# Routine oral examination: differences in characteristics of Dutch general dental practitioners related to type of recall interval

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Abstract – Objectives: The aim of this study was to explore differences in behaviour (characteristics and opinions) among general dental practitioners (GDPs), using either a fixed (Fx) or an individualized recall interval (Iv) between successive routine oral examinations (ROEs). Methods: In the year 2000, data were collected by means of a written questionnaire sent to a random stratified sample of 610 dentists of whom 521 responded, of which 508 (83%) were used for analysis. Results: Two groups of GDPs were distinguished based on their answer to the question: 'Do you apply for all patients a fixed recall interval between two successive ROEs?' Fifty-one per cent of the GDPs (n = 257) applied Fxs for all patients, generally for a period of 6 months. Ivs were applied by 49% (n = 251) of GDPs, depending on the determination of specific patient characteristics. Logistic regression analysis showed that GDPs applying Fxs also used fixed periods between successive bitewing radiographs for all patients. Furthermore, dentists applying Ivs required more time to conduct an ROE, partly because of a more extensive periodontal screening. GDPs applying Fxs, adhered more to the opinion that a fixed recall regime (every 6 months, as existed before 1995) should be re-introduced, whereas the GDPs in support of Ivs were more in favour to support the opinion that the ROE is 'an excellent instrument for effective, individualized oral care'. Conclusions: Dutch GDPs differ in the way they deal with the determination of recall interval frequency. These are also specific differences in performance and opinions regarding ROE. With the changing prevalence of oral diseases and the skewed distribution within populations, further research is advocated on consistent decision making to determine the most appropriate recall policy in preventing oral disease.

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Routine oral examination (ROE) refers to periodic data collection on the general and oral health status of patients. By comparing the data from a ROE to those obtained from previous examinations or to known references, disease onset or progression can be diagnosed. The purpose of a ROE is to prevent oral diseases, and to detect oral diseases at an early stage in such a way that only minimal interventions are required to arrest their progression. The recall interval, i.e. the period between two successive ROEs, can be either fixed or individualized. A fixed recall interval (Fx) is the same period of time

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for all patients between successive ROEs, whereas an individualized recall interval (Iv) varies among patients and is based on the assessment of the individual risk for disease onset or progression.

An international debate on the application of Fxs or Ivs for ROEs is ongoing (1–5). There is little scientific evidence available for the determination of appropriate patient-oriented recall intervals (6). Moreover, scientific literature does not provide unambiguous evidence relating regular dental attendance to good oral health (7–11). Recent studies report regular attendees to have fewer teeth (12), and experience significant less pain and discomfort (13, 14). Attendance patterns are also influenced by patients' perceptions of the effect of oral health on quality of life (15).

The combination of several preventive measures such as the collective use of fluoride toothpastes, public oral health campaigns and regular dental visits, raised interest in oral health among the public (16–19) resulting in decreased caries prevalence in western countries (20). In the Netherlands, from 1948 until 1995 (reform of the national health care system) two routine oral examinations a year were compulsory for all public health care (PHC)insured people as a requirement for reimbursement of costs for dental treatment. In 1981, 60% of the Dutch population regularly visited the dentist for an ROE, and by 1998 this had increased to 80% (21).

Moreover, the interval between ROEs did not change much from an average of 6.0 months before 1995 to 6.9 in 2001 (22), whereas the recall interval for ROEs in Finland moved away from being fixed to individualized (3, 4).

It is unclear as to why general dental practitioners (GDPs) apply Fxs or Ivs. With a decreased incidence of common oral diseases, i.e. caries and periodontal disease, the effectiveness of Fxs can be disputed, as many patients would get their checkup too early, while others would be too late for an early intervention. However, this very problem is also associated with intervals based on a patient's individual risk profile in case the estimation of the interval is incorrect. The predictive validity of diagnostic needs for caries and periodontal disease may be fair on a population level (23), yet on an individual level they are difficult to apply. After all, the progression of oral diseases not only depends on individual risk factors (24), but also on the availability of manpower in dentistry (25), the characteristics of dentists and dental practices (26) and the variation in diagnostic performance. This variation among dentists is ubiquitous and the extent to which this affects oral care is unknown (27). Decisions on recall patients in primary care also have potentially an impact on health care resources and outcomes (28). Research in understanding provider behaviour concerning the assignment of recall intervals is emerging (28–30).

To improve consistent and evidence-based decision making with regard to ROEs, research on the determination of appropriate content and frequency of ROEs is needed. Therefore, the purpose of this study was to explore differences in behaviour (characteristics and opinions) among GDPs, using either Fxs or Ivs between successive ROEs.

## Methods

This study was conducted as part of the Data Stations Project of the Dutch Dental Association (NMT). The overall objective of this project is to periodically collect data on delivery of oral care, on practice management, and on GDPs' opinions and views regarding actual issues in dentistry (31, 32). For this study, conducted in May 2000, a group of 610 GDPs, randomly selected from the population of 5772 GDPs in the Netherlands was requested to fill out a questionnaire on ROEs. Other questions concerned general and profession-specific personal characteristics.

## Procedure

The questionnaire was sent to 610 private practice GDPs in the Netherlands. The initial mail included an introductory letter, a confidential coded questionnaire, and a reply-paid envelope. GDPs who did not return the questionnaire within 4 weeks received a written reminder and, if applicable, were reminded for a second time by telephone after 2 months.

## Questionnaire

The questionnaire comprised 22 items pertaining to three types of variables (characteristics): personal and practice characteristics (Table 1), ROE characteristics (Table 2) and professional opinions (Table 3). The questionnaire was pretested by experienced dentists and assessed by a panel of research experts from three dental schools.

Finally, participants were asked to indicate the level of agreement with five statements regarding ROEs in oral health care by means of the following ordinal scale: agree; neither agree/nor disagree; disagree. The question 'Do you apply for all

Table 1.	General	dental	practitione	rs' p	versonal	and	practice	characteristi	cs stratifi	ed for	fixed	(Fx	group)	and
individu	alized re	call inte	rvals (Iv gr	oup)	between	rout	ine oral o	examinations,	standard	deviati	on (SD)	) and	P-value	3

Characteristics	Fx group (SD)	Iv group (SD)	All respondents (SD)	<i>P</i> -value
Practitioner				
Number of males	230	215	445	
Number of females	27	36	63	0.23
Mean age in years (SD)	45.7 (7.6)	46.1 (7.5)	45.9 (7.5)	0.64
Mean number of parts of days per year spent on continuing education activities <sup>a</sup>	20.3 (16.2)	24.3 (19.8)	22.3 (18.2)	0.02
Mean number of chair-side hours per week	34.3 (7.6)	33.3 (7.6)	33.8 (7.6)	0.16
Practice				
Mean number of patients	2910 (1515)	2603 (1629)	2758 (1578)	0.03
Mean number of public health care insured patients	1746 (227)	1432 (215)	1600 (224)	0.00
Mean number of patients with well balanced oral health <sup>b</sup>	2447 (1189)	2177 (1139)	2314 (1125)	0.59
Mean number of patients with discomfort and pain per week <sup>c</sup>	5.0 (4.6)	4.2 (4.8)	4.6 (4.7)	0.21
Mean hours per week working with dental assistants	54.4 (43.7)	51.7 (41.6)	53.3 (42.6)	0.53
Mean hours per week working with oral hygienist	8.3 (15.6)	6.4 (13)	7.4 (14.4)	0.16

<sup>a</sup>Participation in structured peer review, continuing education, congress visits.

<sup>b</sup>The number of registered patients attending the dental practice at least once a year.

<sup>c</sup>The number of emergency visits per week per practice within the group of regular attendees.

patients a fixed recall interval between two successive ROEs?' could be answered with 'yes' or 'no'. Those who were in favour of Ivs (the 'no' answers), were additionally asked to point out which specific patient characteristics were relevant for their decision making, like the number of restorations, the number of new carious lesions, the extent of gingivitis, the number of periodontal pockets, patient preferences, dental mindedness, age and health risks.

#### Statistical analysis

Relationships for the 51 independent variables within the 22 items of the questionnaire with the dependent variable 'the type of recall interval' were analysed with *t*-tests and chi-square tests for  $2 \times 2$  tables. Sixteen bivariate personal and practice and ROE variables with an alpha ( $\alpha$ ) between 0.00 and 0.15 (Tables 1 and 2) were selected for stepwise logistic regression analyses (forward and backward) with the dependent variable 'the type of recall interval'. Four of sixteen selected variables were dichotomized, and these were the mean number of days for continuing education, mean number of patients, mean number of PHC-insured patients and the time spent on a ROE. The three selected 'professional opinion' variables (Table 3), within the same alpha range were also subjected to stepwise regression analysis with the 'type of recall interval' as dependent variable. Therefore, the responses to the five questions to the category 'neither agree, nor disagree', which represented small proportions, were counted as 'disagree'. The level of statistical significance was set at  $\alpha = 0.05$ .

## Results

The questionnaire was returned by 521 of 610 GDPs. Thirteen respondents were excluded from further analysis for reasons of incidental missing values. This resulted in 508 respondents (83%). The personal and practice characteristics of GDPs in the study population are summarized in Table 1. Eighty-nine per cent of the respondents (n = 445)were male. The mean age of the respondents was 45.9 years (SD 7.5) and the mean number of patients per practice was 2758 (SD 1578). A comparison of characteristics of the respondents with all other dentists in the Netherlands aged ≤64 years revealed no statistically significant differences regarding gender, age, practice residence and year of graduation. Two groups of GDPs were distinguished based on their answer to the question 'Do you apply for all patients a fixed recall interval between two successive ROEs?' Almost 51% of the GDPs (n = 257) applied Fxs, generally a period of 6 months. The other group of GDPs (49%; n = 251) applied Ivs, depending on specific patient characteristics.

Analysis of the bivariate relations with 'the type of recall interval' as dependent variable revealed

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Table 2. Bivariate relations between routine oral examination characteristics and the use of fixed or individualized recall intervals and *P*-value

Routine oral examination characteristics ( <i>n</i> )	Items in questionnaire	<i>P</i> -value
Practitioner		
Time span in minutes (1)	More or <10 min	0.00
Number of diagnostic examinations (10)	Diagnosis of carios	0.00
Number of diagnostic examinations (10)	Assessment of restorations	
	Assessment of oral hygiono	
	Assessment or or an hygiene	0.08
	Assessment of orthodontic treatment need	0.00
	Perform a periodontal screening	0.00
	Update status praesons	0.00
	Making radiographs	
	Portorm a functional examination	
	Perform nulp vitality tests	
Frequency radiographs (1)	Bitowing radiographs, fixed or individualized intervals	0.00
Indications for pari apical radiographs (0)	Prosonce of a fictula	0.00
indications for pen-apical factographs (9)	Pain experience	0 12
	Trauma	0.15
	Pariodontal problems	
	Discoloration of tooth	
	Assessment third molars	0.08
	Abnormalities of the oral mucosa	0.00
	Treatment evaluations	0.00
Record keeping data (11)	Diagnosis of caries	0.09
Record Reeping data (11)	Results of radiographs	
	Anomnesis/notiont history	0.05
	Abnormalities of oral mucosa	0.05
	Trauma dental wear	0.12
	Oral hygiene (plague and bleeding index)	
	Growth and development	0.12
	CPITN-(DPSI)score <sup>b</sup>	0.12
	Emergence of a functional problem	0.01
	Bleeding and attachment loss	0.03
	Asymmetry	0.00
Practice		
Delay time $(1)^c$	More or less than 2 weeks	
Performers ROE <sup>b</sup>	GDP	
	Dental hygienist/auxiliaries	

<sup>a</sup>Bold typeface expresses items selected for regression analysis (0.00 > P > 0.15).

<sup>b</sup>DPSI: Dutch Periodontal Screening Index, derived from CPITN-index.

<sup>c</sup>The time left between the appointment and actual performance of the ROE.

significant differences between the Fx versus Iv group with regard to GDPs personal and practice characteristics (Table 1) and ROE characteristics (Table 2). Regarding personal and practice variables, significant differences were found between groups of GDPs regarding the mean number of days per year spent on continuing education (P = 0.02), the mean number of patients in dental practice (P = 0.03) and the mean number of PHCinsured patients (P = 0.00). Concerning ROE characteristics, GDPs applying Ivs spent more time on a ROE (P = 0.00), especially for periodontal screening (P = 0.00). Furthermore, they recorded a larger number of clinical observations in a patient record,

such as patient history data (P = 0,05), Dutch Periodontal Screening Index (DPSI)/Community Periodontal Index of Treatment Needs (CPITN) index (P = 0.01), bleeding on probing and loss of attachment (P = 0.03) when compared with GDPs within the Fx group. GDPs applying Fxs between ROEs, also applied more frequently fixed intervals when making bitewing radiographs when compared with the Iv group (P = 0.00) (Table 2).

Multiple logistic regression analyses with 'the type of recall interval' as dependent variable and the 16 selected variables on personal and practice and ROE characteristics revealed significant odds ratios for 'the time spent on the ROE', 'the

Table 3. Professional opinions of general dental practitioners (% of respondents), stratified for fixed (Fx) and individualized recall interval (Iv) between routine oral examinations and the *P*-value (probability of the opinions in both groups being statistically significantly different)

	Fx (%)	Iv (%)	
Opinions	(n = 257)	(n = 251)	P-value
Routine oral exa	nination may	cause dental	
overtreatment	5		
Disagree	83	73	$0.02^{a}$
Neither agree, nor disagree	11	16	
Agree	6	11	
Routine oral example	nination can b	e considered a	s the
cornerstone of in	dividual preve	ention in oral c	are
Disagree	6	7	0.72
Neither agree, nor disagree	2	3	
Agree	92	90	
Routine oral exa	nination is an	excellent instru	ument for
delivering effecti	ve individual (	oral care	
Disagree	9	7	$0.06^{a}$
Neither agree, nor disagree	7	2	
Agree	84	91	
Routine oral exa	nination for p	ublic insured p	eople, as
existed before 199	95 twice a year	, should be re-i	ntroduced
Disagree	35	66	$0.00^{a}$
Neither agree, nor disagree	30	16	
Agree	35	18	
Routine oral exar	nination is of i	mportance for	dentists to
secure a solid eco	onomical pract	ice manageme	nt
Disagree	24	27	0.30
Neither agree,	36	40	
nor disagree			
Agree	40	33	

<sup>a</sup>Selected for regression analysis (0.00 > P > 0.15).

screening of periodontal diseases' and 'the interval between successive bitewing radiographs' (Table 4). GDPs in the Fx group also adhered more to a fixed interval for all patients when making bitewing radiographs. The group of GDPs, applying Ivs spent more time on a ROE and focussed more on periodontal screening.

The results from a second logistic regression analysis with the 'type of recall interval' as dependent variable and three selected opinions (Table 3) revealed significant odds ratios for the statements 'an excellent instrument for effective, individual oral care' and 're-introduction of a fixed recall regime' (Table 4). GDPs applying Fxs, adhered more to the opinion that a fixed regime (every 6 months, as existed before 1995) should be re-introduced, whereas the GDPs in support of Ivs were more in favour of the opinion that the ROE is 'an excellent instrument for effective, individualized oral care'. The results of the logistic regression analyses were the same for both models using forward and backward selection of variables.

## Discussion

This study reports on GDPs' self-reported behaviour towards ROEs. We concluded that nearly equal numbers of Dutch GDPs applied Fxs and Ivs between successive ROEs. GDPs assigning Fxs also used fixed periods between successive bitewing radiographs. Dentists assigning Ivs require more time to conduct an ROE, partly because of a more extensive periodontal screening.

Differences found in this study may be partly explained by a stronger focus of GDPs who prefer Ivs on data collection aspects other than screening of carious lesions, such as patient history and periodontal screening. Additionally, reflection on Ivs and individual risk assessment is timeconsuming, and accurate record keeping and explicit communication with the patient will extend the time required for conducting an ROE. This group of GDPs is apparently more focussed on collecting and evaluating clinical data to underpin individual risk assessment in an attempt to prevent oral diseases. In contrast, both groups adhere strongly  $(\geq 90\%)$  to the opinion that 'the ROE can be considered as the cornerstone of individual prevention in oral care' (Table 3), which could possibly be due to different perceptions on prevention of oral diseases. The gain may well be that explicit and recurrent communication with patients during an ROE, as part of a risk assessment policy, regarding prevention of disease and the role of individual risk factors might enhance patients' knowledge on aspects of oral health. Ivs could, hence, result in the delivery of more preventive and patient-oriented oral care.

It is not surprising that GDPs assigning Fxs on ROEs also applied fixed periods regarding successive bitewing radiographs. For too long, GDPs were focussed on caries detection during a ROE, causing some reluctance in conducting individual risk assessment. They apparently have a preference for systematic decision making based on their longterm experiences within the compulsory system, which explains that these GDPs adhere stronger to the re-introduction of a compulsory ROE twice a year (Table 4).

The relatively high mean age of the GDPs (45.9 years; SD 7.5) implies that most undergraduate

Box 1. Dental practice in the Netherlands in 2000

Total population: 15.8 million inhabitants

Number of dentists (64 years or younger): 7284

Number of dentists(GDPs) in private practice: 5772

Number of dentists otherwise occupied in dentistry: 1512

Dental practice: 76% of Dutch dentists work in a single-handed practice, and 24% in group practices.

The majority of the GDPs run their office as a private enterprise

*Practice routines:* On average about 2500 patients visit the practice at least once a year for a dental check-up, which is free of charge for public health care (PHC)-insured patients. The PHC is a health care insurance compulsory for people with a yearly income under € 30 000–. About 57% of the Dutch population is 'PHC'-insured, whereas 43% has a private insurance. The PHC covers full medical care, wheras the coverage of dental treatment requires additional private insurance. Patients with a dental insurance generally pay 25% of the costs of the dental treatment themselves

*Continuing dental education (CDE) activities:* CDE is on a voluntary basis. Over 50% of the dentists attend CDE actively at least once a year. About 25% of all dentists participate in dental peer groups

Practice size (1, 2, 3 or more units), mean number of patients and dentists per practice, and mean and modal number of auxiliary staff per practice in the Netherlands

	1 dental unit	2 dental units	3 or more dental units
Percentage of dental practices	42	44	14
Mean number of dentists	1.1	1.4	1.8
Mean number of patients	2207	2620	3180
Mean number of dental assistants (modus)	1.6 (2.0)	2.3 (2.0)	3.5 (3.0)
Mean number of dental hygienists (modus)	1.2 (0)	0.6 (0)	1.1 (1.0)
Mean number of secretaries (modus)	1.1 (0)	0.9 (0)	1.2 (0)
Source: Bruers JJM, Zorgverlening door tandard	tsen. Nieuwegein: D	utch Dental Association	on, 2000.

CDE-activities: peer review, continuing education.

Table 4. Odds ratios with 95% confidence intervals and P-values from multiple logistic regression analyses with the type of recall interval (Iv = 0/Fx = 1) as dependent variable and professional opinions and routine oral examination (ROE) characteristics as independent variable

	Odds ratios (95% CI)	<i>P</i> -value
ROE characteristics		
Time spend on ROE <sup>a</sup>	0.62 (0.41-0.93)	0.02
Periodontal diseases screening	0.50 (0.34–0.73)	0.00
Fixed interval bite-wing radiographs	2.56 (1.76–3.80)	0.00
Professional opinions		
Excellent instrument for effective individual care <sup>b</sup>	0.31 (0.14–0.66)	0.00
Compulsory ROE twice a year <sup>b</sup>	2.72 (1.77-4.18)	0.00

<sup>a</sup>Time spent by the professional, dichotomized to less or more than 10 min.

<sup>b</sup>Three-point scale dichotomized to 'agree/disagree' by counting 'did not know' as 'disagree'.

training has been completed at least two decades ago. At that time, training in dental school was focussed mainly on knowledge and technical skills rather than information and problem-solving skills. Fxs for regular attendees were found appropriate among dental professionals and public health organizations, leading to a more practice-based rather than an evidence-based culture. According to this survey, GDPs' personal and practice variables other than age, such as the mean number of patients (P = 0.03) and the mean number of PHC-insured patients (P = 0.00), seem to be more determinative variables to assign Fxs or Ivs (Table 1).

Implementing new practice routines requires much time and effort (33). With the existing manpower problem in Dutch dental care, resulting in an increasing workload (25), it is obvious that GDPs tend to decrease rather than extend the time for a ROE in favour of a blanket recall policy for all patients. This especially counts for the 'fixed' group of GDPs which actually provide care to larger numbers of patients (Table 1). Routinely, they save time during an ROE by assigning Fxs, but fail to gain practice time by extending the recall interval for patients with a minor risk for progress of oral disease. Selecting patients with a low-risk profile may be effective (4), and the assignment of Ivs for these patients can be safely extended beyond the previously accepted standard of 6 months. The recall frequency of lowrisk patients may be reduced to once every

12–18 months without jeopardizing their oral health status (1, 2, 4).

Opinions and needs of patients regarding ROEs are yet unknown. Although the prevalence of oral disease decreased (16–20), the recall interval in the Netherlands did not change much from 6.0 in 1995 to 6.9 months in 2001 (22). Obviously, patients still stick to traditionally 6-monthly recall visits, even if it is not related to their individual risk profile. From a quality of care perspective (efficacy and quality of live) and for reasons of effectiveness, it seems however preferable to prevent the onset of oral diseases by using individual risk profiles. Further research in patient's perceptions regarding the content and frequency of ROEs is strongly advocated.

During a ROE, GDPs have to gather various clinical data mainly regarding early manifestations of two common oral diseases: dental caries and periodontal disease. Accurate record keeping and retrospective analysis of clinical data from previous ROEs are a prerequisite for a reliable assessment of disease onset and progression, and will possibly improve appropriate and efficient delivery of oral care. According to this study significant differences exist with regard to the screening of periodontal disease, the time spent on a ROE and recordkeeping between both groups of GDPs. This could be the result of different oral health strategies. Numbers of preventive or curative treatments are indications thereof. With regard to preventive oral health performances of dentists conducting a ROE, some studies (34, 35) reported gender differences. In primary care, gender differences were reported on assignment of revisit intervals (30). Female providers assigned shorter revisit intervals than male providers. However, in this study significant differences between GDPs' gender with regard to assignment of the recall interval were not found.

Interestingly, a small but significant difference exists between both groups regarding the number of days per year spent on continuing education. GDPs assigning Ivs spent on average more time on continuing education activities. Possibly, risk assessment techniques and tailored recall systems are a topic in postgraduate courses and those who attend these courses apply this into practice in an attempt to improve the quality of diagnostic decision-making.

Results from clinical trials on differences in oral health outcomes, measured in patients from GDPs assigning Fxs and Ivs are not available. A design of trial studies is advocated, in which the assessment

of oral health should not only be based on observations of caries and periodontal disease but also on assessment of pain, discomfort, function and patient satisfaction (36). To increase agreement among GDPs on the estimation of recall intervals, specifically designed computer software programmes could be helpful (37). With the increasing tendency to delegate dentist's duties in daily practice to dental assistants, explicit communication on the interpretation and registration of relevant patient data between GDPs and their co-workers are indispensable. Clinical practice guidelines, developed by well-designed consensus and implementation methods (38, 39), and with the commitment of patients, could play an anticipating role in achieving more agreement between GDPs and as a result in improving the quality of clinical decision making.

With the changing prevalence of oral disease and the skewed distribution within populations one may expect that an Iv policy, based on appropriate risk assessment and supported by contemporary computer technology, could improve the quality of oral care. To underpin these hypotheses, further research is needed into the most appropriate and cost-effective recall strategy in preventing oral diseases.

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