

Preventive care and recall intervals. Targeting of services in child dental care in Norway

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Skewed caries distribution has made interesting the use of a high risk strategy in child dental services. **Objective:** The purpose of this study was to describe the preventive dental care given and the recall intervals used for children and adolescents in a low caries risk population, and to study how the time spent for preventive care and the length of intervals were associated with characteristics of the children and factors related to care delivery. **Material and Methods:** Time spent for and type of preventive care, recall intervals, oral health and health behaviour of children and adolescents three to 18 years of age (n = 576) and the preventive services delivered were registered at routine dental examinations in the public dental services. **Results:** The time used for preventive dental care was on average 22% of the total time used in a course of treatment (7.3 of 33.4 minutes). Less than 15% of the variation in time spent for prevention was explained by oral health, oral health behaviours and other characteristics of the children and the service delivery. The mean (SD) recall intervals were 15.4 (4.6) months and 55% of the children were given intervals equal to or longer than 18 months. Approximately 30% of the variation in the length of the recall intervals was explained by characteristics of the child and the service delivery. **Conclusions:** The time used for preventive dental care of children in a low risk population was standardized, while the recall intervals to a certain extent were individualized according to dental health and dental health behaviour.

Key Words: Dental caries, epidemiology, individualization, prevention, risk strategy.

Introduction

Dental caries occurrence among children and adolescents has decreased and is increasingly skewed (Marthaler *et al.*, 1996). This has given rise in recent years to attempts to target preventive care at high caries risk children (Hausen *et al.*, 2000; Wang and Holst 1995). The risk strategy seeks to tailor care to the individual's needs, in the hope of providing more efficient dental care (Rose, 1985). The effect and efficiency of this strategy in child dental care has been questioned (Burt, 1998; Hausen *et al.*, 2000).

A shift from population-based prevention to a high risk strategy has been promoted in countries where caries is strongly polarized (Seppä, 2001). Norwegian health authorities have advised that allocation of resources, frequency of examinations and type and quantity of preventive care, be based on the individual's assessed caries risk (Wang *et al.*, 1998a). The extent to which clinicians deliver individualized care is poorly known (Wang *et al.*, 1998b). Finnish studies have shown that neither the type of preventive care nor the time used for preventive care is individualized (Kärkkäinen *et al.*, 2001).

The purpose of this study was to describe the preventive dental care given and the recall intervals used for children and adolescents, and to study how the time spent for preventive care and the length of intervals was associated with characteristics of the children and factors related to the dental delivery process.

Material and methods

The study was conducted in Bærum, a prosperous suburban municipality near Oslo with an ethnically homogenous and highly educated population. The caries experience in children in the municipality (5 year olds 0.7 dmft, 12 year olds 1.3 DMFT, 18 year olds 4.4 DMFT in the study year), which had no fluoride in the water, was among the lowest in Norway. The public dental services provide comprehensive dental care including preventive care free of charge for all 20,000 resident children and adolescents three to 18 years of age. The study included all children (n=576) recalled for routine dental examination in a randomly selected two week period in autumn 1997. Twenty clinicians working in 16 clinics participated. Following standard procedures in Norway, the children were examined by a dentist or a dental hygienist depending on the availability of dental hygienists. The study was approved by the management in the public dental services and considered as a quality control and follow-up of the routine dental services given.

Method

The data used in this study were selected at the recall examinations in the public dental service and from the records used in the national dental services. The routines, criteria and guidelines used in the public dental services were followed in the data collection. The clinicians were given written instructions about the data recording and the instructions were discussed before the project be-

gan. Information available at routine examination was recorded on a form by the dental examiner using case history, clinical and radiographic data. Dental records and radiographs from previous dental visits were available for most children.

Clinical time was defined as the time the clinician used working with the child in the clinic. Time for preparation, paper work and cleaning was not included. The numbers of minutes (rounded up to the nearest five minutes) spent for clinical and radiographic examination, for preventive treatments (preventive care) and for other treatments (treatment time) were recorded, and the numbers of dental visits only for preventive care and the total number of visits in the current course of treatment were noted.

In addition, whether information about diet and dental hygiene was given and whether hygiene instruction, fluoride application, scaling or other preventive activities were performed, was noted. The total number of preventive measures was calculated by adding the different types of preventive care given to each child.

The number of months set until the next dental recall examination was registered. The intervals in the dental services were set by the examiner according to an evaluation of the need of the individual child as recommended by the Norwegian health authorities. No criteria were given.

Factors hypothesized to influence the time spent for prevention and the planned length of the recall intervals were noted. These included demographic information, medical conditions, oral health, oral health behaviours and information on use of dental services.

The age (mean 9.5, SD 4.7), gender and whether the child had a Norwegian or non-Norwegian background was recorded based on the country of birth stated by the parents or the child. The presence of any medical conditions or disability registered in the child's dental record was noted.

Whether the child had previous caries experience (teeth filled or missing because of caries) and whether the child had teeth with dentin caries at the time of examination, were recorded. Primary teeth were recorded for children six years of age and younger and permanent teeth for older children. Each child was categorized as having or not having dentin caries and/or previous caries experience. In the public dental services, the clinicians usually decide to fill a tooth when caries in dentin is registered. The number of approximal surfaces with enamel caries was recorded and dichotomized as no surfaces or any surfaces with enamel caries. Whether the examiner recorded signs of gingivitis and visible plaque or not was noted. No criteria were given.

Children or parents (if present) were asked whether fluoride supplements or fluoride rinse were used daily, whether the teeth were brushed more than once a day and whether sweets were consumed more often than once a week. Most children below the age of 12 years were accompanied by a parent.

Whether the examiner was a dentist or a dental hygienist and whether the last recall interval was longer than one year was noted. The last recall interval (mean 12.7 months, SD 5.1) was not available for first-time visits such as 3-year-olds and children that recently had moved to the municipality.

Table 1 shows the distribution of the independent variables.

Differences in types of preventive care delivered to children with and without teeth with approximal enamel caries were evaluated using bivariate odds ratios and 95% confidence intervals. Differences between means were tested using t-tests. Time spent for prevention and length of recall intervals were analysed using multiple linear regression analyses entering all the independent variables. The statistically significant variables are reported. Age was included as a nominal covariate as this variable was considered a confounder, but did not vary systematically with the dependent variables. Unstandardized regression coefficients, standard errors and p-values are reported. P-values less than 0.05 were considered statistically significant. Analyses were performed using SPSS statistical software, version 14.0 (SPSS, Chicago, IL, USA).

Results

Table 2 describes resources consumed for dental care of children. The mean total time used for dental care in the treatment sequence was 33.4 minutes and the mean planned recall interval was 15.4 months. Of the total clinical time, 45% was examination time, 22% was used for preventive care and 34% was used for other treatments.

The most frequently used total clinical time was 20 minutes, consisting of 15 minutes for examination and five minutes for preventive care. Few children had visits for preventive care alone and the mean number of preventive measures in the treatment sequence was 2.3.

Figure 1 shows the variation in the time spent for preventive care in the treatment sequence. The majority of children were given no or five minutes of preventive care while only three percent received more than 15 minutes of preventive care.

Figure 2 shows that the recall intervals set for the children varied from one to 24 months. Twelve percent of the children had recall intervals shorter than 12 months, while 55 percent had intervals of 18 months or more.

Table 3 shows the proportions of children given different types of preventive care. The most frequently performed preventive activities were information on hygiene (75% of the children) and diet (64% of the children). Children that had teeth with approximal enamel caries were significantly more often given preventive measures than children without approximal enamel caries. More than 65% of these children received fluoride application, information on hygiene and diet. When approximal enamel caries was recorded, the probability of receiving a fluoride application was 3.4 times higher, the probability of receiving information on hygiene 2.4 times higher and information on diet 1.9 times higher than when approximal enamel caries was not present.

Table 4 shows the bivariate associations, and Table 5 shows the multivariate associations between time spent for preventive care and characteristics related to the child and the dental care delivery process. Table 4 shows that more preventive time was spent on children with clinical findings of approximal enamel caries, dentin caries, previous caries experience, gingivitis and plaque as well as on children who reported eating sweets often.

Table 1. Description of the children (n = 576). Numbers and proportions (%) of all participants

<i>Variable</i>	<i>Categories</i>	<i>n</i>	<i>%</i>
Gender	Boy	307	53
	Girl	269	47
Background	Non-Norwegian	32	6
	Norwegian	544	94
Medical condition	No	534	93
	Yes	42	7
Examiner	Dentist	375	65
	Hygienist	201	35
Plaque	Yes	252	44
	No	324	56
Gingivitis	Yes	72	13
	No	504	88
Fluoride	Use of fluoride supplements or rinse daily	199	35
	Not use of fluoride supplements or rinse daily	377	66
Tooth brushing	Brushing more than once a day	420	73
	Brushing once a day or less	156	27
Sweets	Consumption of sweets more than once a week	359	62
	Consumption of sweets once a week or more seldom	217	38
Previous recall interval	> 12 months	296	51
	≤ 12 months	202	35
Approximal enamel caries	No	454	78
	Yes	122	23
Dentin caries	No	454	78
	Yes	122	22
Caries experience	No	378	65
	Yes	198	34

Table 2. Use of resources for dental care of children. Mean, standard deviation, mode, minimum and maximum

	<i>Mean</i>	<i>SD</i>	<i>Mode</i>	<i>Min</i>	<i>Max</i>
Minutes for examination	14.9	5.0	15	5	30
Minutes for preventive care	7.3	6.0	5	0	60
Minutes for treatment	11.3	23.9	0	0	180
Minutes used in the sequence	33.4	26.7	20	5	220
Visits in the treatment sequence	1.3	0.7	1	1	5
Visits only for preventive care	0.0	0.2	0	0	2
Months until next examination	15.4	4.6	18	1	24
Number of preventive measures	2.3	1.3	3	0	4

Table 3. Proportions (%) of children given different types of preventive measures by caries status at examination. Odds ratios (OR) and 95% confidence intervals (CI)

	<i>Percent given preventive measures</i>			<i>OR</i>	<i>95% CI</i>
	<i>All children</i>	<i>Children without enamel caries</i>	<i>Children with enamel caries</i>		
Information on hygiene	75	71	86	2.4*	1.4-4.1
Information on diet	64	61	75	1.9*	1.3-3.0
Hygiene instruction	44	41	54	1.6*	1.1-2.4
Fluoride application	44	37	67	3.4*	2.2-5.1
Scaling	17	15	23	1.6	0.9-2.6
Other preventive measures	14	12	19	1.7*	1.0-2.8

* $p < 0.05$

Table 4. Time spent for preventive care (minutes) and recall interval set by the examiner (months) according to the independent variables (n = 576)

		<i>Preventive care Minutes</i>		<i>Recall interval Months</i>	
		<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
Gender	Boy	7.4	6.7	15.5	4.6
	Girl	7.0	5.1	15.3	4.6
Background	Non-Norwegian	9.1	8.9	13.2*	4.9
	Norwegian	7.2	5.8	15.5	4.6
Medical disease	No	7.3	6.1	15.6*	4.4
	Yes	6.6	5.2	13.1	6.2
Examiner	Dentist	7.0	6.7	14.7*	4.9
	Hygienist	8.2	8.8	16.6	3.7
Plaque	Yes	8.6*	6.0	14.6*	4.8
	No	6.3	5.8	16.0	4.4
Gingivitis	Yes	9.4*	5.6	13.6*	4.5
	No	7.0	6.0	15.6	4.6
Fluoride	Supplements or rinse daily	6.8	5.8	15.7	4.9
	Not supplements or rinse daily	7.5	6.2	15.2	4.4
Tooth brushing	More than once a day	7.2	5.7	15.9*	4.4
	Once a day or less	7.6	6.7	13.9	5.0
Sweets	More than once a week	7.8*	6.4	15.0*	4.6
	Once a week or more seldom	6.5	5.3	16.0	4.7
Previous recall interval	> 12 months	6.6*	5.6	16.5*	4.2
	≤ 12 months	8.5	6.9	13.1	4.7
Approximal enamel caries	No	6.4*	5.0	16.2*	4.4
	Yes	10.2	8.0	12.5	5.3
Dentin caries	No	6.8*	5.9	16.3*	4.3
	Yes	9.1	6.3	11.8	4.0
Caries experience	No	6.8*	5.7	16.2*	4.4
	Yes	8.2	6.4	13.9	4.7

Differences between the categories on the independent variables * $p < 0.05$

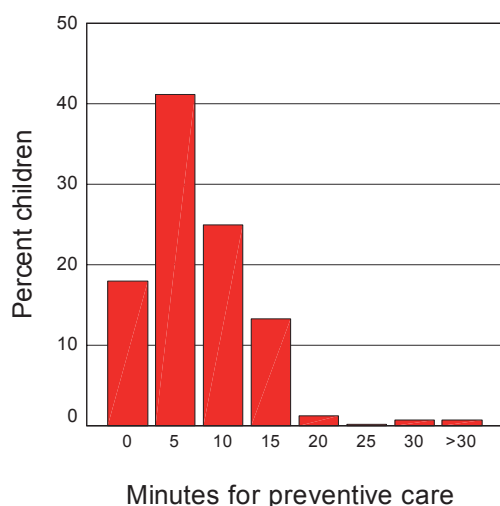


Figure 1. Proportion of children according to minutes spent for preventive care

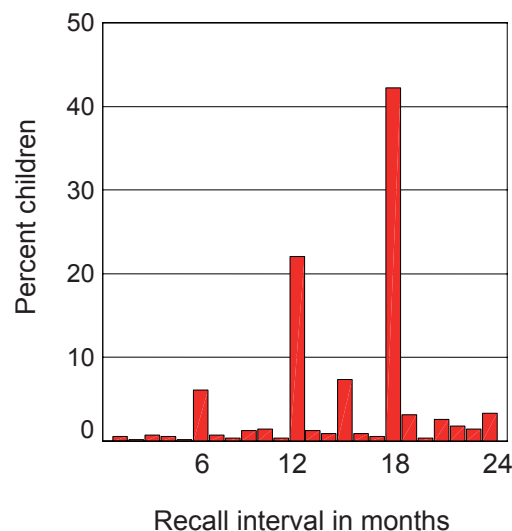


Figure 2. Proportion of children according to length of recall intervals in months

After controlling for other included characteristics (Table 5), statistically significantly more time was spent for prevention when the examiner was a hygienist rather than a dentist (2.1 minutes more), when the child had teeth with approximal enamel caries (3.2 minutes more) or visible plaque (1.5 minutes more). When the previous recall interval was 12 months or shorter, more time was spent on preventive dental care (1.5 minutes). Adjusted for factors included in the analysis, other characteristics were not statistically significantly associated with the amount of time spent for preventive care of the children. All the variables included in the multiple regression analysis explained 14 percent of the variation in time spent for preventive care ($R^2 = 0.14$).

Table 4 shows the bivariate associations, and Table 6 shows the multivariate associations between the lengths of recall interval set by the examiner and characteristics related to the child and the service delivery. Table 4 shows that, using bivariate analysis, most of the registered characteristics were associated with the length of the interval set by the examiner.

Multivariate analysis showed that the planned recall interval was statistically significantly shorter when the child had dentin caries (2.6 months), approximal enamel caries (2.2 months), previous caries experience (1.1 month), gingivitis (1.1 month) or a medical condition (2.0 months). Other variables associated with shorter recall intervals were that the previous recall interval was less than 12 months (2.4 months), a dentist examined the child compared with a hygienist (0.8 month), and that the child reported brushing less than once a day (1.3 months) (Table 6). The following characteristics were not statistically significantly associated with the length of the recall interval: gender of the child, Norwegian background, presence of plaque, use of fluoride supplements or rinses and frequency of sweet consumption. The variables included in the multiple regression analysis explained 35% of the variation in length of the recall interval ($R^2 = 0.35$).

Discussion

In this paper, the focus is on the extent to which dental clinicians adapt preventive care for the individual child. Coming from an area where health authorities and chief dental officers encourage the use of the risk approach, these results indicate that the clinicians followed rigid routines and only to a minor degree emphasised a high risk strategy. They showed that targeting of preventive care based on individual dental health and health behaviour of children was practised to a limited extent only.

In this child population, in which an average child received half an hour of dental care, 45% of the clinical time was used for examination, 34% for treatment and 22% was allocated for preventive care. This situation prevails despite it being 25 years since the law that prioritized prevention before treatments was approved. Knowledge of resource expenditure for preventive care and the use of these resources is scarce, but such information should be acquired and considered when resources are allocated to the dental services. The mean preventive time spent per child in this study was twice that reported for children in the same age group in Finland (Helminen *et al.*, 2002b). Whether the amount of clinical preventive care given is a remnant of policies established in a time when caries was a more widespread public health problem or the preventive care is required to maintain good dental health in a prosperous low risk population is not documented.

To what extent clinical preventive care is individualized is poorly documented. A previous study in the Nordic countries found that time spent for prevention was not associated with the dental health of children and adolescents (Wang *et al.*, 1998b). Studies from Finland have concluded that the preventive care is standardized (Kärkkäinen *et al.*, 2001). This study showed some individualization; the time spent for prevention was associated with presence of enamel caries and plaque, whether the examiner was a hygienist or a dentist and length of previous recall interval. The multivariate analysis showed that the difference in time for prevention between children

Table 5. Multiple linear regression analysis on time in minutes spent for preventive care. Unstandardized coefficients (B), standard error (SE) and p-values

<i>Independent variables</i>	<i>B</i>	<i>SE</i>	<i>p</i>
Approximal enamel caries	3.2	0.7	0.000
Hygienist	2.1	0.6	0.001
Plaque	1.5	0.6	0.008
≤ 12 months since last examination	1.5	0.5	0.007
Constant	1.6		

$R^2 = .14$

Reference categories for significant variables; no approximal enamel caries, dentist, no plaque, more than 12 months since last examination. Age (nominal) was included as a covariate.

Variables excluded by the model; gender, national background, medical disease, gingivitis, dentin caries, previous caries experience and dental health behaviours (use of fluoride supplements or rinses, frequency of brushing and sweet consumption).

Table 6. Multiple linear regression analysis on months planned until next recall examination. Unstandardized coefficients (B), standard error (SE) and p-values

<i>Independent variables</i>	<i>B</i>	<i>SE</i>	<i>p</i>
Dentin caries	-2.6	0.5	0.000
≤ 12 months since last examination	-2.4	0.4	0.000
Approximal enamel caries	-2.2	0.4	0.000
Medical disease	-2.0	0.7	0.002
Brushing once a day or less	-1.3	0.4	0.003
Gingivitis	-1.1	0.6	0.042
Previous caries experience	-1.1	0.4	0.012
Hygienist	0.8	0.4	0.039
Constant	16.4		

$R^2 = .35$

Reference categories for significant variables; no dentin caries, more than 12 months since last examination, no approximal dentin caries, no medical disease, brushing at least two times a day, no gingivitis, no previous caries experience, dentist. Age (nominal) was included as a covariate.

Variables excluded by the model; gender, national background, plaque, use of fluoride supplements or rinses and frequency of sweet consumption.

with and without these characteristics was 8.3 minutes and indicates some individualization.

The clinical time spent on preventive activities for children and adolescents consisted of time for information and instruction related to dental health behaviours and for application of fluoride varnish to 50% of the children.

The present study describes preventive care actually given to children and adolescents (Table 3). Most children were given information on hygiene (75% of all children) and diet (64% of all children) and the mean number of preventive measures given to a child was 2.3. The effectiveness of giving dental health information has been debated (Kay and Locker, 1996), and it has been shown that what dentists consider the most effective preventive care varies (Bratthall *et al.*, 1996) and that their choice of preventive methods differs (Källestål *et al.*, 1999).

The utilization of fluoride varnish (44% of all children) found in this study was in line with the result of

a previous study where 43% of dentists considered use of fluorides to be the most important caries preventive measure and 54% recommended application of varnish for more than half of the children (Källestål *et al.*, 1999).

The optimal use of high fluoride varnish is debated; recent meta-analyses conclude that there is limited evidence that such fluoride varnishes have caries preventive effect (Marinho *et al.*, 2004; Petersson *et al.*, 2004). Use of fluorides in addition to fluoridated toothpaste is recommended by the health authorities if the caries risk is assessed to be elevated. Giving nearly half of all children in a low caries area fluoride varnish application suggests poor compliance with the recommendations; whether this is cost-effective use of resources should be evaluated.

In this low risk population, the mean recall interval was approximately 15 months, and more than half of the children were given intervals of 18 months or more. This is longer than previously reported from the Nordic

countries (Wang *et al.*, 1998b), but shorter than reported from Finland (Helminen *et al.*, 2002a). In Norway, the recommended recall interval for children and adolescents with low caries risk range from 18 to 24 months (Wang *et al.*, 1998a). It has been reported that longer recall intervals save resources without compromising dental health (Wang *et al.*, 1992), but a recent meta analysis concluded that the evidence to support or refute the practice of specific intervals is insufficient (Beirne *et al.*, 2005).

In the present study initial caries, manifest caries and previous caries experience as well as the presence of gingivitis had independent associations with the recall interval. Based on the multivariate analyses, it can be calculated that a child with all these clinical characteristics would have been given an interval of 4.5 months compared with a child with none of the characteristics, who would have been given a 16.4 month interval. All of these characteristics are well documented caries risk factors. Combined, they explained one third of the recall interval variation, indicating that other factors play a major role when recall intervals are set.

The results of this study indicated that dental health personnel comply, to a limited extent, with the national guidelines that recommend a risk approach.

The logic behind the use of individual recall intervals and targeted preventive care is to limit the use of resource intensive methods to those patients who will benefit most from these techniques. Implicit in the use of targeted prevention is a belief that dental clinicians are able to identify in advance patients who will develop dental caries, and a belief that available preventive methods are effective (Rose, 1985). To what degree widely used caries preventive methods are effective is so far poorly documented (SBU - The Swedish Council on Technology Assessment in Health Care, 2002). Recent studies suggest that preventive programs for high risk children have limited effect (Hausen *et al.*, 2000; Källestål, 2005). Based on current evidence regarding effect of preventive activities in clinical practice, a policy combining population-based and risk-based prevention is advocated (Burt, 1998).

The results of this study indicate that the time used for preventive dental care of children in a low risk population was fairly standardized, while the recall intervals to some extent were individualized according to dental health and dental health behaviour. It may well be that the distribution of preventive care delivered to the children included in this study is an appropriate combination of preventive strategies in a low risk population, but this remains to be established.

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