Dental Care and the Health Maintenance Organization Concept

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The principal dental diseases, caries and periodontal disease, affect almost the entire population and result in considerable pain and discomfort, with eventual tooth loss, if untreated. These disorders can either be prevented or their effects minimized through dental intervention so that intact functioning dentitions can be maintained.

Despite the fact that enough practicing dentists probably exist in the United States to achieve these results, the majority of the population lose all of their natural teeth if they live out their normal life spans. The solo-practice fee-for-service system, even with third-party payment, may reduce the difficulties somewhat but cannot solve the problem.

Prepaid dental group practice, either independently or as part of a general health care system, has the potential of virtually eliminating edentulism in populations for which it has responsibility. At present, it is possible to project costs and resource needs with sufficient accuracy to start viable entities. The "health maintenance organization" concept, therefore, applies to dental care.

This paper is a summary and synthesis of the ideas expressed by the author over a period of years with regard to the potential advantages and disadvantages of prepaid or capitation dental group practice as a vehicle for the delivery of oral health care. As such, it contains little that is new except for some updated references.

The current oral health status of the population of the United States is a result of the interaction of dental disease processes and their sequelae with dental treatment. Such dental care has been provided largely by solo practitioners charging fees for service and acting as an independent part of the health care system. A brief review of dental disease, oral health status, and treatment patterns is essential to any discussion of possible improvement in the delivery of care.

Dental Disease

The major disease categories which concern the dentist are: dental caries, periodontal disease, oral clefts and other lesser congenital or acquired deformities, and oral cancer. If left untreated, these

diseases may result in loss of the teeth, facial disfigurement, and even, as in the case of cancer, death.

Two of the disorders, dental caries and periodontal disease, together with their sequelae, occupy almost all of the dentist's treatment time. If left untreated, they result in loss of the natural dentition. The process of ever-increasing severity is usually accompanied by considerable pain and discomfort and reduced ability to eat and enjoy a wide variety of foods.

Dental caries is both cumulative and irreversible. It is the most common chronic disease in the United States and attacks nearly everyone, commencing early in life shortly after the eruption of the deciduous teeth. It is a complex process involving bacterial infection and proceeds inward from the outer surface of the tooth (Young and Striffler, 1969).

At present, there are two major approaches to the prevention of dental caries. Fluorides, particularly if ingested throughout the period of calcification of the crowns of the teeth, can reduce the incidence of caries by up to 60 percent. The elimination of refined carbohydrates from the diet can prevent most caries by interfering with the bacterial conversion of sugars into demineralizing acids. More recently, pit and fissure sealants have been shown to be effective in preventing caries if applied to appropriate surfaces of the teeth on a regular basis.

Once caries is present in the tooth the decay must be removed and replaced by a suitable restorative material, since the enamel does not possess the capacity to repair itself. The longer the delay in treatment, the more severe the lesion. Therapy becomes more complex and time-consuming and eventually may be restricted to tooth removal and replacement.

Periodontal disease attacks the supporting structures of the teeth and increases in both prevalence and severity with age. Almost the entire population is affected to some degree by age 65. While dental caries is responsible for most tooth loss prior to age 35, periodontal disease becomes the leading cause after age 35 (Young and Striffler, 1969).

Even though much remains to be learned about the etiology of periodontal disease, it definitely has been established that a major factor is the accumulation of a complex matrix of hard and soft deposit (dental plaque) on the teeth, both above and below the gingival margin.

Most periodontal disease can be prevented or minimized by a combination of good home care to break up the accumulation of plaque and regular dental prophylaxis to remove to remove deposits left by the patient. Tooth loss can be prevented, even if the destructive process is fairly advanced, by a combination of home care (similar to that used for primary prevention) and treatment to reduce pocket depth and establish relatively normal contours of the teeth and supporting structures.

While there is considerable question as to whether malposed teeth and poor occlusion result in increased incidence of other dental disease, there is no question that poor facial appearance is considered undesirable in our society and may have serious psychological effects. Even though most orthodontic problems cannot be prevented, they can be treated. A recent study (National Center for Health Statistics, 1973) reported that 14.2 percent of all children had conditions for which treatment was highly desirable or mandatory. Another 22.4 percent had definite malocclusions for which treatment was classified as elective.

The treatment of oral malignancy generally is considered to be beyond the scope of dental practice, but its detection is not. About 3.4 deaths per 100,000 persons occur annually (Young and Striffler, 1969). Early discovery and therapy would reduce both mortality and the major disfigurement and loss of function which accompanies the radical surgery and radiotherapy necessary for late care.

In sum, oral disease is a curse which afflicts almost everyone, but which can either be prevented or minimized through a combination of environmental measures, appropriate personal behavior, and therapy. Therapy, by itself, while not too effective in primary prevention can prevent or minimize untoward outcomes.

In this regard dental care must be looked at in a different light than most medical care. Dentistry can be quite effective in maintaining dental health, but medicine is less effective in maintaining general health. Medical intervention in the chronic diseases such as heart disease and arthritis appears to have little effect on morbidity and mortality.

Current Treatment Needs and Patterns of Receipt of Service

Despite the existence of some 100,000 practicing dentists in the

United States and continuing educational campaigns about need for regular dental visits, appropriate home care, and good diet, the oral health status of the population is appalling. Some recent studies have reported the following:

> —Over 20 million persons were edentulous in 1971. Of these almost two million had incomplete or no replacement and almost two million more never used the replacements they had. In all, about three out of every 10 edentulous persons thought they needed either new dentures or improvements on the existing appliances (National Center for Health Statistics, 1974a).
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> —The average dentulous adult had 17.9 DMF teeth in 1960–62. Of these, 1.4 were decayed (D); 9.4 were missing (M); and 7.0 were filled (F). At no age level was the percentage of filled teeth greater than those which were decayed or missing (National Center for Health Statistics, 1967).
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> —In 1960–62 two out of every five dentulous adults had a condition requiring an "early" visit to a dentist (National Center for Health Statistics, 1970).
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> —Children 6–11 years of age had an average of 1.4 DMF teeth per child in 1963–65—0.5 D, 0.1 M, and 0.8 F. The mean increased steadily with age and the number of erupted permanent teeth at risk (National Center for Health Statistics, 1971b).
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> —Over 25 percent of adults had oral hygiene levels ranging from barely adequate to injuriously poor (National Center for Health Statistics, 1965a).
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> —In 1965, the average 14-year-old white child visiting a dentist needed 0.44 permanent teeth extracted and already had 0.25 teeth missing (American Dental Association, n.d.).
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> —The average number of teeth requiring extraction in persons of all ages was 0.95 for males and 0.84 for females. The need for extractions was over 12 times as great for those who had last seen a dentist in over three years as among those who had had a previous visit in from 6–12 months (American Dental Association, n.d.).
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> —In general, unmet dental needs were greatest in the lowest socioeconomic groups and least in the highest, although even the persons in the highest strata still had considerable deterioration and unmet treatment needs.

There is some evidence that there has been an improvement over a number of years. For example, while the number of edentulous persons did not decrease in the 13-year period between 1957–58 and 1971, the percentage was reduced from 13.0 to 11.2 (National

Center for Health Statistics, 1974a). Extractions performed per person per year by private dentists dropped from 0.359 in 1950 to 0.280 in 1969 (Moen and Poetsch, 1970). This decreased tooth loss is hardly encouraging, since the rate of change is very slow.

That the concept that regular appropriate dental care can at least minimize the effects of dental disease, even if patients behavior cannot be modified enough for primary prevention, is not erroneous is borne out by the following facts. In 1960–62 the average DMF score for men with under $2,000 income was 15.3, while that for men with incomes over $10,000 was 19.0. However the number of decayed teeth was 1.8 and 0.9, respectively. In addition the number of missing teeth was 11.3 and 8.0 (National Center for Health Statistics, 1967). Therefore, while disease incidence and prevalence was higher in the upper-income group, tooth loss was less. Similarly, the percentage of edentulous persons age 65 and over was 58.5 for those with incomes under $3,000 and 35.2 for those with incomes over $15,000 (National Center for Health Statistics, 1974a). Comparisons for education follow the same pattern. These differences are associated with different patterns of use, with the higher socioeconomic groups having more "appropriate" use.

Indirect measures of the population's oral health status can be obtained from patterns of receipt of service. Some data from additional studies are:

—In 1973, 48.9 percent of the population visited a dentist at least once. The average number of dental visits per person was 1.6 (National Center for Health Statistics, 1974b).

—In 1963–64, 15 percent of the visits were for extractions and only 13.6 for prophylaxis (National Center for Health Statistics, 1965b).

—18 percent of the population accounted for 75 percent of dental office visits, while 10 percent accounted for 75 percent of dental expenditures in the early 1960s (Newman and Anderson, 1972).

—Use rates and service patterns favored the upper socioeconomic groups.

The change over the years appears to be slowly for the better. In 1963–64, 42 percent of the population had a dental visit, and the average number of visits was 1.6 (National Center for Health Statistics, 1966). In 1969 the respective figures were 44.9 percent and 1.5 (National Center for Health Statistics, 1971a). Over about a

ten-year span the rate of use went up 7 percent and number of visits remained constant. From 1950 to 1969 examinations and prophylaxis almost doubled (0.221 to 0.418 and 0.210 to 0.384), but filling rates remained about the same (0.990 to 1.069) (Moen and Poetsch, 1970). As mentioned previously the extraction rate dropped slightly. Another study (National Center for Health Statistics, 1965b) comparing 1957–58 with 1963–64 reported similar small improvements in the distribution of visits over a six-year interval. As with oral health status, the change in treatment patterns over a period of time, although improving, is relatively slight.

American dentistry prides itself as being the finest in the world, yet most persons who live out their normal life spans lose all their natural teeth. Clearly the current mode of delivery of dental care has not been able to accomplish the goal of maintenance of the dentition despite its technological achievements and the scientific knowledge to virtually eliminate tooth loss.

Manpower

It is possible that the organization of the delivery mechanism is not at fault, if resources as measured by personnel are inadequate. A pertinent question, therefore, is: "Is a ratio of approximately one practicing dentist per 2,000 population adequate?" If maldistribution problems are put aside to simplify the problem, the ratio permits a full-time practitioner to spend almost one hour per person per year in treatment. Studies conducted over 20 years ago (Waterman and Knutson, 1954; Law et al., 1955) have shown that in non-fluoridated areas dentist man-hours per child per year (including prophylaxis time which could be spent by a hygienist) for maintenance care were 1.4 and 0.75 in two different communities. A more recent study (Ast et al., 1970) on younger children reported annual maintenance treatment time of around 20 minutes for a fluoridated community and 35 minutes for a non-fluoridated community.

Pelton (1972) conducted a treatment program for university students and found that the dentist time required for an annual maintenance cycle could be reduced to less than one and a half hours. Prosthetic replacements were not included, but prophylaxis time was.

A study (U.S. Public Health Service, 1954) of a volunteer group who were members of Group Health Association found that 2.8 hours were needed for annual maintenance care, of which 0.9 hours were for prophylaxis and X-rays.

Even though some of these reports date back several decades and include several configurations of dental practice, none involving use of expanded duty auxiliaries, dentist chair time for maintenance care hovers in the vicinity of one hour, if treatment which can be provided by hygienists and assistants is excluded. Since even in a "maintenance" situation not all persons visit (or need to see) a dentist each year, the ratio of 1:2,000 is not very far removed from the ideal.

The discussion has omitted orthodontic care, but extrapolation from available information yields figures which also do not indicate a major manpower shortage. Orthodontists practicing with conventional use of auxiliaries can start about 100 full cases per year (estimate based on personal conversations). If about 25 percent of children are assumed to accept and receive orthodontic services (a larger percentage than those identified as having major needs), treatment would be commenced on about one million persons each year under a "maintenance" situation, since orthodontics needs to be performed only once in a lifetime and there are about four million children born each year. There are about 5,000 orthodontists in the United States, so they fall short of the 10,000 apparently needed to treat the one million cases. However, not all cases are "full" ones, and many orthodontists are now using expanded duty auxiliaries with consequent increases in productivity. In addition, general practitioners can treat minor cases, so the manpower discrepancy is not nearly as great as it would appear to be. In terms of dentist hours, using the "full" case figures, the 15 million treatment hours (100 cases completed in a 1,500-hour work year) would amount to less than one tenth of an hour per person per year when distributed over the entire population.

The ratio of dentists to population has hovered around the 1:2,000 figure for many years, so if the "maintenance" time mentioned previously was achieved with high utilization rates and low tooth-mortality rates, shortage of manpower is not a good explanation of the deplorable state of the nation's dental health. At best, "shortage" can account for only a small part of the problem.

Utilization Rates and Tooth Mortality

The studies previously cited as well as some others have shown that high annual utilization with associated low tooth mortality is achievable. The GHA study (U. S. Public Health Service, 1954), with volunteer participation, had total involvement by definition, and therefore was a very biased population. However, despite considerable need for dental care, annual need for all extractions was reduced to 0.1 teeth.

The Public Health Service projects (Waterman and Knutson, 1954; Law et al., 1955) in Richmond and Woonsocket dealt with the entire school population of these communities. About 6 percent used their own dentists, and 7 to 10 percent received no dental services. The programs were able to treat about 85 percent of all children and reduced extractions to 0.02 in the last series in Richmond and 0.03 in Woonsocket. New children entered the communities during the five- to six-year spans of the projects, and received services, so the results are understated.

Schoen (1965) has reported on a program achieving 85 percent annual utilization rates for a group of longshore children covered by a prepaid dental program. In the last year of a six-year longitudinal study tooth loss was reduced to zero. Another report (Schoen, 1967) on an adult population studied for five years produced data demonstrating tooth loss of less than 0.1 teeth per year and use rates of over 80 percent per year. Another program (Schoen, 1969) involving the same group practice reduced adult tooth loss from about 0.5 teeth in the first year to less than 0.1 in two subsequent years, while achieving use rates ranging from about 60 to 90 percent.

If the results of these various programs and projects are extrapolated to a lifetime, they demonstrate that tooth loss can be diminished to the point where edentulism is a rarity. The studies were not designed to review reduction in the incidence of disease, but even if primary prevention was not achieved, the goal of retention of the natural dentition and almost universal use of dental services was achieved. These results also appear to be better than those for the high socioeconomic strata of the population.

Population Responsibility

Up to this point it has been demonstrated that it is *possible* to pro-

vide dental care to population groups using resources which are not out of line with national averages and achieving, as a minimum, a major reduction in tooth loss. This performance is at variance with the picture for the country as a whole.

The author postulates that the factors common to all of these programs were an *organized practice system* and assumption of *responsibility for the oral health care of a given population.* Both of these are lacking in traditional solo-practice fee-for-service dentistry. This is true even if direct financial barriers are removed by some form of third-party payment. With the usual mode of practice there is no way to get each dentist to husband his valuable treatment time by using priorities and pacing. If each practitioner in a community chooses to perform large numbers of services, whether urgent or non-urgent, immediately essential or elective, on those patients who come to his office, often on a sporadic basis, there will not be enough resources to care for the dental health needs of the entire population. Also, as is evident from the data, sporadic use results in tooth loss and/or the need for more complex and time-consuming treatment (endodontics, crown and bridge) than is required for regular care. Even if a dentist attempts to establish a regular recall system, failure of a patient to return may or may not be due to a move from the geographic area and the dentist cannot know why he never sees the patient again. Lastly, the dentist has no direct knowledge or method of getting to those persons who may reside in his "service" area but do not request any treatment.

The dual requirement of an organized (and controlled) system and assumption of population responsibility is borne out by the report (Galagan et al., 1964) on the dental health status of children in Richmond and Woonsocket five years after the PHS programs stopped. The data show that the gains were largely wiped out. The achievements of the New Zealand dental nurse program are well known. However, a corollary is that the dental health of the population does not continue at the same level after they "graduate" from the school-based program (Redig et al., 1973).

Health Maintenance

A health maintenance organization is, by definition, an organized system for the provision of health care to an enrolled, and therefore well-defined, population. Everything about the HMO concept is,

therefore, made to order for dental care, if the reasoning presented so far is correct. In fact, dentistry fits better than most medicine. The consequences of the common dental diseases *can* be prevented by regular health maintenance in an organized system accepting responsibility for a population.

It has been demonstrated that periodic visits to the dentist can reduce or even eliminate tooth loss. Further, it has been shown that organized systems with appropriate outreach can get a very high percentage of a given population to avail themselves of such service. The problems posed earlier in this paper are therefore reduced to proportions which can be managed by currently available resources.

At present, dentistry is not only practiced as a separate profession, but as a separate system. There is little relationship between dentists and the rest of the health care apparatus—even where prototype HMOs have existed for some time. For example, except for the Portland Region, the Kaiser-Permanante system does not provide dental care. Neither does HIP. While GHA has dentists on its staff, dentistry is not included as part of the general prepaid package. Group Health Cooperative of Puget Sound has a dental cooperative as a separate offshoot which provides care only on a fee-for-service basis.

Dental coverage as a fringe benefit whether through fee-for-service mechanisms or prepaid group practice has developed as a separate entity. Current HMO legislation (House of Representatives, . . ., 1973) is forcing a marriage, at least for the minimum basic and inadequate dental benefit: essentially a prophylaxis and topical fluoride treatment where water fluoridation is not in effect.

There are some good reasons why comprehensive dental care should be part of overall health care. The mouth is part of the body and should be treated as such (interestingly, many physicians and nurses probably visualize a body without the oral cavity while the dentist sees a mouth without a body). One-door health care applies to dentistry. It should be easier for an individual or family to identify with one system for its entire health care. Interaction between the different parts of the health care "team" is facilitated by close organizational relationships. Health education, preventive services, and care for persons with systemic disease can be coordinated for the benefit of all. The possibilities for joint outreach to those persons who do not use services appropriately or

who do not practice preventive behavior are enormous. Why should attempts at diet control for caries prevention be separated from general dietary and nutritional counseling? Families with poor records on immunization probably are equally poor on regular and early children's dental care. Why not deal with the problems simultaneously?

One point, generally neglected, is that dentists really are "primary care" health providers and that the dental visit may be the most regular contact, or even the only one in a particular period, with the health system. As such, the visit may become the point of entry into care, if appropriate evaluation and screening are performed, and possible need determined. The dentist should be concerned with the general health status of the patient not just as it may impact upon dental treatment but as it affects the well-being of the individual. Integrating dentistry into the total system has the potential of enhancing interdisciplinary thinking and cooperation.

There is some doubt as to whether the dental record should be an integral part of the medical chart. Sheer bulk may create numerous problems. However, regardless of the mechanics, each type of health care provider should have available the information generated by the other therapists.

Unfortunately, this idea remains just that—an idea. Some of the organizations hoping to qualify as HMOs under the new act are getting into the dental field, but it still is too early to see whether the results will live up to the expectations.

Methodology for Estimating Costs and Resource Needs

Regardless of whether dentistry is part of a general health care maintenance organization or exists separately, certain general principles apply when costs and resource needs are estimated for a capitation group-practice program.

This particular approach has been developed in detail elsewhere (Schoen, 1974a; 1974b), but a summary will be presented here. Since fees for service are of no concern, the frequency and distribution of services are of no real consequence except as they affect resources. For a given population the essential factors are provider time and cost for given configurations of practice.

Simply stated, the annual cost for providing dental services can be expressed in the following formula:

$$R = T_D \times C_D + T_H \times C_H$$

where

R = annual cost
T_D = dentist time
C_D = cost per unit of dentist time (including dentist income)
T_H = hygienist time
C_H = cost per unit of hygienist time.

The formula can be used to estimate costs for a person, family, or group. The treatment-time factor appears to be affected by population stability and annual utilization rates (leading to different mixes of initial and maintenance care), and differences between adults and children. Specific age differences are not particularly important, since treatment time varies much less than distribution of services. Disease-attack rates are obviously a factor, but time estimates do not vary as much as incidence since a substantial component of time is diagnostic and preventive.

As stated, practice configuration affects time. The larger, more efficient dental team reduces treatment time, but at a somewhat increased cost per unit of time. The exact relationship between different mixes of personnel, facilities, and costs have not been determined as yet.

Since dental disease is chronic and much treatment deals with effects rather than disease itself, priorities and variable pacing of treatment can be established. These obviously affect time and cost, so estimates can be crude and still be successful. The organization controls use of resources, so the prophecy becomes self-fulfilling!

Clearly limits on either available dollars, or resources, or both affect program design. For example, if comprehensive dental care costs $20 per family per month and only $10 is available, changes must be made in order to have a viable plan. Assuming resources, in terms of personnel and facilities, are available, some method must be found to reduce costs to the prepaid portion of the program. One method is to impose surcharges to be paid by the patient for specific dental procedures. Since personal out-of-pocket pay-

ment tends to reduce use of elective services, and most dental care can be placed in that category, the savings on monthly premium are the sum of the patient direct payment and the reduced cost for lowered use of services. Such reduction in use is undoubtedly proportional to the amount of surcharge or co-payment, but the exact ratios for various populations are unknown as yet.

If the stated goal of preservation of the natural dentition is going to remain, great care must be taken in the imposition of surcharges. If possible, none should be imposed for preventive, early treatment and maintenance services so that periodic care is not discouraged. Proportionately heavier charges can be placed against extractions and replacements than against root canal and restorative procedures.

The impostion of a charge per visit, as opposed to a charge per service, even though common for outpatient medical care, can lead to serious problems in dentistry. Dental visits can vary considerably in content and time. Therefore, patients might object to the same charge for a five-minute procedure as for a three-hour procedure. Also if a program is in a financial bind, the visit charge places a temptation on the dentist to increase the number of sessions required to complete a case, despite the resulting loss of efficiency.

Another approach to reducing costs and, in this case, use of resources is to phase family members into treatment. Since initial care is both more expensive and time-consuming than maintenance care, starting with one family member (e.g., the employee or the child) in the first year and adding others each succeeding year reduces cost dramatically and levels out the need for personnel.

Lastly, benefits can be limited. Generally orthodontics is the first exclusion. Other limitations can be imposed by eliminating entire categories of service or restricting the conditions under which types of treatment are covered. For example, all prosthetic replacements can be excluded or just root-canal therapy for posterior teeth. The difficulty with exclusions is that they can have an adverse effect on the quality of care performed. If endodontics is not covered as a benefit, the large out-of-pocket cost can deter the patient from paying for the service. As a result an extraction is performed and the deterioration of the dentition is hastened. By and large, benefit limitations are not desirable.

A working formula is obviously more complex than the one presented here, but not overly so. It must include the factors for utilization rates, stability (initial versus maintenance care) and age (adult versus child). The base-line figure for provider time and cost is affected by efficiency and practice configuration, while premium levels can be modified by out-of-pocket payments.

With the limitations on the use of auxiliaries which still exist in most states, and current practice costs, a comprehensive dental care program for a reasonably stable population would cost about $200 per family per year, if the family size were about three. Such a program would include surcharges to cover dental laboratory costs and some payment for orthodontics. This estimate includes the costs for the initial year, by spreading them out over several years. Obviously no exact figure can be given without knowing the various population and dental practice characteristics described previously.

The annual cost for whatever coverage and benefit structure is decided upon should be added to the other HMO costs and then presented as a total "premium" if a full service HMO is contemplated.

Concerns and Problems

While examples have been presented which demonstrate the possibilities present in prepaid dental group-practice systems, they often do not live up to the potential. Some studies of paired populations, either in dual-choice situations or of similar populations locked into two systems, have shown that significant differences in general use rates or distribution of services are the exception rather than the rule. Simons (1967), in studying a dual-choice prepaid program, reported an annual use by adults of 38 percent for the group practice and 48 percent for the fee-for-service choice. The respective figures for children were 65 percent and 63 percent. Tumelty (1968), reporting on a three-way choice, found annual adult use to be 42 percent for the group practice, 42 per cent for the service corporation, and 32 percent for an insurance company. Figures for children were 52 percent, 55 percent, and 44 percent, respectively. Schoen (1969) compared plans in a dual choice for adults and found average annual use to be 74 percent for the group practice and 35

percent for the service corporation. In a non-dual-choice comparison involving members of the same industry in two adjacent counties, the group practice had an annual use of 33 percent, while a self-insured indemnity system has a use of 34 percent. A non-dual-choice group practice for a lower socioeconomic population without a comparison open-panel plan had a use rate of 41 percent. Annual use rates for children in a dual-choice program were 87 percent for the group practice and 66 percent for the service corporation. Schoen (1969) also studied extraction rates for the same populations. The average rates for maintenance years for adults were 0.16, 0.11, and 0.15 for the group practices and 0.12 and 0.15 for the fee-for-service systems. First permanent molar extraction rates for children for the entire period of an 11-year longitudinal study were 0.01 for the group practice and 0.00 for the service corporation.

In a report including additional non-paired populations, Schoen (1972) found little correlation between method of practice or method of payment on general use rates and little correlation between use rates and extraction rates. There did appear to be a relationship between third-party fringe-benefit payment and tooth loss, since extractions were reduced in any type of third-party system.

Unfortunately, controlled studies of utilization, distribution of services, outcomes, and so on, as they occur in different delivery systems, are few and far between or even completely absent. After many years all one can say is that the potential of a "dental health maintenance organization" is present, but does not appear to be carried out very often.

An additional problem is that of cost. The high-use plans described by Schoen (1967, 1969) have been competitive with the fee-for-service options available. Benefits have been the same as or somewhat better than the open-panel choice. However, dental health maintenance over a lifetime is probably more costly than total neglect. As an extreme example, total loss of teeth at an early age followed by either no replacement or only occasional replacement is less expensive in terms of either personnel time or dollars than annual maintenance care for an intact dentition that suffers from the incidence of some disease. Medi-Cal in California (California Department of Health Care Services, 1968) has ap-

proached the non-treatment extreme. There is no question that its cost for a reported annual use rate of under 20 percent is lower than it would be for a high-use maintenance program.

Since a substantial proportion of the American public still accepts tooth loss as an inevitable consequence of aging, and since quality in terms of preservation of the natural dentition is no less costly than neglect (or even more costly), dental health maintenance becomes hard to sell.

Another problem is the intergration of dentistry into some of the HMO prototypes now in existence. If comprehensive care is included in the basic package, the premium cost rises sharply. Unless group subscribers already have dental coverage as a fringe benefit, many persons might opt out of the prepaid plans into the fee-for-service choices usually available. If these members are covered for dental benefits through some separate mechanism, they may not wish to switch to the newly included dental portion of the HMO. Having one choice for the general medical plan and then another one for dentistry would solve that problem but would complicate administration enormously.

If the larger HMO systems offer a dental benefit as part of the basic package or even as an option, and a large percent of their subscribers choose it, they would have great difficulty in developing an "instant" dental system to match the medical one.

If dental benefits are voluntary, based on individual dues or premium payment, adverse selection is likely to occur. Those persons with large unmet dental needs either know they have them or would soon find out and then would sign up for a period long enough to cover initial treatment. They then could drop out until a new set of major needs developed. Even an annual lock-in would not cover for this experience.

Limiting dental coverage to the basic benefit mandated by the HMO act would reduce costs to pennies per family per month. However, the performance of this service to the exclusion of other dental care is of doubtful value, would probably be used by few persons, and would antagonize everyone. Patients would expect more or get a false sense of security, local dentists would criticize the service, and the HMO staff would have to face the outcry.

Even if the phase-in of dentistry can be accomplished, the organizational ties to the existing medical system must be carefully considered. Dentists must form an equal and autonomous unit

within the HMO structure. Physicians should not be making dental decisions. If the dentists are part of the medical group, as opposed to a separate group, they should have at least the same representation on any boards as a major medical department such as internal medicine, pediatrics, or surgery. It must be remembered that most dentists are primary health care providers (only about 10 percent are specialists) and are probably about equal in number to physicians who provide primary care. If an HMO provides comprehensive dental care to its membership on the basis proposed in this paper, the dental section will be very large.

The relationships of dentists to physicians are not easily solved. As a result of the almost total separation of the two professions, they are covered by different licensing agencies and different state laws and regulations. The resultant legal complexities combined with the differences in organizational levels previously mentioned make it impossible to propose an "ideal" HMO model.

It is generally assumed that economies of scale would apply to larger dental group practices. Doherty (1972) has raised the question of whether this "axiom" really is true. While there are obvious savings in less duplication of equipment (e.g. fewer X-ray machines) and in discounts on bulk purchansing of supplies or even prosthetic appliances from the laboratory, these may be more than offset by the extra and more specialized personnel required to operate a complex practice.

This author has postulated that a group practice can make better use of expanded-duty auxiliary personnel than a solo practitioner. The solo dentist might have more difficulty in managing the larger team involved. Whether this is true or not remains to be seen. Some solo dentists, or those operating in groups of two or three, appear to be extremely productive and to be able to use the new "dentist extenders" very well (Redig et al., 1974). Whether any dentist, either in solo or group practice, will put increased productivity to use in the best interests of the patient is also an open question. If these "advances" are used to increase dentist income by producing more pieces of work without improving dental health or without reducing patient costs, then they are retrogressive. Unfortunately, it probably is true that HMOs will have to pay dentists the going rate however high it may rise. If this occurs, they will be no more effective in combating health care inflation than the medical groups have been.

The populations that need the HMO concept the most, those who have lower incomes and are poor, have no funds to pay the regular premiums. Unless a national health insurance plan becomes law and includes comprehensive dental care, there is little hope that such persons will be reached. Medicaid cannot be counted on, since its concern is lowest possible cost, which, as in the California example, can be achieved by low use and reduced service.

Conclusion

Despite the knowledge and ability to radically improve the dental health of the population of the United States, using the existing number of dentists, the current system has been unable to do so. If dental providers are organized into smaller controlled systems assuming responsibility for given population groups, these changes can be effected.

Many problems of organization and performance exist which must be solved in order to convert the possibility into reality. Studies of efficiency and effectiveness must be conducted with a view of arriving at the best approach.

Difficulties exist in the integration of dentistry into the HMO system, although it appears that the outcome would be worthwhile. A comprehensive national health insurance program, including dental health care, is a necessary ingredient.

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