's (or his/her organization's) priorities for resource allocation, as well as the definition of desired levels of oral

functioning. The decision to treat appears to depend upon the assessor's estimate of the degree to which the condition(s) may be handicapping to the patient's functioning.

In some industrialized countries, there is evidence of increasing demand for orthodontic services for children, and more recently, for adults. As standards of living increase, greater demand is likely to occur for orthodontic care.

Injuries: For traumatic dental injuries, a number of studies of children and adolescents have revealed prevalence rates varying from 8 to 35 percent. In one prospective study, every third child had a traumatized primary dentition before leaving preschool, and every fifth child had sustained injury to the permanent dentition before leaving school at age 16. The data from developing countries are very sparse.

Few reports on maxillofacial injuries are available, but those reporting data from several countries estimated the annual incidence as being 1-4 per 10,000 population, with traffic accidents and assault being the main causes. A remarkably higher incidence has been reported from one country, 19 cases per 10,000, usually caused by assault following alcohol abuse. Maxillofacial injuries have shown an increasing frequency in many industrialized and developing countries, apparently related to higher numbers of traffic accidents, alcohol-related violence, political disturbances and wars. An increase in demand for care is predicted.

All these data on the changing status of oral diseases show clearly the dramatically different oral health needs which populations will have in the future. They call for fundamental changes in the way the profession is structured, both in terms of training and services. Given the length of time which such changes take, the urgency for action cannot be overemphasized.

3. TRENDS AND ADVANCES

3.1 TRENDS IN ORAL HEALTH RESEARCH

As we approach the 21st century, the eventual goal of virtually eliminating the two main oral diseases appears not only to be reasonable, but also probable for a large majority in most populations. Perhaps no other health discipline has realized such a quick and dramatic result from efforts in prevention. For example, according to the Expert Committee on Recent Advances in Oral Health, "current knowledge is sufficient to control, if not eliminate, caries." Periodontal diseases have already ceased to be a major cause of tooth loss in some industrialized countries. Moreover, dental research continues to yield a rich harvest of new and better materials and techniques, new diagnostic methods and treatments, and a broad array of preventive options, and better ways to deliver these products and services to the public.

Advances in caries research have led to improved knowledge of the biological basis for the disease, better understanding of the roles of factors such as fluoride, saliva, and diet, and progress in the development of preventive options, such as improved sealants, antimicrobials, modifying molecules, and immunization. Similarly, periodontal research has produced greater understanding of the disease process and advances in the potential for prevention. These advances are discussed in greater detail in TRS 826, Recent advances in oral health.

The findings from research will continue to have a fundamental and profound influence on the prevention and treatment of diseases and disorders of the teeth, mouth, jaws and face. Although caries in all its forms will continue to be seen for some time, filling of cavities will cease to be the mainstay of general practices. The role of the general practitioner will expand to include the diagnosis and treatment of all diseases or disorders. Oral health care providers will be concerned with detecting and treating viral, fungal and bacterial soft tissue infections, salivary gland dysfunctions, disorders of taste, smell and swallowing, acute and chronic pain, and temporomandibular joint problems. They will be concerned with detecting and treating oral cancer and precancerous lesions, diagnosing and clinically managing patients with AIDS and other systemic diseases, and paying closer attention to efforts which will enhance healthier lifestyles, as the determinants of oral diseases and disorders are identified.

3.2 TRENDS IN CARE DELIVERY

It is difficult to recognize major changes or trends in the delivery of oral care. However, health services, including oral care, seem to be included in the general global trend towards privatization. This certainly is so in the industrialized countries, but some signs are emerging in developing countries as well. New systems to finance health care are being tried or implemented in many countries.

For the industrialized world, a decrease in the priority of treatment within school dental programmes is noted. Increased emphasis is placed on care for the elderly, in some places resulting in outreach programmes for elderly people in institutions. More attention is given to prevention and to the identification of groups in the population who are at high risk of developing oral diseases.

The topics of accountability, quality control, continuing education, and self-assessment are more and more perceived as important in the delivery of care by both the providers and the receivers of care. For some countries (e.g. Sweden), greater utilization of auxiliary personnel has been reported. In other settings, however, there is an over-production of dentists.

In developing countries, the normal pattern of oral health care has included a variety of care delivery systems, ranging from a "Western style" private practice for

expatriate groups and a very small percentage of nationals, to preventive programmes in Maternal and Child Health clinics and primary schools provided by the Ministry of Health, to emergency care, mainly extractions, for adults, provided by either formally or informally trained personnel.

Where changes are occurring, there are both positive and negative influences. On the one hand, there is more systematic prevention and treatment in schools and through primary health care services. On the negative side, there is often pressure to replace traditional systems and adjuncts (e.g. use of chew sticks, or *miswaki*) with high-technology, repair-oriented dental care and products, even though these may be inappropriate in quality, cost, or cultural acceptance.

A special item of concern for developing countries is the widespread exodus of oral health professionals to the industrialized countries in search of a more lucrative professional life.

3.3 TRENDS IN EDUCATION

In the highly industrialized countries there have been some major changes in undergraduate and postgraduate dental education. In Europe, especially, there is a strong incentive for change, as member states of the European Community attempt to standardize both the educational process and the product in relation to health personnel. Particularly in oral health, countries are trying to find a common ground between the stomatologist, a physician with little manual/technical training, and the dentist, a care provider with major emphasis on manual/technical training and more limited medical knowledge. In some countries, after many years of debate, the traditional training of stomatologists has been replaced by the training of dental surgeons. Ironically, this has occurred in a time and in circumstances which instead call for a broader education, one which will preserve the technical excellence of the dental surgeon, but expand his/her horizon to the daily practice of health through oral health.

Education is recognized as a continuum starting with undergraduate studies and continuing at regular intervals throughout the professional career. In general, there has been an increase in the length of the preclinical curriculum. New subjects such as genetics, molecular biology, environmental and behavioral sciences, informatics and community health have been incorporated and some subjects, notably dental mechanics, have been reduced in duration. In most dental schools, students have the opportunity for elective study during the undergraduate course, and this has come to be regarded as a desirable educational experience. In at least one dental school, the first year is spent in general education in subjects of the student's choice. In some schools dental students share core courses with medical students in the general pre-clinical subjects and then have an additional course in basic dental sciences or oral biology. In some countries, progress has been made in the creation of Health Sciences Faculties and Schools where an

integrated preclinical curriculum is taught to multidisciplinary groups of medical, dental and human biology students. Coordinated and integrated courses have been developed which include general anatomy and pathology, microbiology, immunology, medicine and surgery. This has reduced duplication and improved the utilization of resources and curriculum time devoted to these subject areas.

In the clinical part of the dental curriculum, there has been a shift towards teaching prevention, whole mouth care and the team approach to maintaining oral health and treating disease. There has been increasing emphasis on oral medicine, gerodentics, infection control, therapeutics, ethics, and dental practice management.

Perhaps the greatest changes in dental education recently have been in relation to postgraduate education. Here there is considerable variation between countries. There has been an increase in demand for postgraduate, vocational/graduate experience in general dentistry and the specialties of dentistry. These courses vary in duration from one to three years. In the European Community so far, only oral surgery and orthodontics are recognized as dental specialties. In other countries, such as the USA and Sweden, many more dental specialties are recognized. Recently the number of practitioners going into specialty education in the USA has been increasing, whereas in Sweden, the reverse is the case. A number of countries are looking at the introduction of credit relicensing of general dental practitioners and specialists. Some favor this on the basis of attendance at postgraduate courses, others on the basis of self-assessment and peer review. There has been a considerable increase in the availability of postgraduate continuing education courses and educational material, including the use of "distance learning" techniques, such as self-instructional computer-based courses.

Recruitment of students to dental schools has also shown some changes recently. In many countries, a controlled reduction in the number of students entering dental schools has occurred. In general, the numbers of applicants have been reduced. In many countries in which the dental profession traditionally has been predominantly male, there has been an increase in the number of female entrants--40 to 65 percent of entering students has been reported in such countries. The effects of these changes are not fully understood, and there is a need for further analysis and continued monitoring.

3.4 TRENDS IN MANPOWER

The issue of oral health personnel - which categories of personnel need to be educated, their duties and the numbers of each - has for many years been of great concern. The importance of this matter really became evident when the production of dentists in a number of countries became irrelevant to the oral health needs and demands. The problem of production of inappropriate types and numbers of oral health professionals is still being faced by some countries. However, there are several in which the number of dental students has been reduced considerably. As noted earlier, it has

been reported (particularly in countries where over-production exists) that duties which traditionally have been performed by assisting personnel are now being carried out by the dentists themselves. In these areas, the introduction of auxiliary personnel has been delayed. On the other hand, where a reduction has been introduced, and where this change has come into full effect, a trend towards increased use of, and expanded duties for, assisting personnel is expected, or has indeed already started. In addition, professionals are experimenting with various team approaches to increase efficiency and productivity.

Another important issue is the migration of dentists. The numbers migrating within Europe may grow in the future, due to political decisions favoring greater freedom of movement and work. In all parts of the world, there is an increasing political awareness of the difficulties in recruiting dentists to certain areas - rural, sparsely populated, small villages, etc. Many of the political, legal and financial barriers restraining oral health professionals from moving into these settings need to be addressed, although no easy or practical ways of solving this problem have been indicated.

The changing pattern of oral diseases has led to several other trends affecting manpower - less interest in pedodontics and in educating specialists within this sector, and increasing interest in education focusing on the elderly, infection control, and management of new technology.

3.5 TRENDS IN THE PUBLIC

While trends in public attitudes, beliefs and practices have been identified in many industrialized countries, little data are available for developing nations. It is thought that, in a general sense, many of the known positive trends in public behaviour may not be occurring in populations which lack adequate economic and educational resources for oral health care. In any specific setting, after examining relevant data, appropriate strategies should be developed to enhance the match between the public's needs and oral health promotion.

Even within industrialized countries, many of the present health promoting practices vary by socio-economic status of the population sub-groups (e.g. the higher the socio-economic status, the greater the use of oral health care services). The recognition and characterization of these socio-economic and cultural differences can sharpen strategies and target them to those at highest risk of poor oral health.

The trends identified in many industrialized countries include:

- o a growing recognition that a healthy dentition is a vital part of an acceptable quality of life, resulting in oral care (both professional and self-care) becoming integrated into healthy lifestyles;

- o an increase in the proportion of the population seeking oral health care services;
- o an increase in the number of people who visit dental offices for preventive purposes (examinations and oral prophylaxes), as well as a decrease in the number of irregular attenders who tend to visit only because of uncomfortable oral symptoms;
- o a greater interest by the public in infection control practices in the dental operatory, particularly as a result of the fear of transmission of HIV infection and, to a lesser extent, hepatitis;
- o an increasing concern about the safety of restorative materials and oral care procedures such as radiology and fluoridation;
- o a greater demand for accountability of the profession;
- o an increase in oral self-care practices, including greater use of fluoride dentrifices, which seems to be responsible for better oral hygiene states and diminishing severity and prevalence of caries and periodontal diseases;
- o an increased use by adolescents of various forms of smokeless tobacco;
- o an aging of the world's population, leading to an increase in the number of medically-compromised patients with multiple systemic illnesses, who often are taking a variety of medications affecting the oral tissues; and,
- o an increase in the geographic mobility of populations, causing oral health care providers to see patients with a greater variety of oral conditions.

Taken together, these trends suggest the need for altering traditional approaches to health-promoting practices, and for increasing efforts to assure the public of the availability and use of safe procedures and materials as well as the delivery of effective services and advice for self-care.

4. GUIDING PRINCIPLES FOR PLANNING

Most public health organizations and agencies are involved in future planning for the short-term, e.g., goals for the next decade, five-year work programmes and budgets, etc. However, the development of guidelines and recommendations for a longer range future is not so common nor simple. While data regarding current trends and advances are (hopefully) objective, the extrapolation of those data into a picture of the future, and the planning for that future, can be highly subjective. To minimize this subjectivity, before making recommendations, the members of the group first agreed on a set of guiding principles - standard precepts of oral public health which are not constrained by time or circumstances. It is the understanding, acceptance, and application of these principles which form the basis for sound recommendations for the future.

Oral health is an essential part of general health, human function and the quality of life. The abilities to chew one's food, communicate orally, have a positive self image and develop productive social interaction are adversely affected when the mouth or

contiguous structures of the orofacial complex are afflicted with disease or disorder. Since these abilities are essential elements of healthful living, the status of oral health has a direct impact on the functioning of the individual.

Oral health status should be improved and maintained in the most economical manner consistent with quality and access. Since resources are limited, precautions should be taken to avoid the establishment of care delivery, preventive or financing mechanisms that are more costly in money or personnel than is necessary to accomplish program goals. Considerations of efficiency and effectiveness should include the cost to the recipients of the services and cultural acceptability.

Prevention is preferable to treatment as a general rule. It is better to avoid the pain and dysfunction caused by disease and disorder than to undergo the inconvenience and cost of treatment.

Individuals should be motivated to do as much as possible for themselves to achieve and maintain oral health. By taking personal responsibility for their oral health, by such practices as tooth brushing with fluoride toothpaste, flossing, eating a proper diet, and avoiding high risk practices and life styles such as using tobacco or engaging in contact sports without face and mouth protection, many oral problems can be avoided at minimum cost.

Caries and periodontal diseases can be prevented and controlled. Enough is known today to make it possible to prevent and control these diseases but much remains to be done to apply these methods universally.

Community methods of prevention should be supportive of individual and personal care and in some situations is more efficient. Community fluoridation methods - water, salt, or milk fluoridation - usually are more efficient and effective than depending on the daily ingestion of fluoride tablets or the administration of fluoride mouth rinses. However, any community prevention methods which are used should take into account, and be supportive of, existing individual and personal preventive practices.

Oral health care should be provided in the context of comprehensive care. The provision of oral health care should be in the context of the health history and comprehensive care being provided by other members of the total health team.

Oral health care providers should be prepared and motivated to consider general health, and should participate in the provision of general health care. Oral health care providers should not proceed to administer treatment without being aware of the patient's general health status and any medication being used or general health care being provided. Oral health care should be designed and applied so as to improve the general well-being and functioning of the patient and as an adjunct to health care and maintenance being provided by others.

The type, number and distribution of oral health care personnel should be maintained at levels consistent with need, quality, cost and access necessary to achieve desired oral health status. A short supply of health care professionals can result in inadequate access to needed care and higher prices for care received. On the other hand, an over-supply of professional dental personnel can result in costly over treatment and wasteful underemployment. The goal should be to have a proper balance of professionals and supporting personnel sufficient to provide ease of access to quality care at least cost.

Planning, health care practices and educational programmes should be appropriate for the population or situation in question. While some basic approaches and strategies for improving oral health will be suitable for many situations, consideration must be given to variances in disease prevalence, economic and manpower resources, and community and health infrastructure. Priority for the provision of oral health care services should be consistent with the extent and severity of the oral health problems of the population to be served. Educational programmes should be consistent with the current and anticipated needs of the population to be served, as well as take into account their socio-cultural perspectives. Each culture views health differently, and the success of any educational programme, however useful, depends on how effectively it exploits and integrates the best features of the practices culturally acceptable to the population served.

Research, evaluation and education are essential for the continued advancement of oral health. Only through the continued investment in the search for, and the application of, new knowledge, will ways be found to provide universal improvement in all aspects of oral health.

Learning must continue throughout the career of the health professional. With the rapid pace of change in scientific knowledge and in methods of prevention and treatment, health professionals must continue learning, or they may quickly become outdated and unprepared to meet their patients' expectations for the best possible care.

5. FUTURE SCOPE - EXTENDING THE BOUNDARIES

FUTURE SCOPES OF CARE, MANPOWER, AND EDUCATION

The oral and maxillofacial complex includes the teeth, the jaws, the mouth, the salivary glands, and the contiguous craniofacial structures. The oral health practitioner must care for this complex, for the purpose of maintaining healthy motor, sensory, and psychosocial function. The practitioner's clinical responsibilities include an understanding of the causes, risk factors, prevention, and diagnosis of oral diseases and disorders, and the recognition of human systemic diseases and disorders. The health practitioner of the future will require expanded abilities and new attitudes to meet society's evolving health care needs. No longer will it be sufficient for a dentist to sit in an operatory and concentrate on individual teeth. Instead, the new oral health practitioner must view himself, and be viewed by others, as someone who cares for the community's health. To do so, he/she must work to expand access to health care services, and must provide cost effective oral health care within a comprehensive, well-coordinated primary health care framework. Particular emphasis is placed on the fact that the future oral health practitioner must have strong abilities in patient education and counselling, not only in regard to specific oral health preventive regimens, but also in regard to more general lifestyle issues such as diet³. Oral health professionals must have an increasing role in informing patients and educating the public regarding the health effects of tobacco and alcohol - the messages must be much stronger than they have been up to the present time.

As the use of computers increases, the field of informatics will assume a larger role in the clinical practice of the future. Clinical records, patient management, epidemiological and clinical research, and education will all be dependent on electronic informatic technology. Technology which is already available includes voice-activated computer clinical recording systems, periodontal probes which automatically measure and record pocket depths, and interactive computerized continuing education programs. The descendants of these present day rarities will be commonplace in the clinical practices and health professional schools of the future. Clinical diagnosis will be aided by computer programs which analyze objective findings which are input by the clinician. For some diseases, a home computer will assist an individual patient in self-diagnosis, and will then prescribe alternative self-treatment regimens. Computerized standardized clinical recording systems will not only enable oral health professionals to monitor the health of individual patients, but will also permit health planners to monitor the health of the overall community or specific subpopulations, and to identify groups at high risk for oral diseases.

³ Healthy America: Practitioners for 2005; an agenda for action for U.S. health professional schools. Pew Health Professions Commission, Duke University Medical Center. Draft document, June 1991.

The pace of change is such that the use of advanced informatics will be fundamental in keeping at the leading edge of development whether in production of personnel or in the clinical setting. It will be applicable to the student, the teacher and the practitioner.

The changing disease patterns, the advanced diagnostic and treatment methodologies and the broadening of responsibilities illustrate the need for a new type of oral health professional, someone with special education and skills in the care of the oral and maxillofacial complex. These professionals will have the principal responsibility for oral health care, and they may be assisted by specially-trained support personnel. In addition to these generalist "oral physicians," it is anticipated that the need will remain for specialists in the fields of oral pathology and medicine, orthodontics and oral and maxillofacial surgery.

In order to produce these new types of oral health professionals, the educational system will have to be transformed fundamentally. The education of the oral health professional must be broadened, and the traditional medical and dental education systems must be replaced by a health science structure into which students will enter without necessarily being committed to one specific health subsector. The possibility of emerging into the work force at different skill levels will need to be allowed for in this system. Flexibility will be required at intermediary and advanced levels in the process, so that a wide variety of profiles might exist at any one level. Such flexibility could be found in an educational process comprised of a minimal core curriculum and a variety of electives, or "areas of concentration".

It should be stressed that this is not an unrealistic view of the future. The trends in oral health education discussed previously show that the educational process is already heading in this direction. Medical and dental students increasingly are sharing common basic science courses, and there is a trend to a more comprehensive curriculum, with greater emphasis placed on the biomedical sciences. This evolution will need to continue to prepare the oral health professional of tomorrow.

To maintain progress in this direction, the educational system will need to continue to strengthen the basic science foundation to keep pace with the advances in science and to translate these advances into clinical practice applications. There must be a decrease in emphasis and curriculum time on some of the more technical aspects of restorative dentistry, consistent with the coincidence of decreasing needs and increasing technology, such as adhesion and automation. Conversely, greater emphasis will be necessary in less technical areas, such as general medical/physical diagnosis, pathophysiology of disease, patient management, behavioral sciences, self-assessment techniques, clinical pharmacology, diagnostic sciences, information management, risk assessment, and prevention.

6. RECOMMENDATIONS

The group recognizes that dramatic successes in prevention have resulted in the major changes in the epidemiology of the most common oral diseases, dental caries and periodontal diseases, in many parts of the world in the past two decades. It is possible now to prevent and control these two diseases, though in actuality we are far from reaching this potential. Nevertheless, these and other factors, such as changes in scientific knowledge, the outcome and distribution of oral diseases and disorders, and new prevention and treatment possibilities, forecast the likelihood of continued rapid change, with an opportunity to make major improvements in oral health status. However, to maximize this opportunity, the committee believes it is important to stimulate, foster and guide changes in all sectors of the oral health community.

The Committee believes that WHO is well situated to carry out this role as a stimulus and driving force for change. To fulfill this role, WHO should:

- o establish an agenda for change;
- o work with an international leadership group to monitor change and suggest modification of the agenda;
- o give priority attention to developing countries or populations with particular problems or needs;
- o establish and utilize an international fund to provide support for innovative approaches to manpower development, research, education and care delivery; and,
- o maintain a clearing house and provide for exchange of information.

From the previous discussion, it is clear also that the educational system must serve as the vehicle for change. The first steps have been taken, but educators and institutions must reexamine and redefine the educational core for preparing oral health professionals.

The Committee also recommends the following agenda for action. It is proposed as a general guideline for different sectors - industrialized, moderately industrialized, and developing countries - and indicates strategies necessary to bring about the desired changes.

1. The educational core for preparing oral health care professionals should be redefined to meet future needs. All dimensions of professional education must be included in these examinations. Some examples follow:
 - o The educational core for all disciplines on the oral health team that will participate in the provision of care should be included. The core curriculum must create in its students the expanded skills, knowledge, and attitudes necessary to meet the evolving needs of the public.

- o The process must include the identification of anticipated skills and knowledge needed by graduates.

The new curricular core should move towards a common science base with medicine.

- o The teaching-learning process must promote the acquisition of the ability to manage large volumes of information. The volume of information available and need for decisions have become simply too great for traditional memorization strategies.
- o Health Care Teamwork
The educational and care delivery arrangement of dental schools must provide models of integrated functioning of health care professionals, such as physicians, nurses, pharmacists and support personnel, to meet the total health care needs of individuals.
- o Educational Effectiveness
There must be continuous monitoring and evaluation to assure achievement of intended goals.
- o Educational Flexibility
The educational program must offer greater flexibility to pursue awareness and freer options that branch off the required care.

2. Schools must restructure for the tasks ahead. Such a restructuring includes:

- o re-examination and restructuring of the institutional mission to direct institutions' responses to the changing environment;
- o a greater understanding of the health status of the community which graduates will serve;
- o organization of a structure designed to best achieve the new mission;
- o development of a faculty which will model the knowledge, skills and attitudes of the practitioners of the future;
- o assistance in maintaining continued learning of competency throughout the professional's career; and,
- o expanded research activities, including inquiry into health services, education and behavioral science.

3. Health Professional Associations should facilitate evolutionary advancement by:

- o providing an objective review of the scope of responsibilities;
- o providing leadership in facilitating the evolution to a broadened scope of responsibilities;
- o collaborating in establishing and facilitating an agenda for change;
- o supporting educational institutions in their efforts to bring about change;

- o encouraging licensure and accreditation bodies to work closely with schools as they develop responses to the changing environment;
 - o assisting schools in providing continuing education for the profession; and,
 - o conducting and supporting the assessment of quality of care provided by the profession.
4. Graduates of dental schools should utilize expanded knowledge and skills and assist schools in continued adaptation to change.
They should:
- o provide expanded service using new knowledge and skills;
 - o participate in the education of new professionals;
 - o engage in life-long learning and evolution of practice;
 - o provide ethical counseling;
 - o manage large volumes of information;
 - o use appropriately new technology (i.e., infection control);
 - o provide coordinated care; and,
 - o be involved in community health.
5. Governments should support change in dental education to improve oral health by:
- o offering financial incentives to encourage educational innovation;
 - o setting accreditation standards that will provide for the continued evolutionary advance of education;
 - o establishing licensure processes that will foster and facilitate change;
 - o providing incentives for exploration of new personnel and delivery models;
 - o supporting and actively encouraging the development of financing and delivery policies and systems that will provide access to improved oral health status for all segments of the population;
 - o supporting efforts to inform the public as to the importance of proper self and professional oral health care;
 - o supporting basic and applied research;
 - o supporting planning and adjustment of numbers and types of personnel; and,
 - o involving representatives of all segments of society in planning.
6. The public should be involved in the evolutionary changes in dentistry by:
- o participating in national planning, monitoring, and evaluation;
 - o demanding responsive providers;
 - o demanding and expecting access to appropriate and affordable oral health care;
 - o participating in public debate regarding the allocation and utilization of limited health resources, including research, education and care;

- o supporting continued investment in research and education;
- o informing and adopting a more careful approach to utilization of health care services;
- o Supporting disease prevention and health promotion; and,
- o accepting personal responsibility for maintaining healthy life-styles and avoiding disease.

The amazing success story in oral health carries with it the need for rapid and well planned changes. The future will require a smaller, more varied workforce, more integrated with other health services and more broadly effective in prevention and treatment initiatives. The pace of change is rapid; the time needed to keep up with that change is often too great and varies from community to community.

The challenge for the new century is then to maintain and even to intensify our success and to install more efficient mechanisms to allow all communities rich and poor, industrialized and developing, aging rapidly or slowly to benefit from our capabilities to maintain excellent oral health throughout life.