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Changes in the professional domain of Dutch dental hygienists

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Jerkovic K, van Offenbeek MAG, Slot DE, van der Schans CP. Changes in the professional domain of Dutch dental hygienists.

Abstract: *Objective:* This study's purpose was to compare the scope of practice of Dutch dental hygienists educated through a two- or three-year curriculum ('old curriculum dental hygienists' [OCDHs]) with that of hygienists educated through a new extended four-year curriculum leading to a bachelor's degree ('new curriculum dental hygienists' [NCDHs]). *Methods:* In 2005 and 2007, we obtained surveys from 320 OCDHs and the first 67 NCDHs, respectively, in which respondents were asked to complete a questionnaire and score how often they performed certain dental tasks. By means of factor analysis, these tasks were grouped into nine activity groups and 5 remaining single activities. *T*-tests and Mann-Whitney *U*-tests were used to compare the scope of practice between OCDHs and NCDHs. *Results:* NCDHs worked more often in dental offices (instead of being self-employed) and generally worked more hours per week than OCDHs. They performed more often tasks dealing with caries diagnosis and treatment and less often tasks dealing with prevention and periodontology. These differences were statistically significant. However, in dental offices the differences between OCDHs en NCDHs were far less pronounced. In those practices OCDHs performed dental sealants, small corrections of dentures and/or restoration and caries diagnosis during dental check-up no less frequently than NCDHs. *Conclusions:* Although prevention remains the core domain (or role) of all Dutch dental hygienists surveyed, the scope of practice substantially differed. This, however, depended not only on education, but also on type of practice. The new curriculum answers to and legitimates an already developed practice of task delegation.

Key words: dental hygienist; professional domain; scope of practice; task distribution; The Netherlands

Introduction

Dental hygiene is practised in about 30 countries, generally as a licensed profession. The average study duration is 3 years (1). Worldwide, the dental hygiene profession's characteristics are remarkably similar and most noteworthy is the scope of dental hygiene clinical practice (2, 3). In 2003, Johnson (3) examined four dimensions of clinical practice in 19 countries: client assessment, planning dental hygiene care, preventive care and therapeutic services. Across countries planning dental hygiene care and preventive care varied little, while client assessment and therapeutic services varied somewhat (3). Over the past 14 years, the legal scope of practice has expanded across all four dimensions for the majority of countries included in the Johnson study (3). Moreover, in Europe and North America, 'a decline in mandated level of work supervision and a slight but gradual increase in independent practice' were observed (3, p. 299). An increase in the number of baccalaureate dental hygienist programmes and increased professional autonomy were also reported (3). Decision-making responsibilities increased, while the requirement for work supervision declined (3). Supervision requirements that traditionally tied dental hygiene care to private practice dentistry settings are reducing, opening up opportunities for care provision in alternative settings and in public health institutions (1, 4).

During the late 1990s, the Netherlands experienced a growing concern for an increasing shortage of dental professionals (5). This shortage was because of an increasing number of dentists close to retirement age and to a relatively small number of newly graduated dentists. At the same time, oral healthcare demand increased. Involved stakeholders sought for ways to solve this problem. One of the solutions introduced was the redistribution of tasks over dental professions (5–7). Dental hygienists were to take over certain tasks traditionally performed by dentists to reduce dentists' workload and free up more time for them to treat patients. Faced with time pressures, dentists had already been delegating tasks to dental hygienists, e.g. dental check-ups and caries restorations. The extent of this on-going task-delegation process, however, may have differed substantially between practices.

From 1968 to 1992, Dutch dental hygiene education consisted of a 2-year curriculum that covered the following subjects: prevention, periodontology, basic caries diagnosis, sealant, small correction of dentures and/or restorations and X-rays. In 1993, the curriculum expanded into a 3-year programme that included more extensive practical training and administration of local anaesthesia. In 2002, the dental hygienist curriculum was further extended from a 3- to a 4-year Bachelor of Health degree programme to facilitate task delegation from dentists to dental hygienists, to answer the higher demand in oral healthcare and to meet the government demand of a 4-year curriculum in higher education. At the same time, competence-based learning was introduced according to the European Bachelor-Master educational structure, incorporating competencies in diagnosis and treatment of initial caries and in scientific research (8). Dental hygienists would be able not only to screen teeth and gums but also to assess a patient's oral health as well as overall health (8). Therefore, the purpose of extending dental hygienist education was to support the ongoing task redistribution between dentists and dental hygienists and to generate uniformity in the scope of dental hygienists' practice. In the Netherlands, since May 2006, patient referral to a dental hygienist by a dentist is no longer required (9), which potentially expands scope of practice of dental hygienists working in independent practices. However, just because dental hygienists are qualified to perform more caries-related diagnostic and treatment tasks, it does not automatically imply that they will assume these tasks. In the Netherlands, marked differences have been found between dentists' willingness to delegate dental tasks. Greater willingness seems to be mostly associated with a more preventive-oriented dental treatment philosophy and, more generally with a positive attitude towards prevention (10, 11). Differences in dental hygienists' scope of practice can also stem from variations in dental practice characteristics (e.g. practice size, hours per week support from dental hygienists) (10–12). Dental hygienists' scope of practice may also be affected by a hygienist's personal characteristics such as the degree of a person's need for personal growth and accomplishment at work, self-efficacy and willingness to perform certain tasks (13). The availability of short courses for advanced competencies in caries diagnosis and treatment to 2- and 3-year curriculum dental hygienists may have led to an even greater variety in scope of practice.

Until now, no information is available on whether the new curriculum has indeed contributed to further task redistribution, as dental hygienists participating in the 4-year programme graduated only in 2006. Therefore, the purpose of the present study was to compare the current range of work activities of dental hygienists who were educated through the new 4-year curriculum with those who were educated through the old 2- to 3-year curriculum. In other words, do the 'new generation' dental hygienists have and accept opportunities to perform all the activities for which they were trained? For the remainder of this study, we refer to dental hygienists educated by the 2- and 3-year curriculum as 'old curriculum dental hygienists' (OCDHs) and to dental hygienists educated by the new 4-year

curriculum as 'new curriculum dental hygienists' (NCDHs). OC refers to 'old curriculum' and NC refers to 'new curriculum'.

Methods

Study population and methodology

The study population comprised dental hygienists practising in the Netherlands. Two surveys were conducted for this study: (i) in 2005, 800 randomly chosen OCDHs were asked to complete a questionnaire concerning their demographic characteristics, work setting, scope of practice and job characteristics and (ii) in 2007, 99 of 104 NCDHs that graduated in 2006 were asked to participate in this study. NCDH participants received an e-mail linked to an on-line questionnaire that contained the questionnaire completed by the OCDHs as well as 42 additional questions about their work activities.

Demographic characteristics included gender, age, place of education (only NCDHs), weekly working hours, length of experience, type of practice, region and the number of colleagues in the practice. Scope of practice (level of task substitution) was defined according to whether and with which frequency respondents engaged in 42 work activities in oral healthcare. For the first survey, work activities were based on an earlier study (14) and on the Omnibus-enquête[1] (15) and included already some NC-items. For the second survey, this 42-item list was extended to include the activities following from the respective competencies described in the new curriculum. In the NC questionnaire, for some tasks, activities were extended (e.g. caries diagnosis and treatment) and activities for new tasks were introduced (e.g. scientific research and health policy). Each work activity was rated on a 5-point scale, ranging from a score of one for 'never' to a score of five for 'always'/for a client (provided the client's condition requires the activity).

Statistical analyses

First the data were analysed using descriptive statistics (see Appendix S1). Then, to reduce the number of work activities, we grouped the activities measured in both surveys according to their content and level of complexity. A number of exploratory factor analyses (principal component with varimax rotation) suggested that the frequency by which DHs engaged in these activities covaried along these underlying dimensions (16). However, we encountered two problems. First, a few comparatively small tasks like teeth bleaching and patient intake that were represented by single or twin items did not form separate factors. They were taken out of the factor analyses. Secondly, some activities loaded both on a factor that was related to their content and on a factor that was related to their level of complexity. This can be interpreted as follows: DHs that take the decision for a corrective measure will also perform the task. For them, these activities go together (contributes to content-related factor). However, the reverse is not true. Not all DHs who perform the caries treatment also take the decision to do so (contributes to decision task factor). As this variance in scope of practice is exactly our topic of interest, those activities that loaded both on a content factor and on a decision taking factor were assigned to the latter. Thus, nine different factors were distinguished. These nine factors account for 76% of the variance. KMO is 0.84 and Bartlett's test of sphericity shows significance of <0.001. The remaining were 5 single-item categories. Subsequent reliability analyses were performed on the resulting nine activity categories. Table 1 provides the Cronbach's alpha as well as the number of items per group and examples of items. The reliability analyses showed the Cronbach's alpha values to be satisfactory ranging from 0.73 to 0.97.

As all grouped variables were normally distributed, we used *t*-tests to compare the OCDHs' scopes of practice with those of NCDHs, and examined differences in the frequency of performing the nine activity groups. The Mann–Whitney *U*-test was used to examine inter-group differences in the frequency of performing 5 single items. A *P*-value of <0.05 was considered significant.

Results

The response on the first and second surveys was 40% and 67% respectively. Most NCDHs worked in dentist offices (59%) or large group practices (36%),[2] while only 15% work in independent practices. In contrast, OCDHs were more equally distributed over these three different types of practices (Fig. 1). Table 2 summarizes the demographic data for both groups. Understandably, NCDHs were generally younger, had less experience. Also, they tended to work more hours than the OCDHs. Age is correlated with number of working hours (-0.456, $P < 0.001$).

[1]The Dutch Dentist Association uses the Omnibus-enquête for longitudinal scientific research on the 'thoughts and acts' of Dutch dentists on a wide range of elements in their profession.

[2]Dentist office is defined as an office with a single dentist owner, regardless of the number of dentists employed; group practice is defined as a practice with more than one dentist owner.

Table 1. **Activity scales; reliability and examples of tasks**

Activity groups	Cronbach's alpha	*n* activities	Example of an activity
Prevention	0.81	4	Giving a instruction in oral hygiene
Periodontology	0.80	3	Making a treatment plan for a patient with periodontal disease
Caries diagnosis and planning	0.90	4	Making a decision to place a restoration in permanent tooth
Caries treatment	0.97	9	Making a preparation in permanent tooth
Extractions	0.79	4	Extraction of a permanent tooth
Small corrections of dentures and/or restorations	0.73	3	Small correction of denture; small correction of a restoration
Local anaesthesia	0.86	4	Making a decision to administer local anaesthesia
X-rays	0.87	3	Making a decision to take a X-ray for purpose of caries diagnosis
Dental sealants	0.83	3	Making a decision to place a sealant in milk tooth
Single activities			
Dental check-up			
Caries diagnosis during dental check-up			
Teeth bleaching			
Patient intake			
Making a decision to take a dental impression			

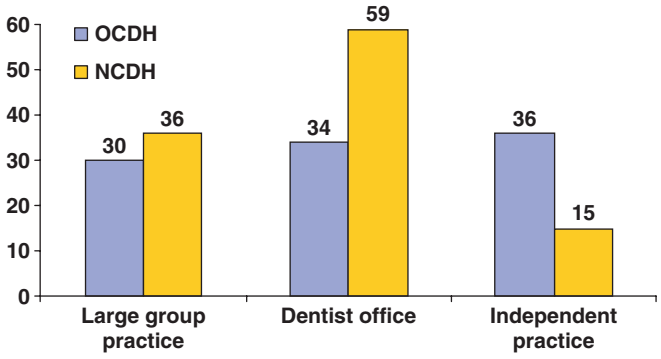

Fig. 1. Percentage of respondents per type of dental care office.

Of the OCDHs surveyed, only 20% performed extended tasks in the field of caries diagnosis, planning and treatment, which have now been implemented in the new curriculum. Of the NCDHs surveyed, a large majority (87%) performed these extended tasks ($P < 0.001$), even while being relatively younger and having less experience. In addition, NCDHs performed more often dental sealants tasks and small corrections of dentures and/or restorations and caries diagnosis during the dental check-ups ($P = 0.013$, $P = 0.008$, and $P = 0.022$ respectively). OCDHs, on the other hand, were the ones that did significantly more the patient intakes ($P < 0.001$). Moreover, OCDHs slightly but significantly more often performed prevention tasks and periodontology ($P = 0.006$ and $P < 0.001$, respectively). However, the frequencies in performing tasks associated with anaesthesia, extractions and X-rays as well as the frequency of dental check-ups, teeth bleaching and making a decision to take a dental impression did not differ between the two groups (Table 3).

As DHs from independent practices are underrepresented in the 2007 sample, we repeated the same analysis for the employed DHs of both groups only. This further analysis showed that practice setting makes a difference for how DHs

Table 2. **Sample characteristics**

	Mean (SD)			
Demographic data	OCDHs *n* = 281 (2005)	NCDHs *n* = 66 (2007)	NVM members 2005 2367*	NVM members 2007 2150†
Age	35 (9.1)	25 (3.5)	35	39
Female (%)	98	94	98	98
Years of experience	11 (8.3)	1 (0.59)	–	–
Weekly working hours	27 (8.9)	31 (8.76)	–	–
Working in independent practice (%)	37	15	36	39

*Members of Dutch Association of Dental Hygienists in 2005 (18).
†Members of Dutch Association of Dental Hygienists in 2007 (19).

Table 3. **Activity group scores for old and new curricula dental hygienists**

Activity group	Mean activity rating (SD)* OCDHs *n* = 281	NCDHs *n* = 66	*P*-value (*t*-test)
Prevention	4.93 (0.22)	4.84 (0.32)	0.006
Periodontology	4.75 (0.64)	4.20 (1.00)	<0.001
Caries diagnosis and planning	1.60 (1.10)	2.55 (1.41)	<0.001
Caries treatment	1.51 (0.92)	2.89 (1.37)	<0.001
Extractions	1.33 (0.66)	1.19 (0.40)	NS
Small correction of dentures and/or restorations	2.10 (0.88)	2.38 (0.96)	0.022
Local anaesthesia	4.07 (1.25)	4.30 (0.80)	NS
X-rays	3.27 (1.43)	3.38 (1.10)	NS
Dental sealants	2.36 (1.31)	3.04 (1.28)	<0.001

Single activities	Median (range 1–5) OCDHs *n* = 281	NCDHs *n* = 66	*P*-value Mann–Whitney test
Dental check-up	3	3	NS
Caries diagnosis during dental check-up	3	4	0.008
Teeth bleaching	1	2	NS
Patient intake	4	3	0.013
Making a decision to take dental impression	1	1	NS

NS, not significant; OCDHs, old curriculum dental hygienists – are hygienists educated through a 2- or 3-year curriculum; NCDHs, new curriculum dental hygienists – are hygienists educated through a new extended 4-year curriculum leading to a bachelor's degree. *Scores range from 1 to 5: 1, never; 2, seldom; 3, sometimes; 4, mostly; 5, always.

Table 4. **Activity group scores for OCDHs en NCDHs in dentist offices and group practices**

Activity group	Mean activity rating (SD)* OCDHs *n* = 165	NCDHs *n* = 55	*P*-value (*t*-test)
Extractions	1.46 (0.78)	1.22 (0.43)	0.027
Small correction of dentures and/or restorations	2.23 (0.85)	2.43 (1.00)	NS
X-rays	3.95 (0.99)	3.52 (1.00)	0.007
Dental sealants	2.90 (1.24)	3.10 (1.27)	NS

Single activities	Median (range 1–5) OCDHs *n* = 165	NCDHs *n* = 55	*P*-value Mann–Whitney test
Caries diagnosis during dental check-up	3	4	NS

NS, not significant; OCDHs, old curriculum dental hygienists – are hygienists educated through a 2- or 3-year curriculum; NCDHs, new curriculum dental hygienists – are hygienists educated through a new extended 4-year curriculum leading to a bachelor's degree. *Scores range from 1 to 5: 1, never; 2, seldom; 3, sometimes; 4, mostly; 5, always.

score on these activities (Table 4). OCDHs working in dentist offices and/or group practices performed more often extractions and X-rays activities compared with NCDHs in these practice settings ($P = 0.027$ and $P = 0.007$ respectively). For OCDHs and NCDHs working in dentist offices and/or group practices, no significant differences in the frequencies of performing small corrections of dentures and/or restorations; dental sealant activities and caries diagnosis during dental check-ups were found.

Discussion

In this study, we observed clear differences in the scope of practice for the majority of NCDHs as compared with OCDHs. However, these differences are partly explained by differences in practice setting.

For the group as a whole, there were differences in the frequency with which dental hygienists performed tasks dealing with prevention, periodontology, caries diagnosis, planning and treatment and small correction of dentures and/or restorations. OCDHs performed more prevention and periodontology tasks, whereas NCDHs performed more caries-related diagnostic and treatment tasks. Although statistically significant, the small differences we observed in prevention tasks may not be clinically relevant. Prevention was still shown to be the core task of all the Dutch dental hygienists surveyed.

The overall scope of practice of Dutch dental hygienists remains comparable to most other countries (3), except for performing initial cavity preparation or 'drilling'. As reported in 2003, the Netherlands is the only country where dental hygienists perform initial cavity preparation or 'drilling'. Dental therapists, however also perform these tasks in Europe, Canada, Australia and New Zealand. As being incorporated into the Dutch dental hygienist curriculum, initial cavity preparation is now performed by dental hygienists on a regular basis in addition to their primary prevention and periodontology duties.

Some extended tasks turned out to be performed as often by OCDHs that are employed in a dentist office and/or a group practice. In fact, they performed extraction and X-ray activities even more often than NCDHs in these practice settings. Here, work experience seems to win over education. Moreover, while overall the NCDHs perform more often dental sealant activities, small corrections of dentures and/or restoration and caries diagnosis during check-ups, these differences disappeared when we controlled for practice setting.

These findings confirm that the task redistribution is an on-going process in the Dutch dental health care system. What the new curriculum contributes to this process is the caries diagnosis and treatment.

Only few NCDH choose to work in independent practices; they might want to get some experience before setting up their own practice and/or they consciously choose for a practice that offered extended roles for dental hygienists. According to the Dutch law, dental hygienists do not need dentist's supervision for these activities but inform consent from the dentist in still needed. Therefore, dental hygienists may perceived more opportunities for performing these activities and further developing them in dental office and group practices.

As expected, NCDHs worked relatively more hours than OCDHs. As NCDHs are relatively younger (Table 2), relatively fewer of them will probably have to cope with family responsibilities yet. More working hours may create more opportunities for new dental hygienists to perform the whole spectrum of tasks for which they were trained.

According to figures from the National Public Health Compass (17), the time needed to obtain an appointment with a dentist in 2006 had decreased compared to that in 2001; the 2006 waiting times are back at the level of 1997. In 2006, 74% of patients were able to obtain an appointment with their dentist within 4 weeks compared to 67% in 2001. Dutch dentists also reported a lower workload in 2006 as compared with that in 2001 (17). This may partly be attributable to the presence of higher number of educated dental hygienists in the workforce from 2000 to 2005. Apparently, the problem of having too few dentists had largely been solved, even before the NCDHs had graduated. Thus, to the extent that dentists' workload is no longer a relevant issue, lowering the cost of dental care may serve as a new argument in support of task redistribution. The introduction of 'prophylaxis assistants' in Dutch dental care could influence dental hygienists' scope of practice as well as further task redistribution. Consequently, it is still important to gain insight into the future development of task redistribution in Dutch dental care and in the professional domain of Dutch dental hygienists.

One weakness of the present study is the relatively lengthy interval between the first and second survey, which assessed OCDHs in 2005 and NCDHs in 2007. If task redistribution is indeed an on-going process, as we argued in the introduction, given that our study did not follow OCDHs between 2005 and 2007, we cannot make any definitive conclusions about task redistribution in this group of dental hygienists that may have occurred during this period. Some of them may have become competent in the new tasks incorporated into the extended 4-year curriculum by means of additional courses.

This is the first study on NCDHs and their scope of practice in the Netherlands. This cohort might have encountered some barriers in terms of insufficient practice hours in the newly implemented curriculum as well as in performing their jobs because of their new role in dental teams. Therefore, these findings may not accurately predict the scope of practice for the next dental hygienists to be graduated which is another potential weakness of this study. To get more insights into the changes in dental hygienists' scope of practice over the years, we will conduct a second study in 2009 comparing the scope of practice among three cohorts of dental hygienists. All NCDHs graduated in 2006, 2007 and in 2008 will be included in the study.

To support task redistribution; to answer growing demand in complex tasks within some dental care specialties (implantology, aesthetics and prosthetics) and to keep dentists satisfied with their jobs, educators introduced in 2006 a new 6-year curriculum for dentists that include new competencies for complex patients. However, the first dentists educated through this 6-year programme will not graduate until 2012. Meanwhile, NCDHs will have already been at work in the field for at most 6 years. This could have the potential to influence negatively task redistribution between new dentists and new dental hygienists. The possible consequence of this scenario is that NCDHs will not have enough opportunities to use all of their skills. Long-term research is needed to examine the scope of practice of Dutch dentists and dental hygienists after dentists from the new 6-year programme graduate in 2012.

In summary, we found that the scope of practice and task redistribution for the majority of NCDHs substantially differed from those of OCDHs with respect to caries diagnosis and treatment only. It seems that most NCDHs had sufficient opportunity to perform all the tasks for which they were trained. Even if the scope of practice of NCDHs and OCDHs differs significantly, prevention remains the core job of all Dutch dental hygienists.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Appendix S1. Descriptive data for activity groups.

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