Government policies on fluoride utilization in the Nordic countries

Nina J. Wang
Public Dental Services, Oslo, Norway

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In most but not all the Nordic countries, the National Boards of Health have issued guidelines governing the utilization of fluoride. The purpose of this paper is to outline the process of policy formation, describe the current fluoride guidelines in the Nordic countries, and discuss compliance with and appropriateness of the guidelines. The fluoride guidelines summarize current knowledge and make recommendations on choice of fluoride preparations (supplements, toothpaste, and varnish) and doses. Fluoride policies in the Nordic countries in the late 1990s state that use of fluoride toothpaste twice a day is the preferred and sufficient source of fluoride for the majority of the population. The policies of the Nordic countries are similar, but there are differences, some of them self-explanatory others not so obvious. In the case of supplements, for example, there are differences in the recommended dosage schedules. In the case of toothpaste, it is unclear what concentrations of fluoride are recommended both for children and for adults. Starting time for the use of fluoride, whether toothpaste or supplements, varies between countries. The clinicians' compliance with fluoride guidelines has not been systematically evaluated. Comparing the advice and treatments offered by dentists in the Nordic countries with current guidelines suggests that national policies influence the practice of clinicians. For government policy to be appropriate, it is imperative that the guidelines are based on sound scientific evidence. It is thus concluded that if non-evidence-based elements are included in national guidelines, this should be clearly stated to prevent confusion and enhance compliance from professionals and the public. □ *Clinical guidelines; fluoride toothpaste; fluoride supplements; preventive strategies*

Nina J. Wang, Elmholt Alle 11, NO-0275 Oslo, Norway. Tel. +47 22 05 58 36, fax. +47 22 05 58 93, e-mail. ninaw@odont.uio.no

In all the Nordic countries, Denmark, Finland, Iceland, Norway, and Sweden, fluoride is recognized as one important factor among others that has contributed to the documented decline in dental caries during the last generation (1). In the 1990s, caries incidence and prevalence has reached a reasonably low level in all these countries (2).

There is still debate about appropriate fluoride use (3) and disagreement continues among clinicians in the Nordic countries about the importance of fluoride as a caries-preventive method (4), about the choice of fluoride preparations, and about what strategies, doses, and concentrations should be used.

The dental care systems in the Nordic countries have many characteristics in common compared with systems in other parts of the world (5, 6). Care is subsidized or provided free of charge to all children and, according to law, preventive care is given preference (7–9). In most, but not all countries, the National Boards of Health have issued guidelines governing the utilization of fluoride (10–13). These guidelines summarize current knowledge on use of fluoride and include advice on strategies and methods of fluoride use.

This paper describes how policy documents regarding the use of fluoride are decided and discusses why governments make policies. The present fluoride policies in the Nordic countries are described. Compliance with fluoride guidelines is exemplified using information on the advice and treatments offered by dentists in their practices in the Nordic countries (4, 14). The material used in this paper comes mainly from official documents belonging to Nordic government bodies (10–13), and from recent research on fluoride strategies in the Nordic countries (4, 6).

Policy formation

Governments in most Nordic countries have formed a policy on fluoride use. Policy is a defined course of action adopted for the sake of expediency and facility (15). The word policy is used equivalently with recommendations or practice guidelines issued by an official body. The National Boards of Health issue the respective government policies on fluoride. In Norway, this is done by Statens Helsetilsyn, in Finland by STAKES, in Sweden by Socialstyrelsen, in Denmark by Sundhedsstyrelsen, and in Iceland by Office of the Chief Medical Officer. The government bodies obviously do not hold updated expertise regarding topics such as fluoride, but they consult leading national and international scientists when policies are being formed.

Government policies are not themselves legally binding, but they constitute recommendations and advice for good professional practice. These policy documents intend to describe practices or procedures that reflect generally accepted professional norms, and indicate where the boundaries of defensible professional activity lie (16). This

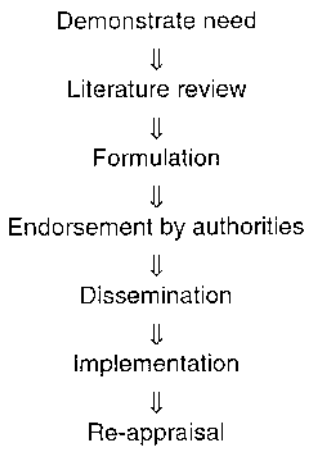

Fig. 1. The steps used in development and dissemination of policy documents (17).

means that the professional who chooses practices that depart from current guidelines has to be prepared to document and justify his or her choice (16).

National guidelines are considered particularly necessary when a large body of knowledge has to be interpreted and when the guidelines affect large populations (17). The background for the development of government policies involves the principle of evidenced-based dentistry, the need for cost-efficient care and the desire to optimize the health outcome for the patient (18). Aims of policies are to reduce inappropriate practice variation, improve practice among clinicians, and promote good dental care for the patients (19).

Policy documents are generally formed using the steps shown in Fig. 1. In a clinical area where need for a policy is demonstrated, data are drawn from research information. A policy is formulated and a document is produced after consideration of the available evidence and widespread consultation. Finally, it is imperative that policy documents are subjected to periodic review as new evidence arises.

Fluoride policies in the Nordic countries in the 1990s

The fluoride policy documents include recommendations on the use of toothpaste, supplements (Table 1), chewing gum, rinse, and varnish (Table 2); they summarize current knowledge on the mechanisms of action of fluoride and present strategies on the use of fluoride.

The policy documents of the Nordic countries have many features in common. All the current policies concede that the caries-preventive effect of fluoride is topical and that the aim is to maintain a prolonged elevation of fluoride in the oral fluids. The documents state that the majority of the population use fluoridated toothpaste daily, and that brushing with fluoride toothpaste morning and evening is considered the basis for all caries prevention in both children and adults. The need for a flexible approach accommodating individual circumstances is also stressed. In the latest revisions of the policy documents of most countries the recommended doses of fluoride have been reduced and more than one exposure to fluoride each day is encouraged. In several countries the documents also emphasize information enabling individuals to select and use the appropriate fluoride vehicle.

Table 1. Dosage-schedules for fluoride supplements according to policy documents for each of the Nordic countries

Age (years)	Finland	Iceland	Norway	Sweden
0.5–1	0.00	0.25	0.25	0.00
1–2	0.25	0.25	0.25	0.00
3–6	0.50	0.50	0.50	0.50
7–12	0.75	1.00	0.50	0.75
13–14	1.00	1.00	1.00	1.50
15–18	1.50	1.00	1.00	1.50
>18	1.50	?	1.50	1.50

Sweden, Finland, and Norway have revised their policies during the 1990s (10–12). Iceland has some written advice from 1996 (13). In Denmark, policy documents on the use of fluoride are not official but they include and underline different aspects of its utilization.

Norway

According to the policy document issued in Norway in 1996, toothpaste should be recommended for all individuals from eruption of the first tooth, and the fluoride concentration in the toothpaste should not be less than 0.1%. The amount should be increased gradually from "barely visible" at the start to an amount equal in size to the nail of the little finger at 12 months of age to a pea-sized amount at age 6 years.

Other fluoride vehicles, such as supplements and rinses, should be used after an individual assessment of caries risk. When supplements are used, several lozenges taken during the day, each with a low quantity of fluoride, are recommended rather than a single large dose daily. In addition, the document stresses the value of activities

Table 2. Use of fluoride varnish for at-risk children according to policy documents

Country	Application of fluoride varnish
Sweden	Should be used 4 to 6 times at short intervals during the initial caries treatment
Norway	Application after need 2 to 4 times per year
Finland	May be used 2 to 3 times per year
Iceland	Reimbursed 2 times a year until the age of 13 years

performed by the individual, i.e. the use of lozenges and rinses is preferred to application of varnish by a dental professional.

Sweden

Swedish policy regarding the use of fluoride from 1991 emphasizes the use of fluoridated toothpaste twice a day from eruption of the deciduous molars. The concentration of fluoride in toothpaste is not mentioned in the recommendations but it is stated that the amount on the brush should be small.

According to the policy, additional fluoride preparations such as lozenges may be used for a limited period in individuals with high caries activity. The document states that fluoride supplements should not be used continuously. For risk children, varnish should be applied four to six times at short intervals during the initial dental treatment. The Swedish recommendations stress the value of information enabling individuals to select appropriate fluoride preparations themselves.

Finland

In the Finnish policy document from 1996, the recommended starting age for use of toothpaste is the eruption of deciduous molars or the 2nd year of life. The amount used has to be pea-sized and the child should be able to spit before starting the use of fluoride toothpaste.

Additional fluoride in the form of lozenges, chewing gum, or rinse could be recommended after an individual evaluation. The document recommends that the dosage of supplements be in accordance with weight and that the daily dose should be taken in several small doses during the course of the day. Fluoride varnish might be used 2–3 times per year in caries-active individuals.

Iceland

In the Icelandic statement, fluoride toothpaste for all individuals from eruption of the first tooth is recommended. In addition, rinsing with fluoride solutions is recommended for all school children and fluoride supplements are recommended for risk children. In Iceland, it is claimed that there is no dental service system appropriate for identifying risk children. They consequently define all children as risk individuals and recommend supplements for all (13).

Denmark

The Danish government has not developed policy documents regarding the use of fluoride. However, according to the dental schools (pers. comm.), toothpaste with 0.1% fluoride should be used by all individuals. For individuals with high caries activity, additional fluoride might be recommended in the form of chewing gum or lozenge, but only if tooth-brushing and use of toothpaste is impossible.

Differences between the national policies

Although the recommendations of individual Nordic countries are similar, there are differences, some of them explainable by availability of fluoride in the drinking water or differences in dental health. Others are not so obvious.

For fluoride supplements, there are differences in the recommended dosage schedules (Table 1). The starting time for use of supplements is 6 months in Iceland, 12 months in Finland, 3 years in Sweden; in Norway the lower age limit is not defined. It is recommended that the daily dose be divided into several smaller doses in Norway, Iceland, and Finland but this is not mentioned in the Swedish policy.

For toothpaste, it is not clear what concentrations of fluoride are appropriate for children nor for adults. In the Norwegian guidelines it is stated that the fluoride concentration should be at least 0.1%; in the Finnish policy document it is stated that difference in caries-preventive effect between various fluoride toothpastes has not been documented; in the Swedish and Icelandic advice the fluoride concentration is not mentioned. The recommended starting time for use of fluoride toothpaste varies between countries; in Iceland and Norway the recommended start is at 6 months of age (eruption of first tooth), whereas in Sweden and Finland toothpaste is recommended at 12 months of age (eruption of first molar).

Table 2 summarizes the recommended use of fluoride varnish in risk children. The number of recommended applications varies. In addition, the persistence of the recommendations varies. In Sweden, varnish applications are to be performed, in Norway this has to be evaluated individually, and in Finland fluoride varnish may be used. In Iceland, where fluoride varnish application is reimbursed twice a year for at-risk children under the age of 13 years, this probably guides the use of fluoride varnish. For Icelandic children <13 years old and not at special risk only one fluoride application is reimbursed per year but no guidelines for what constitutes caries risk are given.

Clinicians' use of fluoride in the Nordic countries

Recent data regarding the fluoride recommendations that Nordic dentists and dental hygienists give their patients and the sources of information the clinicians base their practice on are available (4, 6). In this study, data on the use of fluoride was collected from 1700 dentists who delivered dental care to children in 1995 in Denmark, Iceland, Norway, and Sweden. Unfortunately, no data from Finland were collected in the study.

The proportion of dentists who considered fluoride the most important preventive method varied between the

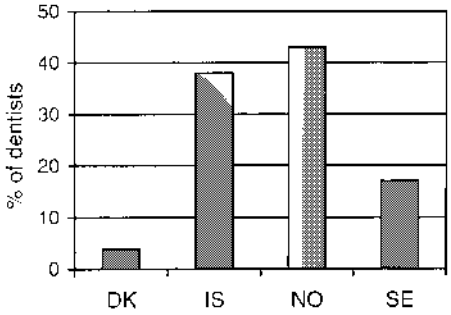

Fig. 2. Proportion of dentists considering fluoride to be the most important preventive method in Denmark, Iceland, Norway and Sweden (4).

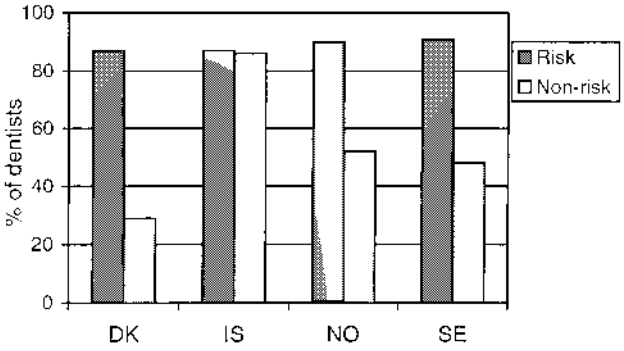

Fig. 3. Proportion of dentists usually applying varnish to at-risk and non-risk children and adolescents in Denmark, Iceland, Norway and Sweden (4).

Nordic countries in 1995 (Fig. 2). Fluoride was considered the most important preventive method by 4% of the dentists in Denmark while 43% of dentists in Norway considered that fluoride was the most important preventive measure for children and adolescents.

In all countries, the vast majority of children are advised to use toothpaste with fluoride (Table 3). In Norway, some are not advised to use toothpaste. It is likely that these children are young and are recommended supplements. Table 3 also shows that supplements are not recommended in Denmark, while in the other countries, especially in Norway, a sizeable proportion of children were at that time instructed to use the supplements. It is obvious from Table 3 that rinsing is more often recommended in Iceland than in the other countries.

Fig. 3 shows the use of varnish in children in 1995. More than 80% of the dentists in all countries claimed that they usually applied varnish for risk children. Regarding non-risk children, the use is higher in Iceland than in the other countries. It should be noted that dentists in the other countries too applied varnish to a substantial proportion of the non-risk children. Referring back to government documents, the Icelandic reimbursement system covers varnish application once a year for non-risk children. In none of the other countries is varnish recommended for non-risk cases.

Information to patients regarding fluoride is given to most individuals in Norway and Sweden (Fig. 4). In Denmark and Iceland, this practice is less common. Information is given to both at-risk and non-risk individuals.

According to clinicians the fluoride methods used differ between the countries (Table 3) (4, 6). In Denmark, toothpaste is considered sufficient. In Norway, dentists add supplements in many cases. In Iceland, both fluoride rinsing and supplements are deemed necessary. In Sweden, toothpaste is the basis and supplements, rinse, and varnish are recommended for some individuals.

Regarding strategies, in Iceland more or less the same methods are used for all, while in the other countries the dentists claim that they adjust their methods according to their perception of the child's caries risk.

Table 3. Proportion of dentists recommending different fluoride preparations to more than 90% of children and adolescents in Denmark, Iceland, Norway, and Sweden (4, 6)

	Denmark	Iceland	Norway	Sweden
Toothpaste	98	99	84	98
Supplement	0	22	25	2
Mouth rinse	3	40	3	4

Compliance with fluoride policies

Although interest in policies or clinical guidelines has never been greater, uncertainty persists about whether they are effective (17, 20). Generally, studies conducted after release of guidelines have shown that practitioners have less than satisfactory awareness with guidelines and compliance is poor (17). A large number of variables are shown to influence the practice of clinicians (17) and the successful introduction of clinical guidelines is claimed to depend on the processes of development, dissemination, and implementation (20).

No systematic evaluation of the compliance with

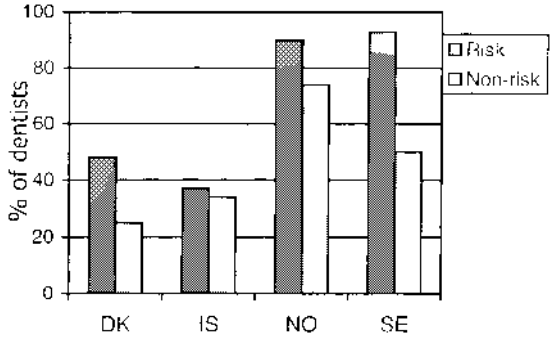

Fig. 4. Proportion of dentists giving information on fluoride to at-risk and non-risk children in Denmark, Iceland, Norway and Sweden (4).

Table 4. Most important source of information for dentists (%) in Denmark, Iceland, Norway, and Sweden (4)

	Denmark	Iceland	Norway	Sweden
Chief dental officer	86	28	70	27
Dental education	1	58	0	0
Meetings	13	11	30	64
National literature	0	0	0	8
International literature	0	3	0	1

fluoride policies has been performed in the Nordic countries. However, comparing fluoride policy documents with recent data on fluoride use shows that the practices of dentists differ between countries, tending to follow the same pattern as the differences in policy documents. This could indicate that the dentists know the guidelines and that government policy influences their recommendations to patients. However, it could also be concluded that available data suggest there are certain discrepancies between policy and practice. The clinicians' awareness and acceptance of government policies on fluoride use should be further evaluated.

To keep up-to-date with new knowledge is time-consuming, perhaps impossible for a clinician. Recent data show that dentists seldom read scientific papers (4). A minority of clinicians claim to read international or national literature (Table 4), but the chief dental officers are relied upon as the main source of information in most countries. This may suggest that government policy based on updated knowledge could serve as a method for putting evidence-based dentistry into practice.

Evidence-based government policy could serve a useful purpose by disseminating new scientific knowledge. Scientific knowledge has no utility until it has impacted on practice. However, regardless of government policy, it is the responsibility of the scientific community to present new knowledge to clinicians.

Conclusions

In the future, rational use of fluoride depends on a vast number of factors, including economics, educational level, caries situation, hygiene status, and access to dental services. Most of these factors are similar in the Nordic countries and should prompt similar views on the benefits of fluoride. Accordingly, fluoride policies have recently been revised in the Nordic countries and are today more in harmony with each other than previously. During recent years, policy documents have increasingly stressed the use of local or topical methods, of individualized care and of reduced fluoride doses, and the documents encourage self-care and information to patients.

Despite the similarities, there are differences between countries in dosages, concentrations, application frequencies, age limits, and indications for the various fluoride treatments. Relying on the policy documents there is no consensus regarding these factors in the Nordic countries. It is tempting to speculate whether these parts of the policies are evidence-based. For government policy to be appropriate, it is imperative that the guidelines are based on sound scientific evidence. If non-evidence based elements are included in national guidelines, this must be clearly stated to prevent confusion and enhance compliance from professionals and the public.

Comparing the advice and treatments offered by dentists in the Nordic countries with current guidelines suggests that national policies influence the practice of clinicians. There is some discrepancy between policy and practice. However, as the policies have been altered in recent years, it is possible that in the future clinical practice will be further modified in accordance with government policies.

In conclusion, fluoride policies in the Nordic countries in the late 1990s state that use of fluoride toothpaste twice a day is the preferred and sufficient source of fluoride for the majority of the population. For the minority of the population with special needs, individualized care is recommended. However, the content and extent of the recommended individualized fluoride programs differ considerably between the countries.

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