



# Basic Package of Oral Care

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**Basic Package of Oral Care**

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### **Acknowledgments**

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## **Preamble**

Oral health remains a luxury for most of the world's population. This is especially true for the disadvantaged irrespective of whether they live in some of the world's most wealthy or the world's poorest countries. Oral health problems remain a global problem and therefore must be a global concern.

The Basic Package of Oral Health Care (BPOC), as presented in this report, represents a fusion of concepts and approaches that have developed over the last decade. In presenting this package, great emphasis has been placed on approaches with proven effectiveness and that are acceptable, feasible and affordable for most disadvantaged communities.

The BPOC is regarded as an essential foundation to any oral health care provision in a country or community. Only once the foundations are well established should other oral health provisions be considered. Regrettably, this is often not the case, and as a result large sums of public money are spent on inappropriate and often ineffective facilities.

The essential components of the BPOC: Oral Urgent Treatment (OUT), Affordable Fluoride Toothpastes (AFT), and Atraumatic Restorative Treatment (ART), are components that the Oral Health Unit of the World Health Organization has developed and promoted through partnership with non-governmental organizations, academia and industry. It is a perfect example of how different partners working together for a common goal can advance the boundaries of oral health care.

As an example, the dramatic decline in the level of caries in many Western Countries over the past two decades was first recognized through an analysis of data in the WHO Global Oral Data Bank. This decline is believed to be largely the result of the increased use of fluoridated toothpastes in such countries. Since poorer segments of the world's population are unable to afford toothpastes, WHO collaborated with industry to produce an effective and affordable fluoride toothpaste. After successful field trials in Indonesia, affordable fluoride toothpastes are now available to many more of the world's population than ever before.

Another example is Atraumatic Restorative Treatment. The Oral Health Unit of the World Health Organization was one of the first to recognize the huge potential that the ART approach could offer for community-based oral care around the world. For this reason ART was presented at headquarters of the WHO in Geneva on World Health Day in 1994 to mark the beginning of the Year of Oral Health 1994/95. The WHO has continued to support ART in the form of the WHO ART Global Initiative 1998-2000. This has seen the global promotion of ART through education in the form of training packages and ART master classes, community demonstration projects and technical assistance.

Now the essential components of basic oral care have been combined into a well-defined package, the next and crucial step is to evaluate the package as a whole in different settings around the world. To make this possible WHO once again calls for partnership between governmental and non-governmental organizations, the health profession, the academic community and industry.

It is also inevitable that as technologies and approaches develop the package will evolve to adopt those that are appropriate, affordable and scientifically proven to be effective. For this reason, there is a continued and essential need to continue research into areas that show potential.

This report would not have been possible without the continued support of many around the world, in particular members of the WHO Collaborating Center for Oral Health Care Planning and Future Scenarios, College of Dental Science, University of Nijmegen, the Netherlands.

Lastly I would like to acknowledge the contribution of my predecessors, Dr. Gennady Pakhomov and the late Dr. David Barmes, who had both the imagination and courage to foster and support fledgling concepts and approaches. Their farsightedness has matured into the BPOC - an essential step for the improvement in oral health globally.



Prof. Dr. P.E. Petersen  
Oral Health Unit, WHO  
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## **Foreword**

Oral health is recognized as a fundamental contributor to general health. Oral health problems continue to affect people throughout the world. Although seldom life threatening, these problems adversely affect people's well being, quality of life and economic activities. Governments allocate budgets for oral services, but in many non-established market economies (non-EME) the budgets are very limited and the services are not always directed to those most in need. This leads to situations in which large segments of the population have limited or no access to oral health care, and hence continue to suffer. This situation calls for the establishment of oral health as a priority and for the implementation of the essential components of oral health care that are affordable within the prevailing health infrastructures of deprived communities.

The Oral Health Unit of the World Health Organization charged the WHO Collaborating Centre for Oral Health Care Planning and Future Scenarios in Nijmegen, the Netherlands, with the task of compiling a report on the establishment of priorities in oral health care for deprived communities based on proven and effective oral health measures.

The philosophy of Primary Health Care (PHC), with its leading principle of basic oral care for all and emphasis on prevention and affordable and sustainable services, was a guideline in writing the report. The basic assumption was that the services offered should primarily meet people's perceived needs and treatment demands. The second assumption was that periodontal diseases are not a major cause of tooth loss. Therefore, removing calculus by scaling tooth surfaces is not considered a priority. As the report focuses on oral health care within the context of PHC, the treatment of serious disorders, e.g., oral cancer, cleft lip and palate disorders, are also not addressed.

The report outlines the basic premise behind the three key components that constitute the Basic Package of Oral Care (BPOC). These are: Oral Urgent Treatment (OUT), Affordable Fluoride Toothpaste (AFT) and Atraumatic Restorative treatment (ART).

It argues for community-oriented promotion of oral health and affordable and effective interventions. It suggests that the package should be financed predominantly by public funding and implemented by competently trained primary (oral) health care workers.

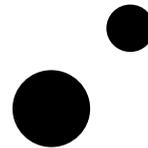
This report is a policy document. It presents the rationale that eventually leads to priorities in basic oral care. It is intended as a call to action for policy makers (Chief Dental Officers and advocates of oral health care at the Ministry of Health) and for partners in the development of oral health care (Non-Government Organizations (NGOs) and industry).

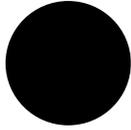
The report does not provide an overview of the specific content of each proposed component. Neither does it outline the tasks of various cadres of dental personnel nor does it present a strategy for implementation.

Although of great importance, these elements cannot be covered in one report. Each local situation demands tailor-made solutions with respect to the personnel involved, its content and extent of the service offered.

This report strongly recommends the implementation of small-scale (demonstration) projects to assess the effectiveness and sustainability of the basic package of oral care under local conditions before introducing the BPOC on a wider scale. In this endeavor, NGOs and industry have an important role to play, particularly in the planning and evaluation stages. They should consider themselves as partners to governments in working toward improved oral health for deprived communities.

Ass. Prof. Dr. FHM Mikx,  
Director WHO Collaborating Centre for Oral  
Health Care Planning and Future Scenarios





## Oral Health Priorities for the Disadvantaged



*This chapter describes the prevailing oral health problems among disadvantaged populations in both established and non-established market economies. Untreated oral diseases, inequalities in delivery systems and the absence of adequate community-oriented preventive services characterize the current situation. There is an urgent need for a change toward an oral care system that meets the principles of primary health care (PHC). A basic package of oral care (BPOC),*

*which is available to all, aims at achieving the objectives of the PHC approach. The three components of the BPOC are 1) Oral Urgent Treatment (OUT); 2) Affordable Fluoride Toothpaste (AFT); and 3) Atraumatic Restorative Treatment (ART). Oral health promotion is considered an integral part of BPOC. Each region and country should develop its own BPOC based on the perceived needs of the local population and on existing supporting environmental conditions.*



## Introduction

Oral health problems exist for the disadvantaged both in non-established market economy (non-EME) and established market economy (EME) countries. The difficulties are particularly severe for many communities in non-EME countries, which often have little or no access to basic emergency treatment for oral pain and infections. In addition, these communities usually have no organized system for the prevention of oral diseases.

In non-EME countries as well as in pockets of deprivation in EME countries, the insufficiency of resources for oral health and the shortage of dentists are commonly considered the main barriers to future improvements. Increasing the number of dentists and stimulating individual-oriented oral health education (OHE) provided by dental professionals often are not feasible. An alternative, consisting of training primary health care workers to undertake elements of basic oral care and the integration of OHE into the primary health care system, is rarely available. Although oral health is often a low priority among decision-makers, most non-EME countries have public funds available for oral health care. The important question is how to utilize these funds appropriately to meet the most urgent needs. Governments do not always realize that there is a compelling need to develop basic oral health care systems against the background of limited funding, existing infrastructures and perceived needs and treatment demands of the population.

### The primary health care approach

Governments in many countries have adopted the primary health care (PHC) approach in their national health care systems. PHC means redirecting the prevention and control of common diseases away from hospital-based care. PHC aims to provide basic curative and preventive care for all at a cost that the country and community can afford. Oral diseases, particularly dental caries with its early onset, are among the most common diseases. Therefore, oral care should be part of the PHC system. Unfortunately, oral care is inadequately integrated into the PHC systems in many countries.



There is currently no sustainable basic oral care service in PHC that can be universally adopted. Two main barriers prohibit proper inclusion of oral health care into the PHC system: dentistry's traditional orientation toward individual care rather than a community approach, and its inherent technical - rather than social and behavioral - character. The philosophy of conventional dentistry must change to one of low-technology treatment, control and prevention to meet the perceived oral health needs and treatment demands of the community.

National epidemiological data on the prevalence and severity of oral diseases are of limited use in planning for basic oral health care. The emphasis on professional normative epidemiological data on oral diseases and treatment needs has seriously distorted people's views on oral health and on determining priorities for establishing needed services. More meaningful indicators for the planning of basic oral care include information on the community characteristics, people's habits and perceived oral health problems and needs as well as the existing infrastructures.

The emphasis on these indicators of need is crucial. In addition to the needs observed by the professional, it should reflect the perceived needs and wants of the consumer. This collaborative approach has a better chance of being integrated into the existing community health care structures. However, since many non-EME countries have insufficient resources to run even a rudimentary PHC system, proposals for a new oral health care strategy must be viewed in the wider context of the available PHC services.



### The prevailing oral health situation

In many non-EME countries, the majority of 12-year-old children have untreated dental caries, with risk of pain, disfigurement and spreading infections. This condition can result in tooth loss at a relatively young age. Relief of pain is the predominant treatment demand of disadvantaged populations. Pain is mainly caused by oral infections, which in some cases can be life-threatening. People from disadvantaged communities do not visit clinics for preventive intervention or for restorative treatment to prevent loss of teeth. The standard of oral hygiene is usually low and knowledge and habits relating to oral health are often poor.



Oral health care in most rural and some urban areas in non-EME countries is difficult to obtain.

Changes in attitude, leading to demands for more prevention-oriented treatment and changes in lifestyle conducive to good oral health, will take time. In such circumstances, oral health promotion (OHP) is the cornerstone of oral health self care. It is vital to the control and prevention of oral diseases in the future.

Unfortunately, most populations in non-EME countries are not exposed to community-oriented OHP.

Oral health care in most rural and some urban areas in non-EME countries is difficult to obtain. If available, tooth extraction is the predominant mode of treatment. Oral care is usually conventional in nature with the emphasis on technical and curative solutions, which are expensive and an option only for the affluent sector of the population. This type of traditional dentistry overlooks the importance of community-oriented prevention, exemplified by the improvement in oral health in EME countries. The history of dentistry in EME countries demonstrates that merely increasing the number of dentists does not control dental caries. It was not until the acceptance of OHP and the introduction of mass preventive measures, particularly the provision of fluoridated toothpaste, that the incidence of caries and gingivitis started to decline.



The history of dentistry in EME countries demonstrates that merely increasing the number of dentists does not control dental caries.

Toothpaste, including fluoridated toothpaste, is available in most countries. However, in many cases, the price is too high. Thus, situations may occur in which people want to use toothpaste (and toothbrushes), but cannot afford to do so.

Despite the general improvements in oral health achieved in EME countries, there are many people who have not benefited sufficiently from effective preventive and curative oral health services that are available. This is apparent in the excessive level of caries and the disproportionate treatment needs of the young, deprived and socially disadvantaged groups. This unfavorable situation is also seen in immigrant groups in many EME countries.

### **Rationale for the Basic Package for Oral Care (BPOC)**

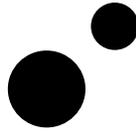
The situation in most non-EME countries and in disadvantaged communities in EME countries calls for a change in approach.

Traditional western oral health care should be replaced by a service that follows the principles of PHC. This implies that more emphasis should be given to community-oriented promotion of oral health. Treatment that is affordable for governments and individuals should also receive more attention. Using this approach, the level of untreated dental disease will become manageable. A basic package of oral care (BPOC) aims to reach all people at a much lower cost than traditional oral health services. The three components of BPOC are:

- Oral Urgent Treatment (OUT)
- Affordable Fluoride Toothpaste (AFT)
- Atraumatic Restorative Treatment (ART)

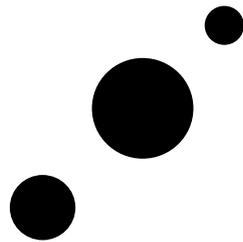
Oral health promotion forms an integral component of BPOC to heighten awareness of what is possible. The successful introduction of BPOC in a community relies to a large extent on good communication among all parties involved. There is no single model suitable for universal application. Each region or country should develop its own BPOC based on the perceived needs of its population and on the utilization of existing health care structures. The latter point is crucial. Too many oral health programs have failed as a result of management, logistical and financial problems because they were organized apart from the existing PHC. The following chapters highlight the general principles behind the three components of BPOC and provide evidence of their effectiveness.





## **Oral Urgent Treatment (OUT) for the emergency**





## management of oral pain, infection and trauma



*This chapter discusses services targeted at the emergency relief of oral pain, management of oral infection and dental trauma through Oral Urgent Treatment (OUT). Access to this component of basic oral care is a fundamental right for everyone.*

*Therefore, governments must take the responsibility to establish and maintain a functional OUT service that is accessible and acceptable to the entire population.*

### **What is OUT?**

Oral Urgent Treatment (OUT) is an on-demand service providing basic emergency oral care. An OUT service must be tailored to the perceived needs and treatment demands of the local population. Thus the precise content of an OUT service will differ from country to country and possibly from district to district within the same country.

The three fundamental elements of OUT comprise:

- Relief of oral pain
- First aid for oral infections and dento-alveolar trauma
- Referral of complicated cases.

It is anticipated that an OUT service would be able to manage the majority of cases requiring basic emergency oral care. The main treatment modalities would include:

- Extraction of badly decayed and severely periodontally involved teeth under local anesthesia
- Treatment of post-extraction complications such as dry sockets and bleeding;
- Drainage of localized oral abscesses
- Palliative drug therapy for acute oral infections
- First aid for dento-alveolar trauma
- Referring complicated cases to the nearest hospital.

### **Why is there a need for OUT?**

Although most oral diseases are not life-threatening, they constitute an important public health problem. Their high prevalence, public demand for treatment, and their impact on the individual and society in terms of pain, discomfort, functional limitation and handicap affect the quality of life. In addition, the social and financial impact of oral diseases on the individual and community can be very high.



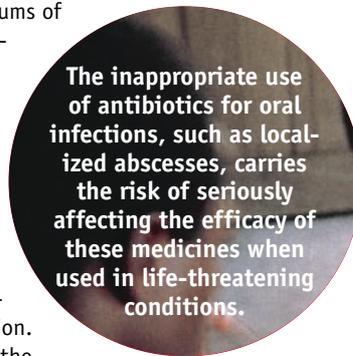
### Pain relief

In non-EME countries, the most common oral health problems and the use of oral health services are strongly related to pain and discomfort. The relief of pain is considered the predominant treatment demand in many population groups. Dental decay is the main cause of toothache. In these circumstances pain relief is achieved through extracting badly decayed teeth. Despite treatment of dental decay through tooth extraction, a high percentage (>90 %) of decayed teeth are left untreated in many countries.

In order to stop oral pain, people usually resort to medicines. Large sums of money are spent on pharmaceutical painkillers, antibiotics and traditional medicines.

Often the use of medicines is not followed up by treatment of the source of the pain. The combination of palliative drug therapy and operative treatment should be emphasized in a proper OUT situation.

It is important to note that the inappropriate use of antibiotics for oral infections, such as localized abscesses, carries the risk of seriously affecting the efficacy of these medicines when used in life-threatening conditions. A report entitled 'Antibiotic use in Dentistry', from the American Dental Association (1997), pointed to the alarming increase in microbial resistance to antibiotics. It cautioned dental professionals against the overuse of antibiotics. A number of studies carried out in various countries on antibiotic use in dentistry determined that antibiotics were prescribed unnecessarily in 22 to 74 percent of cases.



### **First aid for oral infections and dento-alveolar trauma**

#### *Oral Infections*

The most common oral infection that requires assistance in an OUT situation is the localized dental abscess. This condition usually results from untreated dental decay and/or periodontal disease. Health personnel should be able to provide first aid to people with oral infections.

#### *Dento-alveolar trauma*

The second most common reason for children to visit the dental clinic for emergency care is the management of dental trauma. The most frequent types of dental trauma include enamel and enamel-dentine fractures. Studies investigating the prevalence of untreated dental trauma among children up to age 15 ranged from 7 to 50 percent, depending on age and location. These data show that there is a need for organized care to manage dental trauma within the government medical health services. It is known that late complications of dental injuries may lead to pulp death, root resorption and loss of alveolar bone.

Until recently traffic accidents were the most frequent cause of dental and facial trauma in EME countries. Currently (domestic) violence and sports accidents are the leading cause. However, in most non-EME countries traffic accidents remain the major reason for dental and facial trauma.

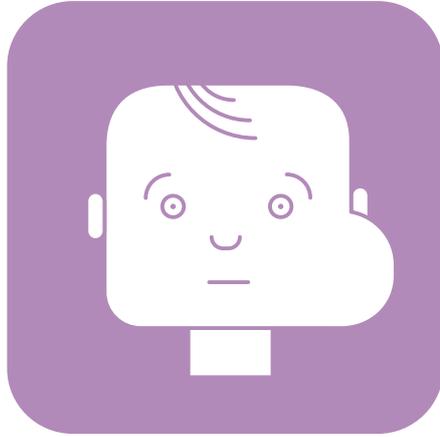
Reduction in dental and facial trauma is attributed to stronger legislation on alcohol restrictions for drivers, the compulsory wearing of seatbelts, safety requirements for vehicles and better road conditions.

### **Referral of complicated cases**

In line with the referral system in use in a country's health infrastructure, complicated cases require referral to specialists. OUT personnel should be adequately trained on the circumstances that require referral to an oral health professional.

### **Conclusion**

Emergency oral care that is easily accessible for all should be the first priority in any oral health program. OUT should be integrated into the PHC system at a sub-district level and should make use of PHC facilities in both urban and rural areas.

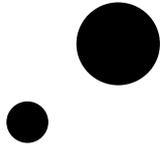


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## Preventing Dental Caries





## through Affordable Fluoride Toothpaste (AFT)



*The use of fluoride toothpaste is considered to be the most efficient means of controlling dental caries. However, for it to be effective, the fluoride in the toothpaste needs to be bio-available at a sufficient concentration at the tooth surface. This chapter discusses these aspects and ways in which governments and industry can ensure the availability of effective fluoride toothpaste at an affordable cost to consumers.*

### Fluoride for the control of caries

Exposure to the correct amount of fluoride is considered by the World Health Organization to be the most effective preventive measure against caries. Unfortunately, in most non-EME countries the recommended fluoridation of water and salt may not be easily attainable, since they lack the required infrastructure, technology and resources, particularly in rural areas. A report of an international workshop on fluoride states unequivocally that fluoride toothpaste is one of the most important delivery systems for fluoride. The caries-reducing effect of fluoride is almost exclusively topical, which explains the anti-caries efficacy of fluoride toothpaste.



### Why fluoride toothpaste?

The anti-caries efficacy of fluoride toothpaste has been proven in an extensive series of well-documented clinical trials. These studies have involved different sources of fluoride (sodium fluoride, sodium monofluorophosphate, etc.), different levels of fluoride (mainly 1,000 and 1,500 ppm F<sub>-</sub>) and different abrasive systems (for example, silica, chalk, alumina, etc.).

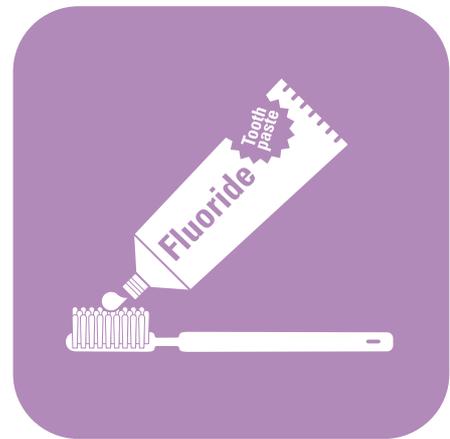
In many EME countries, there have been substantial reductions in dental caries over the past few decades. The number of teeth affected by caries (DMFT) decreased from about 8 to about 1.5 for 12-year-olds

Most scientists agree that the decline in dental caries in EME countries can be attributed mainly to the widespread use of fluoride toothpaste, particularly through twice-daily toothbrushing with fluoride toothpaste.

Variations in the level of dental caries, both within and between non-EME countries, have been reported, so it is difficult to draw strong conclusions regarding the trend in dental caries in these countries. In areas with ongoing traditional lifestyles, the prevalence of dental caries may remain fairly stable. In some urban areas, the level of dental caries may increase. This assumption is based on changing dietary patterns and increased sugar consumption. In general, it can be concluded that there are contrasting trends in caries prevalence in children in EME compared to non-EME countries: EME countries have a decreasing trend while non-EME countries with improving economies show an increasing trend.

Widespread and regular use of fluoride toothpaste in non-EME countries would have an enormous beneficial effect on the incidence of dental caries and periodontal disease.

The interesting phenomenon in EME countries is that the incidence of caries has declined tremendously, although the total amount of sucrose consumption per capita has hardly changed. Where oral hygiene with fluoride toothpaste is adequate, diet has become a less significant factor in caries prevention. Hence, promotion of the exposure to fluoride through twice-daily toothbrushing with fluoride toothpaste is the first step in the prevention of caries. More than one billion people in EME countries use fluoride toothpaste for toothbrushing. This proven oral hygiene adjunct is the best caries-reducing measure. Therefore, widespread and regular use of fluoride toothpaste in non-EME countries would have an enormous beneficial effect on the incidence of dental caries and periodontal disease. Nevertheless, in non-EME countries, widespread and regular use of fluoride toothpaste is uncommon. In addition to the benefits for preventing caries, toothbrushing has a favorable impact on the condition of periodontal tissues.



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### **Developing an effective, low-cost fluoride toothpaste**

The price of toothpaste is often too high in non-EME countries. Therefore many people cannot afford to use it regularly.

Collaboration between the WHO Oral Health Program and industry resulted in the development of a new, low-cost fluoride toothpaste (SMFP), which proved to have anti-caries efficacy in a school-based oral health program in Indonesia.

Supervised daily toothbrushing with SMFP toothpaste (1,000 ppm F<sub>2</sub>) in a Chinese kindergarten, under conditions prevailing in a rural county in China and with minimal involvement of oral health personnel, also demonstrated the effectiveness of this preventive approach. After three years of study, a 43 percent reduction in caries was found among children who performed daily supervised toothbrushing with fluoride toothpaste and who received oral health education as compared to control children. In each of these studies, cooperation among dental academia, local government authorities and industry was the key to success.

### **Access and promotion**

Promotion campaigns are required to attain widespread and regular use of fluoride toothpaste by people in non-EME countries. An important aspect in the outcome of such activities is the cost of the promoted toothpaste. All parties involved, i.e. governments, toothpaste manufacturers, the dental profession, and most important, the general population, would benefit if twice-daily toothbrushing with a pea-sized quantity of fluoride toothpaste were to become a widespread habit. Therefore, these parties should combine their efforts to reduce the price and to stimulate the use of fluoride toothpaste with anti-caries efficacy.



Toothpaste is often regarded by governments as a cosmetic product and is, therefore, subject to a higher level of taxation. This, in turn, makes toothpaste less affordable. Governments should recognize the enormous benefits of fluoride toothpaste to oral health and should take the responsibility to reduce or eliminate the tax burden on this product. Preferential tax consideration for toothpaste should be considered only when the toothpaste has been shown to have not simply appealing claims but proven anti-caries efficacy as well.

The highest priority for toothpaste manufacturers should be to produce toothpaste with anti-caries efficacy, which people will buy and use. An affordable fluoride toothpaste that is "low cost" should not imply "low quality". Efficacy should be the highest priority. Fortunately, fluoride is a comparatively inexpensive ingredient. In contrast, such cosmetic components as flavor and packaging, which contribute to the intrinsic consumer appeal of toothpaste, are relatively expensive.

Manufacturers are striving to produce lower-cost packaging for toothpaste. For example, sachets, rather than tubes, have been tried and have not detracted from consumer appeal. Moreover, producing paste in smaller containers lowers the unit cost to the consumer, which can also influence the decision to buy.

**Fig 3.1 Supervised toothbrushing by school children in different countries**

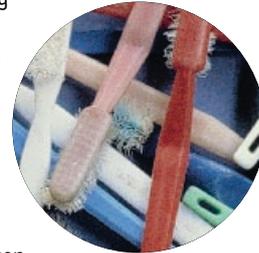


With economic growth, lifestyle changes often follow. People start to change their diets, pay more attention to their appearance and buy products, such as carbonated soft drinks, snacks and cosmetics, associated with these changes. However, it remains uncertain how people will decide which items get priority. The consumer may regard toothpaste primarily as a cosmetic that helps improve his or her looks and the way his or her mouth feels. Hence, the use of toothpaste may well fit into the new lifestyle. Advertisements for toothpaste should appeal to public sentiments of changing lifestyle and awareness of good oral health. This requires cooperation among government, toothpaste manufacturers and the health care profession in national advertisement campaigns. These campaigns should be combined with long-term reinforcement programs of oral health education stressing the use of oral hygiene with fluoride toothpaste at an early age.

### Using fluoride toothpaste effectively

Oral hygiene education should include advice on toothcleaning habits. Research has shown important links between the anti-caries efficacy of fluoride toothpaste and the way in which it is used. The two most important factors are brushing frequency and rinsing habits. Twice-daily brushing is recommended because it improves anti-caries efficacy compared to brushing once a day.

Thorough rinsing after brushing reduces the efficacy because it reduces fluoride in the mouth to sub-optimal concentrations. Therefore, no rinsing or rinsing only once after brushing, followed by expectoration of the remaining toothpaste, is recommended



Education should also be targeted at the amount of toothpaste used. It is now recommended that only a 'pea-sized' amount of toothpaste, about 0.5 g, be used. Toothpaste can be used with a toothbrush or chewing stick if that is the cultural norm. This small amount of fluoride toothpaste does not appear to reduce the effectiveness of the toothpaste. Besides, by using a smaller amount of toothpaste per brushing, the toothpaste will last longer, thereby making it more affordable. The main reason for recommending a pea-sized amount of toothpaste is the concern for young children who are less able to expectorate and who may ingest too much toothpaste, which might lead to dental fluorosis. To prevent dental fluorosis, it is also recommended that an adult supervise toothbrushing of children younger than six years of age. Clear instructions on the efficient use of the toothpaste, including the optimum amount of toothpaste to use, correct rinsing methods, and advice on supervising young children, should be printed on the toothpaste package.

### Ensuring the efficacy of fluoride toothpaste

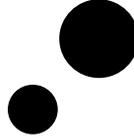
Recent analyses of toothpaste in several non-EME countries have shown that not all fluoride toothpaste on the market contains sufficient amounts of free ionized fluoride (NaF) or ionizable fluoride (SMFP). The efficacy of fluoride toothpaste depends on the amount of free ionized or ionizable fluoride. Most fluoride toothpastes, particularly private brands, are categorized as cosmetic products. They do not require approval from any regulatory body and therefore need not demonstrate proven anti-caries efficacy. Besides, many non-EME countries do not have adequate control mechanisms. Analyses are needed in non-EME countries to monitor locally available fluoride toothpastes for their anti-caries efficacy. The WHO Collaborating Centre in Nijmegen, the Netherlands, can act as an independent institute for monitoring the amount of free ionized or ionizable fluoride in locally produced toothpastes.

The fluoride toothpastes on the market have varying concentrations of fluoride. The best choice might be toothpaste with between 1,000 and 1,500 ppm fluoride, since it seems that 1,000 ppm fluoride in toothpaste is more effective than lower concentrations of fluoride. A higher concentration of fluoride (>1,500 ppm F<sub>2</sub>) in toothpaste has the inherent risk of causing dental fluorosis when used by young children.

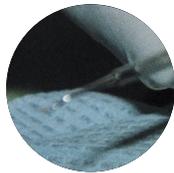
### Recommendations

1. Affordable fluoride toothpaste with anti-caries efficacy should be made available to all to ensure that all populations are exposed to adequate levels of fluoride by the most appropriate, cost-effective and equitable means
2. The packaging of the fluoride toothpastes should be clearly labeled with:
  - The fluoride concentration and the descriptive name of the fluoride compound
  - Descriptive names of other ingredients, such as abrasives
  - Production and expiration date
  - Instructions for using a pea-sized amount of paste
  - Directions for proper rinsing after brushing
  - Advice for adult supervision of tooth brushing by young children.
3. The method of dispersal of toothpaste should facilitate the use of small amounts of the paste.
4. An independent laboratory should monitor the fluoride content of toothpaste.
5. Fluoride toothpaste that meets recommended standards for efficacy should be tax-free and classified by governments as a therapeutic agent rather than a cosmetic.





## Managing dental caries through the





## Atraumatic Restorative Treatment (ART) approach

4

*Atraumatic Restorative Treatment (ART) is an appropriate approach to the treatment of dental caries because it is not limited to the confines of a dental clinic. ART thus increases affordability, availability and accessibility of dental treatment. ART has*

*been demonstrated to be effective for the management of single-surface cavities and for fissure sealants. It is acceptable to patients. As such the approach complements primary caries preventive methods as part of a basic package of oral care.*

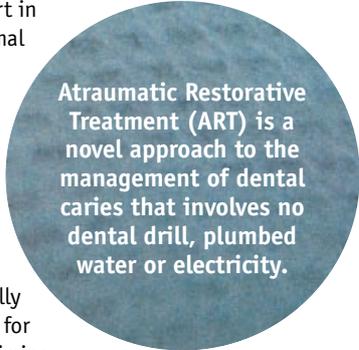
## Introduction

While preventive methods, such as affordable fluoride toothpaste, continue to make a large impact on the level of caries, some carious lesions inevitably progress to cavitation. In the absence of restorative treatment, this leads to pain, infection and ultimate loss of the tooth.

Conventional restorative treatment approaches rely heavily on electrically driven equipment that is expensive and difficult to maintain. Moreover, the complexity of the equipment required usually restricts the treatment setting to a dental clinic. Thus, conventional restorative treatment for many non-EME countries and communities has been shown to be impractical on the grounds of cost, availability and accessibility.

Atraumatic Restorative Treatment (ART) is a novel approach to the management of dental caries that involves no dental drill, plumbed water or electricity. The approach consists of manually cleaning dental cavities using hand instruments. The cavities and adjacent fissures are filled with an adhesive, fluoride-releasing restorative material. An ART sealant can be applied in pits and fissures with evidence of enamel caries but without cavitation. The ART approach is entirely consistent with modern concepts of preventive and restorative oral care, which stress maximum effort in prevention and minimal invasiveness of oral tissues. Moreover, since all sound tooth tissue is retained during the cleaning of the cavity, pain and discomfort are rare during treatment, virtually eliminating the need for an anesthetic. The elimination of the need for a dental drill or local anesthesia with ART means the approach is extremely well accepted even by young children who have never had dental treatment before.

Appropriately trained dental auxiliaries, such as dental therapists, can perform ART at the lower level of the health care pyramid such as in health centers and in schools. This makes restorative treatment more affordable, while simultaneously making it more available and accessible. ART, therefore, meets the principles of PHC: prevention (through secondary prevention), appropriate technology, affordable treatment and equitable distribution of services. A textbook on ART, by Frencken and Holmgren, provides a detailed, step-by-step description of the ART approach.



Atraumatic Restorative Treatment (ART) is a novel approach to the management of dental caries that involves no dental drill, plumbed water or electricity.

### Effectiveness of the ART approach

The effectiveness of hand instruments for opening tooth cavities has been studied. In Zimbabwe adolescents belonging to a low-caries risk group, it was possible to gain access to tooth cavities with a dental hatchet in 84 percent of the dentinal lesions judged to be in need of treatment. Dentinal lesions in approximal surfaces of anterior teeth, however, were judged to be difficult to treat using ART.

In Syria, in a younger age group (6-8-year olds) with high-caries risk, it was possible to treat at least 90 percent of the dentinal lesions in the primary dentitions. The comparable figure in the permanent dentition in this age group was 54 percent.

The use of excavators for removing infected carious dentine was in use long before the advent of rotary instruments and their effectiveness has been clearly demonstrated.

### Survival of ART restorations

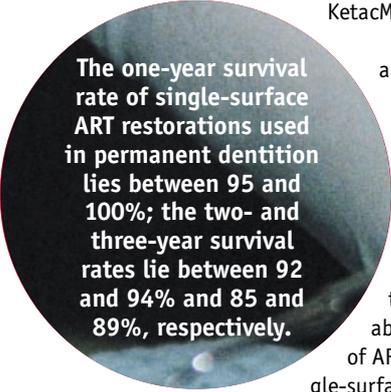
Current research on the ART approach has mainly investigated the approach in single-surface carious cavities using glass ionomer as a restorative material. In earlier ART studies a low-stress bearing glass ionomer (ChemFil, ChemFil Superior, Fuji II) was used. More recent studies have used a medium-stress bearing glass ionomer specifically developed for the ART approach (Fuji IX, KetacMolar, ChemFlex).

The use of the ART approach for the restoration of multiple-surface carious cavities using glass ionomer should be carefully considered. Studies evaluating multiple-surface ART restorations are currently being carried out. As evaluation results are not yet available, the indication for the use of ART is currently limited to single-surface carious cavities. Therefore, in order to ensure consistent and reliable results with ART, careful selection of cases and restorative materials is required.

### How good are ART restorations in the permanent dentition?

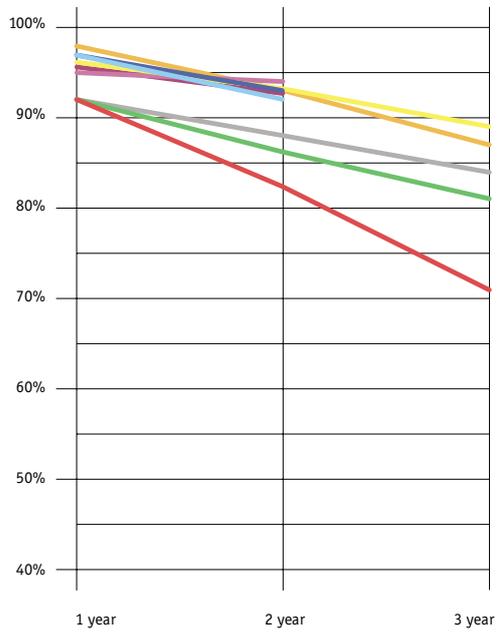
The majority of studies evaluating ART restorations have been made in the permanent teeth of adolescents. At this age, dentine caries are most common in pits and fissures. Hence the studies that are presented in Figure 4.1 refer only to single-surface ART restorations of longer than one year.

With the exception of the earlier studies, when the ART approach was still being developed, it can be concluded that the one-year survival rate of single-surface ART restorations used in permanent dentition lies between 95 and 100 percent and that the two- and three-year survival rates lie between 92 and 94 percent and 85 and 89 percent, respectively. When ART restorations from the 1996-1999 China study were classified into "small" restorations (less than half the occlusal width) and "large" restorations (greater than half the occlusal width), the three-year survival percentages were 92 percent and 77 percent, respectively. The overall results suggest that the average annual failure rate for ART restorations is about 4-5 percent for the first three years.



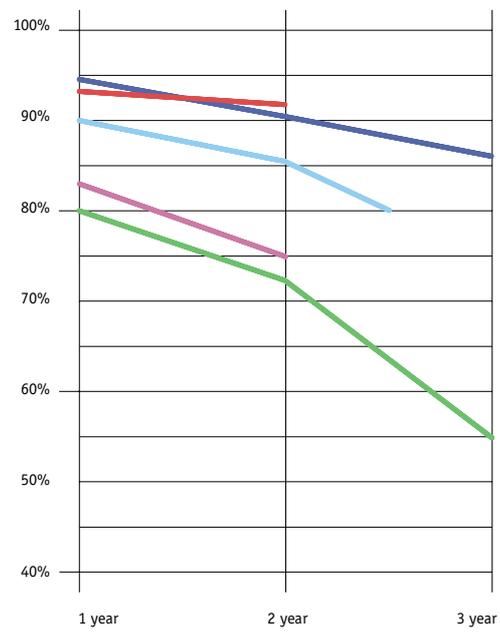
The one-year survival rate of single-surface ART restorations used in permanent dentition lies between 95 and 100%; the two- and three-year survival rates lie between 92 and 94% and 85 and 89%, respectively.

**Figure 4.1 Overview of survival of single-surface ART restorations in permanent dentition longer than 1 year**



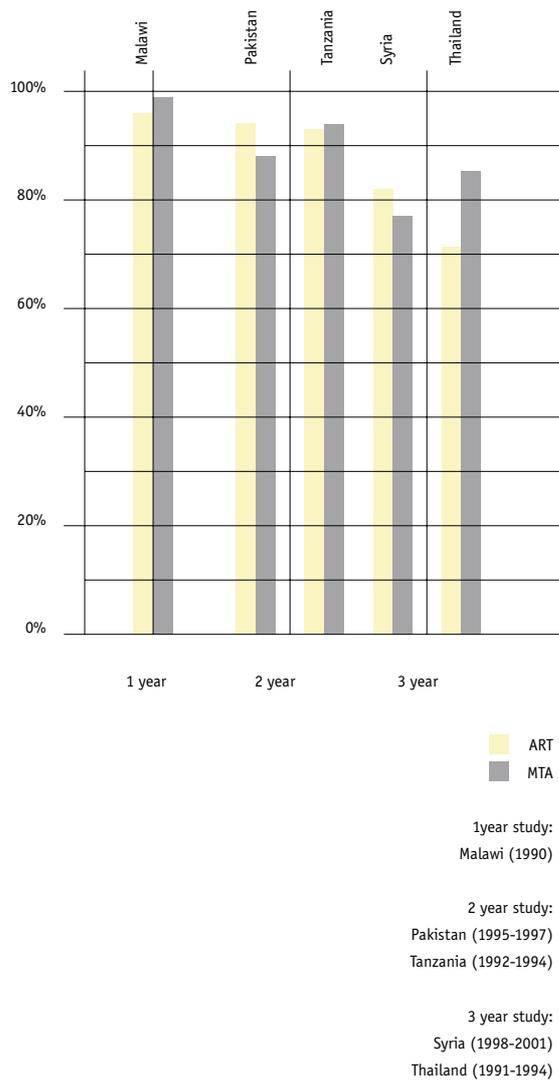
- China (1996-1999) — Yellow line
- China (1997-1999) — Light blue line
- Hong Kong (1995-1997) — Pink line
- Pakistan (1995-1997) — Dark blue line
- Syria (1998-2001) — Green line
- Tanzania (1992-1994) — Maroon line
- Thailand (1991-1994) — Red line
- Zimbabwe (1993-1996) — Grey line
- Zimbabwe (1994-1997) — Orange line

**Figure 4.2 Overview of survival of single-surface ART restorations in the primary dentition longer than 1 year**



- China (1996-1998) — Light blue line
- China (1997-1999) — Pink line
- China (1997-1999) — Red line
- Syria (1997-2000) — Dark blue line
- Thailand (1991-1994) — Green line

**Figure 4.3 Survival results of restorations prepared with hand instruments and filled with glass-ionomers (ART) compared to restorations produced using rotary instruments and amalgam**

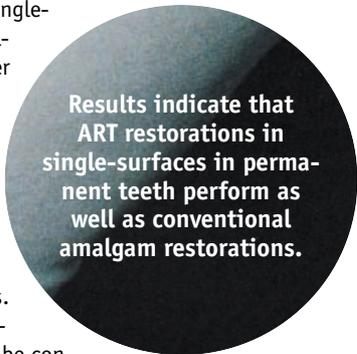


## **ART restorations vs. conventional restorations**

### *Permanent dentition*

As with all restorative procedures, survival is influenced by many factors. These include the caries risk profile of the population, the practice environment, the operator and the materials used. Numerous studies have assessed the quality of amalgam and composite resin restorations. Comparisons between studies are difficult because of diverse study designs, evaluators and evaluation criteria. Therefore, only estimates can be made about the average life span of an amalgam and composite resin restoration in general dental practice. Survival of these types of restoration varies considerably and ranges from five to more than 20 years. The outcomes from conventional restorations are considered the reference point to which the ART restorations should be compared. A few studies have compared restoration survival of ART to that using the conventional approach. The studies were conducted among school children in Malawi, Tanzania, Pakistan and Syria and among school children and adults in Thailand. The results of these studies are presented in Figure 4.2.

There was no statistically significant difference reported between the survival of conventionally placed amalgam and ART restorations using glass ionomers in single-surfaces after one year in Malawi and two years in Pakistan and Tanzania. Only in the earlier Thailand study was a statistically significant difference reported between the survival of conventionally placed amalgam and ART restorations in single-surfaces after three years. The amalgam restorations performed better. However, recent results from Syria showed no statistically significant difference between single-surface ART and amalgam restorations after three years. These findings indicate that ART restorations in single-surfaces in permanent teeth perform as well as conventional amalgam restorations. However, these short-term findings should be confirmed in longer-term comparative studies.



**Results indicate that ART restorations in single-surfaces in permanent teeth perform as well as conventional amalgam restorations.**

### *Deciduous teeth*

Only one study has investigated the difference between ART restorations using a medium-stress bearing glass ionomer and conventional amalgam restorations in the deciduous dentition. The three-year survival of single-surface ART and amalgam restorations in Syrian school children were 86 percent and 80 percent, respectively. This difference was statistically significant in favor of ART. The survival outcomes for single-surface ART restorations in primary teeth longer than one year are shown in Figure 4.3.

The three China studies show differences in results over two years, although the newer improved glass ionomers were used in all three studies. In the first two studies in China, where lower survival rates were observed, the restorations were placed under field conditions in very young children by dental therapists and dental students. In the third study in China, where higher survival rates were reported, an experienced dentist placed the restorations in older children. It is likely that the differences were largely due to operator performance. In Syria, an operator effect was observed among the eight dentists who placed the ART restorations. Thus, it seems that when experienced operators place single-surface ART restorations in primary teeth, the survival rates approach those seen for ART restorations in permanent teeth. While ART has the potential to be particularly useful in providing care for the young child, the results of studies thus far need to be confirmed by other investigations.

#### **ART related sealants**

The success of sealants must be considered in two ways. While retention rate has routinely been used as a criterion for success, the ultimate success of a sealant should be expressed in terms of its ability to prevent caries, which is the primary purpose of sealants. Thus, biological outcomes should take precedence over mechanical outcomes.

Sealing surfaces with glass ionomer as part of the ART approach seems to be beneficial. In Zimbabwe, after three years, comparable surfaces that were not sealed had a four times higher chance of developing a dentinal lesion than those that were sealed. Despite the somewhat lower retention rate obtained with glass ionomer compared to composite resin sealants, its caries-preventive effect is still very acceptable. In the studies in Zimbabwe and China, caries progressed in 2 to 4 percent of the surfaces that had been sealed after three years and then only in those teeth that had lost the sealant.

More recent studies of ART sealants have used both improved materials and methods of placement and careful selection of surfaces in high-risk individuals with early enamel lesions and with deep fissures. The three-year survival of 71-72 percent for partially and fully retained glass ionomer sealants is extremely encouraging considering they were placed under field conditions.

### **The acceptability of ART**

#### *Discomfort during treatment*

In Pakistan, patient discomfort was compared for restorations placed using ART with those placed using conventional procedures, i.e. rotary drill and amalgam, in patients aged 6-16 years. Discomfort was reported in fewer restorations placed with ART (19%) than in those placed using the drill and amalgam (36%). Similarly, in Indonesian children, discomfort as assessed using both physiological and behavioral methods, was less with the ART approach than with conventional procedures. In Chinese pre-school children, discomfort was experienced by only 7 percent of those receiving an ART restoration.

#### *Post-operative sensitivity*

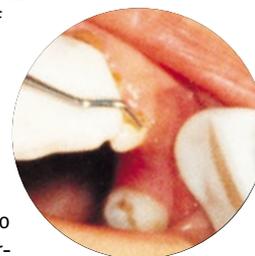
In Zimbabwean teenagers, patients were asked about post-operative sensitivity two to four weeks after restoration placement. Post-operative sensitivity had been experienced in 6 percent of the ART restorations placed, but by the time of the evaluation sensitivity had disappeared from all but one restoration. Similar results were reported in Chinese adolescents, with only 5 percent reported having some post-operative sensitivity.

#### *Acceptance by patients*

95 percent and 91 percent of secondary school students in Zimbabwe and China, respectively, expressed satisfaction with the ART procedure and with the resulting restoration(s). The same percentages of students reported that they would not hesitate to undergo the same treatment again if needed and would recommend it to their best friend.

### **ART in the health sector**

In many countries there is already some provision for dental care in schools. This is often delivered through the use of mini-clinics or mobile dental units where traditional dental care is provided. The advantage of the use of ART in a mobile setting has been shown in South Africa. For years a well-equipped mobile dental unit with three dental chairs was in operation in rural primary schools. However, it was reported that staff members had difficulties in treating these children because many of them were afraid of the dental treatment delivered through this system. It was decided to introduce ART into the care delivery system. A year after the introduction of ART, the percentage of extractions was reduced by 17 percent for permanent teeth and by 36 percent for primary posterior teeth compared to the year prior to ART. In addition, the percentage of amalgam restorations was reduced by 16 percent in permanent teeth and 1 percent in primary teeth. Conversely, restorative care increased by 33 percent in permanent teeth and 37 percent in primary posterior teeth. This positive change was ascribed to the patient-friendly nature of ART. It had reduced fear, mainly because of the absence of injections, and consequently had increased children's acceptance of restorative care. Another advantage was the simplified cross-infection control, particularly in an area with a high incidence of people with HIV and hepatitis.



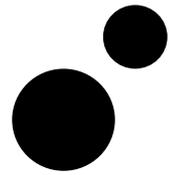
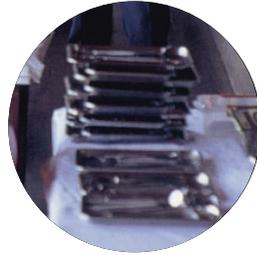
### Cost of ART restoration and ART sealant

The implementation phase of a cost-effectiveness study, comparing ART restorations using glass ionomer with amalgam restorations, started in Ecuador, Panama and Uruguay in May 2002. It will take more than three years before the results are published. Less complete data come from the ART study in Zimbabwe. When the cost of all consumable materials such as filling material, gauze, cotton wool, mouth masks, gloves etc. was taken into account, it was estimated that an ART restoration or ART sealant cost US\$ 0.47 in 1993 and US\$ 0.51 in 1996, excluding personnel salaries. These estimates are much lower than recently published estimates for traditional amalgam restorations in non-EME countries. A BPOC demonstration project will include costing of the package.



### Conclusion

- A large proportion of dentine lesions can be treated using the ART approach.
- The placement of restorations using the ART approach seems to cause less discomfort than conventionally placed amalgams.
- The survival rate of single-surface ART restorations using glass ionomers in the permanent dentition is higher in more recent studies compared to earlier studies.
- The average annual failure rate for ART restorations using glass ionomers in single-surfaces in the permanent dentition is about 4-5 percent for the first three years.
- The short-term survival of single-surface ART restorations using glass ionomers in the permanent dentition is comparable to amalgam restorations using conventional methods.
- The caries-preventive effect of ART related glass ionomer sealants is 96 to 98 percent after three years.
- The three-year survival of 71-72 percent for partially and fully retained glass ionomer sealants is extremely encouraging considering they were placed under field conditions.
- To ensure optimal results from the ART approach, educational courses for operators new to the techniques need to be organized prior to applying the approach in the field and clinic.





## Personnel and equipment for OUT and ART

5

*The training and job description of oral health personnel will differ from country to country and are regulated by the country's legislative system. This chapter provides information about the various types of oral health personnel suitable to provide OUT and ART services at the lower level of the PHC pyramid. Affordable fluoride toothpaste is*

*considered an element of health promotion and no attempt is made to discuss the types of personnel required to be involved in this promotion.*

*Furthermore, an attempt is made to list the basic requirements in terms of equipment and instruments to perform OUT and ART.*



The precise type of personnel required for OUT and ART services largely depends on local conditions, national health personnel infrastructure, and health strategies.

**Personnel requirements for OUT**

The precise type of personnel required for OUT services largely depends on local conditions, national health personnel infrastructure, and health strategies. The differences in types of health care personnel for OUT are shown in the three examples presented here. In Cambodia, primary health care nurses implement the Basic Package of Oral Care (BPOC). These nurses undergo a five-month dental training program. They are considered proficient in the skills required to render all services included in the BPOC. The requirements for enrolling in the dental

upgrading course include the following: one year of basic health training; at least one year employed as a primary health care nurse at a district referral or health center; and a signed agreement to return to the district referral or health center after the dental training has been completed.

Tanzania is the next example. There, rural medical aids provide pain relief through tooth extraction supported by drug therapy at rural health centers or dispensaries. The basic training for rural medical aids lasts three years. The dental upgrading training is accomplished through a short in-service training course. The rural medical aid is then considered proficient in the skills required to render OUT services. Both patient satisfaction with the pain relief service and job satisfaction among rural medical aids were reported to be high.

In Nepal, health assistants with extended duties that include oral health education, tooth extraction and first aid for maxillo-facial trauma, have been trained in a couple of months. In other countries, such as Kenya, Malawi, Vietnam and Zimbabwe, OUT services may be provided by dentally trained personnel such as dental therapists.

### Personnel requirements for ART

Different types of dental personnel have participated in ART studies. They vary from final year dental therapy students to dentists. Data analyses have shown the following findings.

- There was a statistically significant difference in survival of ART restorations between dentists (Pakistan, Syria) and between senior dentists and junior dental therapists, with the former performing better (Zimbabwe), but not between senior dentists and senior dental therapists (Thailand).
- The survival of ART restorations placed by dental therapists (China and Tanzania) was comparable to those placed by dentists (Pakistan and Syria).
- The survival of ART restorations placed by final year dental therapy students was below average (Cambodia).



Restoring decayed teeth through ART requires knowledge and skills about the maintenance and functioning of the dentition in total. Therefore, short training courses, as have been conducted for OUT personnel in Nepal and Tanzania, are inappropriate. It seems that the dental therapist is a suitable type of dental personnel to carry out the ART approach. However, local circumstances may lead to specific training courses on ART that exclude elements that make up the dental therapy training. Such a training course would then be shorter than the usual three years needed for the dental therapy training. It is up to each government to decide what is best under the prevailing circumstances.

### Conclusion

While auxiliary medical and dental personnel will provide most of the OUT service at the lower level of the PHC pyramid, dentists play an important role in the overall structure. Dentists interested in community dentistry may be useful as teachers and instructors in the competency-based training of providing OUT and ART personnel. Furthermore, dentists in government service, preferably with some training in public health, are required to supervise and monitor the oral health services in regions or districts. These government dental officers are also responsible for the training and upgrading/refresher courses for dental and medical auxiliaries.

### Equipment, instruments and materials required for OUT

The equipment may include the following:

- A chair or bed/couch with head support
- A stool for the dental health worker and assistant
- A table for instruments and medicines
- A light source, which ideally does not rely totally on electricity supply
- A wash basin
- A system of water storage if running water is not available
- A pressure cooker and heat source for sterilizing the instruments.

A basic set of dental instruments and materials should be compiled. This should be considered the minimum required for the provision of OUT services. There are numerous types of extraction forceps and they are expensive. Decisions must be made regarding the number and type of forceps required. A limited set of two to four different types of forceps and one or two dental elevators will suffice for the extraction of all types of teeth. The expected number of patients per day and the time needed for sterilizing the instruments determine the number of sets of instruments required. This will differ from country to country and from community to community.

### **Equipment, instruments and materials required for ART**

The equipment and material requirements for ART have been reduced to a minimum. This lowers initial set up and maintenance costs and allows treatment to be provided in virtually any environment. All that is required are appropriate supports for the patient and operator, dental hand instruments, an adhesive restorative material, relevant consumable materials and a source of lighting. The hand instruments used in the ART approach have been carefully selected and are based on the steps involved in placing an ART restoration. Only those instruments that are essential are included. Almost all the instruments used are those commonly found in dental clinics and are readily available from dental instrument suppliers (fig. 5.1). The instruments used are mouth mirror, explorer or probe, tweezers, excavators, dental hatchet and an applier/carver. A new instrument for opening tooth cavities has been developed recently (fig 5.2).

The consumable materials required include cotton wool rolls, cotton wool pellets, petroleum jelly, tumbler/cup, wooden wedges, matrix band and plastic strip. Until now glass ionomers have been used as the restorative material. However, if ART is to be undertaken in a well-equipped dental clinic, either in a district or provincial hospital or privately, then resin-based composite materials might be considered.

### **Conclusion**

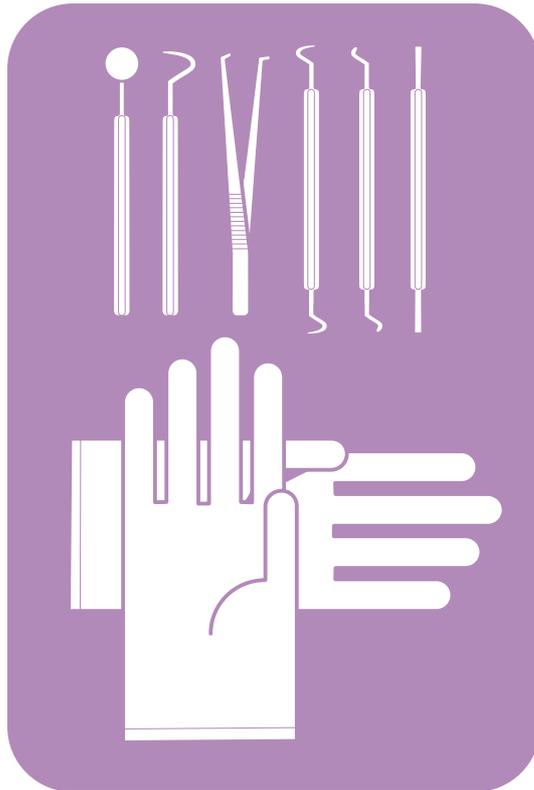
The type of dental personnel needed to perform OUT requires a shorter training period than those performing ART. The national health and legal structures will have to be followed when introducing the BPOC. The equipment, materials and instruments required to do OUT and ART are not electricity-dependent, much cheaper to purchase and to maintain than that required for traditional western dental treatment and, therefore, permit the BPOC to be undertaken almost anywhere.

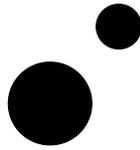




**Figure 5.1** A set of instruments and materials required for producing an ART restoration. (Reprinted with permission from Drs. J.E. Frencken and C.J. Holmgren)

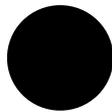
**Figure 5.2** The new ART instrument for opening tooth cavities. It is placed in the entrance of a cavity. The soft carious tooth material and biofilm are seen alongside the instrument. (Reprinted with permission from Dr. D. Taifour)





## Recommendations for establishing and





## evaluating BPOC demonstration programs

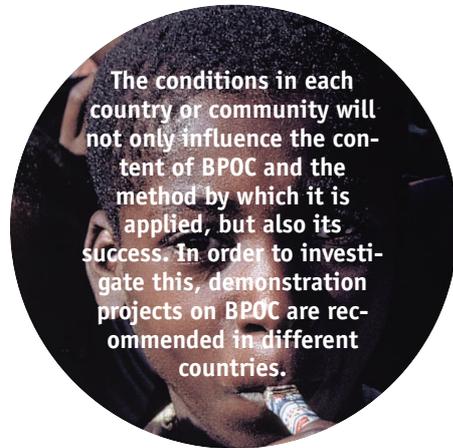
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*The need for and effectiveness of each of the individual components that constitute the Basic Package of Oral Care (BPOC) have been discussed in previous chapters. The next step is to demonstrate the effectiveness, efficiency, acceptability and sustainability of the BPOC as a means of improving oral health within the country or community for which it is intended.*

## Introduction

Implementation of the BPOC depends on prevailing local factors, including available human and financial resources and existing infrastructures, local perceived needs, and treatment demands of the community and that of its leaders. The conditions in each country or community will not only influence the content of BPOC and the method by which it is applied, but also its success. In order to investigate this, demonstration projects on BPOC are recommended in different countries.

The guidelines presented below assume collaboration among local partners, local government, industry and organizations (including NGOs) providing oral health experts. It aims at highlighting aspects of preparation, planning, implementation and evaluation of demonstration projects. A summary of the essential steps to be taken in a demonstration project is given in Table 6.1.



## **Factors to consider before starting the program**

### *Identifying a local partner*

The local partner should be willing to accept joint responsibility for the planning and implementation of the program with the ultimate objective of taking on the ownership of the ongoing activities in a later phase. The setting up of a working group to initiate the program and to oversee its implementation is desirable.

### *Obtaining approval from decision makers*

Approval for the program implies consultation with the authorities as early as possible. It is essential to obtain their consent for the planning of the demonstration program and for its implementation. In this context it is essential to have briefing at ministry level, since the Ministry of Health is a fundamental player in developing (oral) health services.

### *Probing the interest of possible parties involved*

Local political, religious and community leaders, as well as the heads of medical and educational systems and other possible service providers, e.g. traditional healers, should be consulted to probe their views and interest in the BPOC program. If their interest is low and their willingness to support the program is nil, then it might be necessary to abandon the idea of starting a program for that particular community.

### *Understanding the local situation*

The success of any oral health program, including oral health services research projects, depends on how well it meets the wishes and expectations of the community. If the program fails to meet these, then there is likely to be a problem with both acceptance and sustainability. In designing the program, many factors should be taken into consideration, including epidemiological data on the community's oral health status and normative needs, the people's perceived needs (wishes) and treatment demands, their knowledge and habits related to oral health, existing health and educational structures, and available human and financial resources.

## **The process of planning**

### *Formulating measurable objectives*

The collected information on the local prevailing conditions provides a basis for developing the program proposal. The next step is the formulation of appropriate objectives for the program that are consistent with the wishes and expectations of the community and its leaders. The objectives must be defined in such a way that allows for meaningful evaluation. Objectives that cannot be achieved or cannot be properly evaluated will frustrate both the providers and consumers, which could hinder continuation of the program.

### *Consultation among all parties involved*

When the program proposal has been formulated it should be presented to all parties involved. This consultation is important to determine whether the objectives and the chosen strategy meet their wishes and expectations. It is probable that in the light of consultation, minor modifications will be required. It is essential that all parties involved agree on the final draft of the program proposal. When the proposal has been accepted by those responsible, a protocol should be devised, which highlights the details of all parts of the program, the individuals responsible for each activity and the time frame.

## **Implementation, process monitoring and evaluation**

### *Monitoring activities, maintaining communication, tackling problems*

Continuous monitoring of all activities is required during implementation. Maintaining communication with all parties involved is a prerequisite to identifying small problems, which if not resolved can seriously threaten the success of the program. Unforeseen more serious problems may emerge that require modifications of the original proposal or may force the discontinuation of the program. Moreover, the monitoring process reduces the risk of drawing faulty conclusions from the results of the outcome evaluation. For instance, the conclusion that the program was ineffective when in reality the program was not carried out as designed.

### *Assessing the outcomes*

The rationale for setting up a demonstration program (community trial) is to determine the feasibility, effectiveness, efficiency, social acceptability and sustainability of the BPOC under local conditions. This implies that the results of the outcome evaluation must be determined to assess whether the objectives have been met. Depending on the formulated objectives, achievements can be evaluated by assessing the concomitant outcome effects, for example:

- A reduction in the number of people with toothache
- Utilization patterns of offered services, such as an increase in people seeking regular check-ups and in those coming to have decayed teeth filled. The utilization pattern of toothpaste and tooth-cleaning devices should also be determined
- Oral health status, e.g., number of teeth decayed, filled or sealed
- Consumer's satisfaction with treatment received
- Job satisfaction of providers
- Generated resources
- Sales figures of toothpaste or price fluctuation of toothpaste by year.

The length of the demonstration program depends on the type of outcome effect to be assessed. Studies with the objective of controlling or reducing the level of dental caries might need to run for two to four years before results can be assessed. Ideally, process evaluation should have revealed whether the program is likely to be sustainable before a final assessment has been carried out.

### *Reporting the findings*

The results of the evaluation process, including conclusions and recommendations, must be reported to all parties at regular intervals for subsequent discussion. The final outcome of the program should also be reported to all parties. In addition, outcomes, whether successful or unsuccessful, should be reported in the scientific literature. This will guide other countries or communities that might consider commencing a BPOC program.

### Future options after evaluating a BPOC program

#### *Abandon the program*

The option of abandoning the program should be considered if it is found to be ineffective, unacceptable or unaffordable. Without adequate support from the community or government, an oral health services program cannot become sustainable. There is no reason to continue the program with external funding if all signs indicate that neither the government nor the community is willing to support the program with local resources.

#### *Modify the program and run another demonstration project*

Another option might be to modify the program in order to solve problems identified during the evaluation. For example, a reorientation of the program might be required to address the wishes of the parties involved, which emerged during the course of implementation. Initiation of a modified program may be considered in another demonstration program.

#### *Continuation and expansion of the program*

Agreements on ownership must be made at an early stage of the demonstration program. The responsibilities regarding continuation should be formalized with the authorities at the end of the demonstration program. The decision to expand the program on a larger scale belongs to the authorities and the community. All efforts related to the implementation of the demonstration program on a larger scale must be based on self-supporting activities, which implies that no external funding should be considered.



Table 1 Flow chart of activities in an oral health demonstration study

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