



## Scientific Research Report

## Provision of Oral Health Care by Dentists to Community-Dwelling Older Patients

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## ABSTRACT

**Background:** Research into oral health care for older people has shown that dental care in general decreases with increasing age and frailty and, therefore, oral health care provision may be complex. The aim of this study is to identify the oral health care dentists provide to community-dwelling older people and which barriers they experience in doing this.

**Methods:** In this cross-sectional study, a representative sample of dentists in the Netherlands was asked to prospectively select one older patient and describe this patient using a specially developed registration form; the patient was requested to fill out a questionnaire. The relationship between experienced barriers in providing oral health care to older patients and characteristics of the dentists and the patients was studied by means univariate and multivariate logistic regression analysis.

**Results:** In total, 923 dentists were asked to participate in the study. Data were available for 39.4% dentist–patient pairs. In most cases (87.4%), oral health care was focussed on conservation of the dentition. In all, 14.0% of the dentists experienced barriers in providing oral health care for older people. Some patient factors increase the risk of experiencing barriers, eg, the more difficult behaviour of older patients and the greater disease burden.

**Conclusions:** Oral health care was mostly focussed on conservation of the dentition, and dentists especially experience barriers in oral health provision to older patients if they are already frail.

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## Introduction

As long as older people live at home, they are dependent on the oral care of general dental practices, which is primarily focussed on maintaining the function of the dentition. Research into the use of oral health care shows that the

relative proportions of diagnostics and prevention drop with age and that older patients mainly visit the general dental practitioner (from now on called dentist) for restorative procedures and prosthetics due to caries or periodontitis.<sup>1–5</sup> This could be explained by the fact that regular dental checkups often decrease.<sup>6,7</sup> Data from the Netherlands also show that dental visits decrease after the age of 55.<sup>8,9</sup> Another explanation of the increase in the number of curative treatments is that the oral health of older people in general is poorer and there is more frailty than in younger people.<sup>10–12</sup> This can be the result of their dental history, resulting in more demand for restorative care and functional repair or because of a

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decrease in oral health by chronic conditions, increasing frailty, and polypharmacy.<sup>13-17</sup>

Because of these factors, maintaining good oral health status amongst older people may be difficult, and providing oral health care may be more complex.<sup>18,19</sup> Research has shown that barriers are perceived in providing oral health care to older people due to their physical and mental limitations, insufficient knowledge of the dentists, shortcomings in the facilities at the practice, financial reasons, and a lack of time for providing adequate care to older people at home or in nursing homes.<sup>20-23</sup>

Oral health care for community-dwelling older people seems complex, but it is less clear what that care actually involves and to what extent it is related to the barriers that dentists perceive. The purpose of this study is to explore the care that dentists provide to community-dwelling older people and to assess the extent to which they experience barriers in providing this care. The following research questions will be addressed: What are the characteristics of dentists and dental practices providing oral health care for older patients and what oral health care do dentists provide to older patients? Which barriers do dentists perceive in providing oral health care to older patients? To what extent are these barriers related to characteristics of the older patient, the dentist, the practice, and/or the way in which care is provided?

**Materials and methods**

**Study design**

This cross-sectional study investigates the oral health care that Dutch dentists provide to community-dwelling older people by asking a sample of dentists to select one older

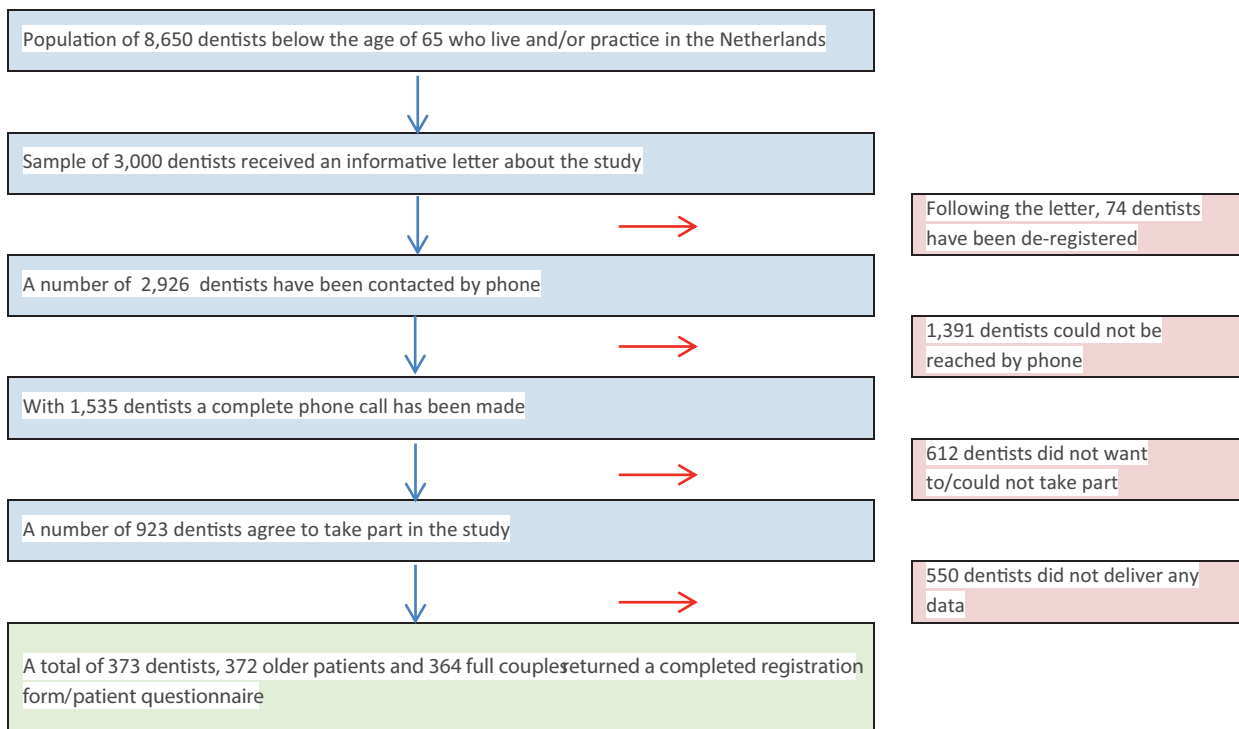
patient randomly from their files and describe this patient using a registration form. In addition, the patient was asked to complete a questionnaire. The design of this study has been described previously.<sup>24</sup>

**Recruitment of dentists and data collection**

A random sample of 3000 dentists was drawn from the total population of 8656 dentists aged 64 or younger who live and/or work in the Netherlands. They received an information letter about the study, stating that they would be contacted by phone within 1 week for a further explanation of the study. In response to this letter, 74 dentists indicated that they did not want to be contacted. Full phone conversations were held with 1535 dentists, of whom 923 were willing to participate in the study. Then, 325 dentists were asked to include a patient aged 60 to 64 in order to identify predictive symptoms of oral diseases. Further, 598 were asked to involve a patient aged 75 or older, since more frailty is to be expected and, therefore, older people encounter more problems maintaining their oral health and they will find it more difficult to visit a dentist (Figure). Both the dentist and patient received an information letter and informed consent form, respectively a registration form and a questionnaire.

**Research instruments**

In addition to the medical history, dental history, and data about dental visits in the past, the registration form requested data about morbidity, treatment strategy, and treatments provided. Dentists were asked to record the



**Figure – Flowchart for the study.**

procedures carried out during the most recent visit and whether they experienced barriers in the care.

The patient questionnaire included general data and data about tobacco use and alcohol consumption, medication, frailty status, daily oral health self-care, and dental visits.

### **Constructing the patient characteristics**

Using data from the patient questionnaire, the socioeconomic status (SES) of older people was determined based on their highest level of education (low/average/high) and/or their last profession using the International Standard Classification of Occupations (ISCO) classification.<sup>25</sup>

The data regarding sex, marital status, additional dental insurance, the presence of diseases and medication use, smoking, and alcohol consumption were dichotomised.

In the literature, there is no general consensus about the best way to measure frailty amongst older people by self-report. For the sake of feasibility, a simple classification was used based on the ability to carry out 7 activities of daily living.<sup>26</sup> Frailty was determined as a sum score of 7 dichotomous variables in the responses about mobility, care dependency, and care support (Cronbach's alpha = 0.756). An older person was considered frail if they responded in the affirmative to 3 or more questions.

Capability for oral health self-care was determined on the basis of whether they were able to brush their teeth every day and whether brushing had become more difficult in the past 2 years.

### **Constructing the dentist characteristics**

The data regarding sex, appointment policies, satisfaction with the care provided, whether there had been contact with other health providers, and whether the treatment strategy was determined exclusively by the oral situation or after other factors had been included were dichotomised.

The barriers perceived by the dentists were merged in some cases. Aspects of the insurance and/or financing were grouped as financial barriers. The duration of the treatment, complexity of the clinical situation, use of medication, degree of assistance required, mobility of the patient, and/or limitations to the technical options were grouped as care provision barriers. The communication barriers group comprised the patient's behaviour, the patient wanting something different, communication with other (health care) disciplines, and/or communication with the family or family-based care-givers.

All dental procedures in the Netherlands are expressed using more than 300 codes that are associated with fixed rates.<sup>27</sup> The data about the dental care provided was classified into three categories: diagnostics, preventive care, and curative care. The curative care contained all procedures regarding cariology, periodontology, endodontology, gnathology, prosthetics, extractions, and crown and bridgework. The codes are linked to fixed rates, allowing the expenditure of the care provided to be calculated for each patient.

### **Constructing the dental practice characteristics**

For determining the makeup of the dental team, only the disciplines involved in providing care for the patient were

included, such as the dentist, the dental assistant, the dental hygienist, and the clinical prosthetician.

Using the FACTOR procedure in SPSS, a standardised total score was calculated for the size of the dental practice based on 3 closely related characteristics: the total number of patients in the practice, the number of dental chairs, and the number of dentists (Cronbach's alpha for the standardised item = 0.888). The higher the score, the larger the practice.

## **Statistical processing**

All data were processed, linked, and analysed using the statistical software package SPSS, version 24 (IBM-Corp, 2016). The distributions of characteristics for the dentists, dental practices, patients, and care provided to the patients were determined (FREQUENCIES procedure). A bivariate analysis was carried out, using logistical regression to analyse the relationship of these characteristics with the perceived barriers (LOGISTIC REGRESSION procedure). Thereafter, multivariate logistical analysis determined which of the characteristics were ultimately the determining factors for the barriers perceived by the dentist (LOGISTIC REGRESSION procedure). For this purpose, the first models included all characteristics that showed bivariate correlation ( $P < .15$ ) with those experienced barriers. The variable assessment of patients' behaviour was not included here because the patients' behaviour was also included in the determination of whether dentists perceived barriers. The final model was created using the characteristics that remained, after stepwise elimination of nonsignificant characteristics; it provided a significantly better estimate compared to the baseline model (Chi-squared = 40,011;  $df = 4$ ;  $P < .000$ ).

## **Results**

After repeated requests, a total of 373 (40.4%) dentist registration forms and informed consent forms were returned, as were 372 (40.3%) of the patient questionnaires and informed consent forms. Data were available for 364 (39.4%) dentist-patient pairs. A nonresponse analysis was carried out but did not show any significant differences (Appendix A).

### **Older patients**

Of the older patients in the study, 52.8% were female and 8.0% had a low SES. About two-thirds (65.7%) had one or more diseases and 75.2% were taking one or more medicines (2.9,  $SD = 3.1$ ). In addition, 9.4% of the older patients stated that they smoked, and 78.2% regularly consumed alcohol. Finally, 9.6% were found to be frail and 3.9% had difficulties with daily oral hygiene (Table 1).

### **Dentists and practices**

The male/female ratio of dentists in the study was 63.0%/37.0%, and the average age was 49.7 years ( $SD = 10.8$ ). An average of 2.8 dentists ( $SD = 2.3$ ) were working per practice, and 64.6% of the dental teams included at least a dentist, dental

**Table 1 – Characteristics of older patients who regularly visit the dental practice.**

Demographic characteristics (n = 359-373)	Mean	SD	Proportion
♣ Female*			52.8%
♣ Age	74.8	9.3	
- Aged 74 or younger			32.4%
- Aged 75-79			33.8%
- Aged 80 or older			33.8%
♣ Single*			33.9%
♣ Low socioeconomic status <sup>†</sup>			8.0%
♣ Supplementary insurance for oral health care <sup>‡</sup>			70.8%
<b>Morbidity and frailty (n = 353-367)</b>	<b>Mean</b>	<b>SD</b>	<b>Proportion</b>
♣ One or more diseases*			65.7%
♣ Number of diseases	1.0	1.0	
♣ Use of one or more medicines*			75.2%
♣ Number of medicines	2.9	3.1	
♣ Frailty <sup>§</sup>	0.7	1.3	9.6%
<b>Lifestyle and oral care behaviour (n = 360-363)</b>	<b>Mean</b>	<b>SD</b>	<b>Proportion</b>
♣ Smoking*			9.4%
♣ Alcohol consumption*			78.2%
♣ Daily oral hygiene is/ became difficult			3.9%

♣ Patient questionnaire.

\* Dummy variable (0/1).

<sup>†</sup> Socioeconomic status is determined based on the highest level of education (low, average, or high) or the last profession (low, average, or high) based on the ISCO-08 classification.

<sup>‡</sup> In the Netherlands, the basic insurance covers some dental costs; individuals can get supplementary insurance on their own initiative.

<sup>§</sup> Sum score of 7 items about self-care, aids, and support, comprising a total score for frailty (Cronbach's alpha = 0.756); a score of 3 or more is considered as frail.

hygienist, and assistant. An average of 4084 patients (SD = 3448.7) were registered per practice, of whom around 19.7% (SD = 10.9) were older than 65 years (Table 2).

With respect to the dentist and their practices, 18.2% of the older patients were also seen by another oral health care provider. In 87.4%, treatment strategy was focused on conservation of the dentition, and 49.8% of the most recent visits involved a curative treatment. The expenditure of the care provided was no more than €50 in 33.2% of cases and over €100 in 24.4% of cases. Almost all older patients (97.0%) were cooperative during the treatment. For 9.7% of the older patients, the dentist had additional consultations with another health care professional in the 2 years prior to the examination. Furthermore, 91.6% of the dentists were satisfied with the care they provided (Table 3).

### Perceived barriers

About 1 out of 7 dentists (14%) stated that they did perceive barriers when providing oral health care to older patients (Table 3). For 9.9% of dentists, this was about the actual provision of care, for example, due to complexity of diseases or decreased mobility. For 3.0%, it involved financial barriers and 2.7% experienced difficulties in communication (see Appendix B).

Table 4 shows that experiencing barriers in providing oral health care to the older patients has a bivariate relationship

**Table 2 – Characteristics of dentists and dental practices.**

Demographic characteristics (n = 373)	Mean	SD	Proportion
♀ Female*			37.0%
♀ Age on January 1, 2017	49.7	10.8	
- Aged 29 or younger			2.4%
- Aged 30-39			21.7%
- Aged 40-49			15.0%
- Aged 50-59			40.5%
- Aged 60 or older			20.4%
<b>Practice characteristics (n = 345-373)</b>	<b>Mean</b>	<b>SD</b>	<b>Proportion</b>
♀ Number of dentists	2.8	2.3	
- 1			34.0%
- 2			22.7%
- 3			15.1%
- 4			10.7%
- ≥5			17.5%
♀ Makeup of the dental team			51.7%
- Dentist(s), dental assistant(s), dental hygienist(s)			31.3%
- Dentist(s), dental assistant(s), dental hygienist(s), dental prosthetician			12.9%
- Dentist			1.4%
- Dentist, dental hygienist			1.1%
- Dentist(s), dental assistant(s), dental prosthetician			0.6%
♀ Number of registered patients	4084.0	3448.7	
- ≤2000			28.1%
- 2001-4000			38.6%
- 4001-6000			15.9%
- ≥6001			17.4%
♀ Proportion of patients aged 65 years and older (%)	19.7	10.9	
- ≤10			13.3%
- 11-20			58.7%
- ≥21			28.0%
♀ Number of treatment chairs	3.8	2.7	
- 1-2			40.4%
- 3-4			32.8%
- ≥5			26.8%
♀ Practice has wheelchair access*			93.8%
♀ Appointment for next periodic check made during visit*			84.4%
♀ Region of residence			
- North			8.3%
- East			23.9%
- South			22.5%
- West			45.3%
♀ Urban character of practice location <sup>†</sup>			19.3%
- Very urban (≥2500 addresses per km <sup>2</sup> )			27.7%
- Strongly urban (1500–2500 addresses per km <sup>2</sup> )			19.3%
- Moderately urban (1000–1500 addresses per km <sup>2</sup> )			20.7%
- Not very urban (500–1000 addresses per km <sup>2</sup> )			13.0%
- Not urban (≤500 addresses per km <sup>2</sup> )			












♀ Registration by dentist.


\* Dummy variable (0/1).

<sup>†</sup> No postcode is known for 73 of the practices.

with some of the characteristics of older patients, the care provided, and the expenditure of the care at the last visit. Table 5 shows that the more satisfied a dentist was with the care provided, the fewer barriers they experienced. It was also the case that the barriers perceived by the dentist

**Table 3 – Characteristics of provided oral health care to older patients by dentists.**

	Mean	SD	Proportion
<b>Care provided during the last dental visit (n = 340-373)</b>			
 Treating oral health care provider			
- Dentist			81.8%
- Dentist + dental hygienist			9.6%
- Dentist + dental assistant			8.3%
- Dentist + dental prosthetician			0.3%
 Treatment was emergency treatment			12.6%
 Oral care provided on the occasion of last visit			
- Curative			37.6%
- Diagnostics + prevention			28.2%
- Diagnostics			18.5%
- Diagnostics + curative			6.8%
- Prevention			3.5%
- Prevention + curative			3.0%
- Diagnostics + prevention + curative			2.4%
 Expenditure (in €) for last dental visit <sup>†</sup>	92.86	129.43	
- <25			17.1%
- 26-50			33.2%
- 51-75			14.4%
- 75-100			10.9%
- 101-150			6.8%
- 151-200			5.8%
- ≥201			11.8%
<b>Assessment by dentist of treatment (n = 371-373)</b>			
 Assessment of patients' behaviours			
- Cooperative			97.0%
- Uncooperative			1.6%
- Passive and lifeless			1.4%
 Treatment strategy			
- Focussed on construction			5.1%
- Focussed on conservation			87.4%
- Focussed on reduction			7.5%
 Besides oral situation			89.8%
treatment strategy also determined by other factor(s)			
- Patient wishes			73.2%
- Level of oral hygiene			58.3%
- Medical situation			21.0%
- Financial situation			19.6%
- Practice policy			18.3%
- Family wishes			1.6%
 Contact with other health care provider(s) in past 2 years			9.7%
- General practitioner			1.9%
- Medical specialist			6.2%
- Pharmacist			2.1%
- Paramedical care provider			1.3%
- Thrombosis service			1.3%
- Home care provider			0.3%
 Clinical assessment of oral health (on scale from 1 to 10)	7.3	1.1	
 Satisfied with the care provided*			91.6%
 Experiencing barriers in care provision			14.0%
- Regarding providing care			8.5%
- Regarding financial issues			2.5%
- Regarding communication			1.4%
- Regarding providing care, financial issues, and/or communication			1.6%

 Registration by dentist.

\* Dummy variable (0/1).

<sup>†</sup> There are fixed rates for dental procedures in the Netherlands so the various rate codes could be used for calculating the costs.

increase along with the expenditure, disease burden, and difficulty of daily oral hygiene.

## Discussion

This study has shown that the treatment strategy of the oral health care provided in dental practices to community-

dwelling older patients was largely aimed at conservation and curative treatment of the dentition. When doing so, a minority of dentists experienced barriers. In particular, factors associated with the patient (such as their behaviour, diseases that were present, and whether daily oral hygiene was difficult for them) played a role in the perception of barriers, in addition to the expenditures associated with the most recent visit.

**Table 4 – Bivariate analysis of the relationships between whether barriers are experienced by dentists and the characteristics of the dentist, the dental practice, the patient, and the oral health care provided to the patient.**

		Odds ratio	95% CI		P
			Lower	Upper	
<b>Patient characteristics (n = 359-367)</b>					
♣	Age	1.000	0.968	1.032	.984
♣	Female*	1.198	0.659	2.175	.554
♣	Single*	1.522	0.824	2.813	.180
♣	Low socioeconomic status*	1.789	0.686	4.662	.234
♣	Supplementary insurance*	1.308	0.651	2.628	.451
♣	Number of diseases	1.621	1.239	2.210	.000
♣	Number of medications	1.112	1.018	1.214	.018
♣	Frailty	1.352	1.119	1.634	.002
♣	Daily oral hygiene is/becomes difficult*	8.333	2.673	25.984	.000
<b>Demographic characteristics dentist (n = 373)</b>					
♣	Age	0.977	0.951	1.004	.089
♣	Female*	1.381	0.757	2.157	.293
<b>Practice characteristics (n = 339-373)</b>					
♣	Size dental practice <sup>†</sup> (number of dentists, number of patients, number of dental chairs)	1.199	0.917	1.569	.184
♣	Proportion patients aged 65 years and older	1.020	0.994	1.046	.133
<b>Care provided during the last dental visit (n = 340-373)</b>					
♣	Treated by dentist and another health care provider*	1717	0.856	3.446	.128
♣	Treatment was emergency treatment*	1.118	0.471	2.665	.801
♣	Last visit diagnostics performed*	0.689	0.379	1.252	.222
♣	Last visit prevention performed*	0.919	0.486	1.736	.794
♣	Last visit curation performed	1.302	0.720	2.355	.383
♣	Expenditure for last dental visit	1.003	1.003	1.005	.003
<b>Assessment by dentist of treatment (n = 361-373)</b>					
♣	Patients behaviour:				
	- Is uncooperative vs cooperative	27.289	2.983	249.637	.003
	- Is passive vs cooperative	6.822	0.937	49.648	.058
♣	Treatment strategy:				
	- Is focused on construction vs conservation	0.773	0.172	3.467	.737
	- Is focused on reduction vs conservation	2.300	0.917	5.771	.076
♣	Treatment strategy also determined by:				
	- Wish patient*	2.145	0.970	4.774	.059
	- Oral hygiene level*	1137	0.620	2.082	.678
	- Medical situation*	2600	1378	4.908	.003
	- Financial situation*	1024	0.486	2.161	.950
	- Policy dental practice*	0.538	0.219	1.317	.175
	- Wish family*	6.437	1.263	32.821	.025
	Contact with other health care providers*	1.619	0.667	3.931	.287
	Rating clinical impression	0.612	0.472	0.793	.000
	Satisfaction with the care provided*	0.168	0.076	0.374	.000

♣ Registration by dentist.

♣ Patient questionnaire.

\* Dummy variable (0/1).

† Standardised total score calculated on the basis of three strongly related characteristics, namely the number of patients in the practice, the number of treatment chairs, and the number of dentists (Chronbach's alpha on standardised item = 0.888): the higher the score, the greater the practice.

It is not surprising that the dentists were primarily providing curative treatments. Older patients can retain their own teeth up to an advanced age, but due to a long dental history, restorative interventions are often required due to wear and tear of teeth or restorations. In addition, curative interventions may be needed due to increasing caries activity, which is caused by reduced daily oral hygiene as a result of physical disability or cognitive impairment with consequently increasing dependency on care, the effects of a dry mouth, and/or changed eating patterns.<sup>17,28</sup>

Nor is it surprising that the difficulty of patients' daily oral hygiene is seen as a deciding factor in dentists' perceptions of barriers in oral health care for older people. After all, difficulty with daily oral hygiene can be an expression of medical or cognitive issues that make an older person more frail and

dependent on care. This could lead to complex treatment and could be perceived by dentists as a barrier.

However, dentists can anticipate deterioration of oral health by preparing the dentition of an older patient in advance for potential or increasing problems in the future which can make the mouth "lifecycle proof."<sup>29-32</sup>

The possible difficulty of performing daily oral hygiene contributes to the experience of barriers by dentists. That is why it is important, when daily oral hygiene becomes difficult, to organise support by a family care-giver or a professional caregiver.<sup>19,33,34</sup> An implication of this study for dentists may therefore be to focus more on prevention. Support older people at home to perform their daily oral hygiene independently for as long as possible.<sup>35,36</sup> Extra care by dental (prevention) assistants and dental hygienists can be deployed

**Table 5 – Multivariate analysis of the relationships between whether barriers are experienced by dentists and the characteristics of the dentist, the dental practice, the patient, and the oral health care provided to the patient.**

		Odds ratio	95% CI		P
			Lower	Upper	
	Constant	0.331			.014
👤	Satisfaction the care provided*	0.131	0.052	0.326	.000
👤	Expenditure for last dental visit	1003	1001	1005	.003
👤	Daily oral hygiene is/becomes difficult*	7.240	1.832	28.614	.005
👤	Number of diseases	1.475	1.070	2.032	.018

Nagelkerke  $R^2 = 0.221$ 

👤 Registration form dentist.

👤 Patient questionnaire.

\* Dummy variable (0/1).

by shortening the checkup intervals, taking extra fluoride measures, and individualising preventive instructions. Support can also be obtained from (family) caregivers or home care workers, and they can receive written instructions so they know how daily oral hygiene can be carried out most optimally.

For dentists, it is therefore also recommended to keep track of the older person, especially as it is known that the frequency of visits to the dentist decreases with age and older people often no longer have contact with the dental practice.<sup>9,37</sup>

Other research has shown that the patient's SES turns out to be a determining factor in whether they visit the dentist. Particularly, older people with a low SES visit a dentist less often or only for serious complaints.<sup>38,39</sup> This may explain the small percentage (8%) of older people with a low SES in the described study. More research is needed on this subject in order for older people with a low SES to continue their regular visits. This is certain because research shows that a low SES is more likely to be associated with both general health and oral health problems.<sup>37,40-42</sup> It is therefore important that dentists be aware of this and make sure that all ageing patients continue to visit the practice regularly. Another possibility is to consider home visits by an oral health care professional.

It would also be helpful for dentists to collaborate more with other health care providers than they do now. In this way, dentists could play an active role in emphasising the importance of oral health in relation to general health and well-being.<sup>43</sup> The dentists in this study had been in contact with other health care providers in the past 2 years in 9.7% of the cases, usually with medical specialists and to a much lesser degree with general practitioners. Especially in older people, where care dependency easily may occur, the various primary care disciplines should design the care around the older person in a more interdisciplinary way and in consideration of their social environment.

This study shows that the more challenging the older patient's behaviour is, the more barriers the dentist may experience in providing good oral care. The behaviour of an older person can be an expression of how they retain their autonomy and dignity. Lothian and Philip (2001) point out that caregivers often have a stereotypical view of older people. If the dentist might learn more about communicating with older persons, had more regular contact with older

people, and was more familiar with them, their attitude could change and they would be less likely to perceive an older person's behaviour as difficult.<sup>44</sup>

In this context, education is important and the core curriculum of dentistry should pay attention to these concerns, enabling students to acquire knowledge about the characteristics and environment of (frail) older people at an early stage and above all develop skills to deal with this. Students must learn that providing oral health care to specific target groups, like older people, is more than just technical clinical action.

This study has some limitations. Compared to the overall population of dentists in the Netherlands, the youngest group of dentist (aged 29 years or younger) was underrepresented, while the oldest group (aged 55-64 years) was overrepresented.<sup>45</sup> According to the protocol, the dentist had to be associated with the older person for at least 2 years, which may have led to underrepresentation of the youngest age group.

The overrepresentation of dentate older, higher-SES patients confirms the image that this group still visits the dental practice.<sup>40</sup> However, because the selection of an older patient had to be performed by the dentist, it is conceivable that dentists involuntarily sought older people who could easily answer the questionnaire when selecting a patient for the study. This may also at least partly have resulted in overrepresentation of more highly educated older people. This circumstance must be taken into account when interpreting the results. The results therefore say less about older people who do not (or no longer) visit dental practices. For them, the risk of oral health care problems is undoubtedly higher and dental care provision is even more challenging.

In conclusion, it may be stated that the care provided to older persons by dentists is primarily aimed at conservation and largely curative. Dentists particularly experience barriers in providing oral health care for this target group if older persons experience general health problems, when performing oral health care is compromised (perhaps as a result of the medical situation or behaviour), and when the visits are more expensive.

### Conflict of interest

None disclosed.

**Appendix A. Some individual background characteristics of participants and nonparticipants in the study “Care for older people” in the population of 64 years or younger (January 2017) with a known residential and/or work address in the Netherlands, January 2017**

		Participant	Nonparticipant	Total
👤	Sex <sup>†</sup>			
	- Male	63.0%	58.7%	58.8%
	- Female	37.0%	41.3%	41.2%
👤	Age on January 1, 2018 <sup>‡</sup>			
	- 29 years or younger	2.4%	10.6%	10.3%
	- 30–34 years	11.3%	13.1%	13.0%
	- 35–39 years	10.5%	12.7%	12.6%
	- 40–44 years	9.4%	10.9%	10.8%
	- 45–49 years	5.6%	8.3%	8.2%
	- 50–54 years	18.0%	11.7%	12.0%
	- 55–59 years	22.5%	16.2%	16.5%
	- 60 years or older	20.4%	16.4%	16.5%
	Mean (SD) <sup>§</sup>	49.7 (10.8)	45.8 (12.0)	46.0 (12.0)
👤	University of graduation <sup>¶</sup>			
	- Amsterdam (UvA/VU/ACTA)	36.2%	40.1%	39.9%
	- Groningen (RUG)	16.6%	13.9%	14.0%
	- Nijmegen (RUN)	29.8%	21.9%	22.2%
	- Utrecht (RUU)	12.3%	8.9%	9.1%
	- Abroad	5.1%	15.3%	14.8%
👤	Year of graduation <sup>  </sup>			
	- 1979 or earlier	7.5%	6.0%	6.1%
	- 1980–1989	44.2%	31.7%	32.3%
	- 1990–1999	18.1%	16.9%	16.8%
	- 2000–2009	22.1%	27.4%	27.2%
	- 2010 or later	8.1%	18.0%	17.6%
	Mean (SD) <sup>#</sup>	1992.2 (10.6)	1996.5 (11.9)	1996.3 (11.9)
👤	Region of residence <sup>††,*</sup>			
	- North	22.5%	19.4%	19.5%
	- East	45.3%	52.6%	52.3%
	- South	23.9%	17.3%	17.6%
	- West	8.3%	10.3%	10.2%
	- Defence		0.4%	0.4%
👤	Registration in KRT <sup>††,**</sup>			
	- yes	33.0%	50.8%	50.0%
	- no	67.0%	49.2%	50.0%
N		373	8.346	8.719

👤 Registration by dentist.

<sup>†</sup> Chi-square = 2792; *df* = 1; *P* = .095; Cramèr's *V* = 0.018.

<sup>‡</sup> Chi-square = 53,223; *df* = 7; *P* < .000; Cramèr's *V* = 0.078.

<sup>§</sup> *F* = 37,537; *df* = 1; *P* < .000; Eta-squared = 0.004.

<sup>¶</sup> Chi-square = 41,792; *df* = 4; *P* < .000; Cramèr's *V* = 0.070.

<sup>||</sup> Chi-square = 42,226; *df* = 4; *P* < .000; Cramèr's *V* = 0.071.

<sup>#</sup> *F* = 45,286; *df* = 1; *P* < .000; Eta-squared = 0.005.

<sup>††</sup> Chi-square = 16,950; *df* = 4; *P* = .002; Cramèr's *V* = 0.044.

<sup>††</sup> Chi-square = 45,143; *df* = 1; *P* < .000; Cramèr's *V* = 0.072.

\* The given “region of residence” is based on the division of the Netherlands into KNMT regions.

\*\* KRT offers dentists the possibility to register continuing education activities on a voluntary basis.



## Appendix B. Barriers experienced by dentists in providing oral health care to older patients who visit the dental practice

Experience barriers				
No				313 86.0%
Yes				51 14.0%
Regarding financial issues	11	3.0%		
- Insurance aspects	6	1.6%		
- Financial aspects	11	3.0%		
Regarding providing care	36	9.9%		
- Duration of treatment	6	1.6%		
- Complexity of diseases	19	5.2%		
- Medication use	5	1.4%		
- Degree of dependency	4	1.1%		
- Mobility of the patient	16	4.4%		
- Limitation of use clinical-technical possibilities	8	2.2%		
Regarding communication	10	2.7%		
- Patients behaviour:	7	1.1%		
- Deviating wish patient	8	2.2%		
- Communication with family/informal care	2	0.5%		

n = 364

Registration by dentist.

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