

Integrated dental care in nursing homes

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Chapter

1

Introduction

This thesis presents a study of the dental care in Dutch nursing homes. The aim of the study is to gain insight in the dental treatment needs of nursing home residents and to study the possibilities for improvement of the dental care by offering integrated dental care in these homes. The origin of the study was at the beginning of this century, when two developments took place:

- The Dutch Society for Gerodontology initiated a postgraduate program to educate dentists to dentist-geriatrics. In UMC Utrecht this program started with four dentists.
- The Dutch College for Health Insurances (Dutch: College Voor Zorgverzekeringen) asked the UMC for an investigation into the dental treatment needs of nursing home residents.

In the postgraduate education three dentists participated who practiced in three nursing homes across the Netherlands that offered integrated dental care. They were familiar with the residents, management and staff in these three nursing homes and, therefore, were in a good position to study the dental treatment needs of the residents. A fourth dentist participated in the program, who was working in an academic centre for special dental care. It was decided that the four dentists, in the context of their education, would gather information about the dental treatment needs of the residents in the three nursing homes. They reported their findings to the Dutch College for Health Insurances (De Putter, 2002). Subsequently one of the dentists, the author of this thesis, continued to further analyse aspects of dental care in the three nursing homes in more detail. It was deemed important to gain more insight in this topic, as demand for dental care for elderly Dutch nursing home residents may increase in the near future.

The growth of the elderly Dutch population and the change in their dental status

According to Kalsbeek (2002) in the year 2000, 61786 care-dependent residents lived in 416 nursing homes. In 2009, 58498 care-dependent residents older than 65 years lived in the 334 Dutch nursing homes (CBS, 2010). The reduction in the number of nursing home residents as well as in the number of nursing homes may be explained by the policy of the Dutch government to stimulate extramuralisation. The aim of this policy is to let elderly people live in their own home as long as possible, with ambulant care when needed. However, according to demographic prognoses, the number of elderly Dutch people will continue to increase. Figure 1 shows a CBS prognosis from 2011 of the number of Dutch people over 65 years old. The number of Dutch people over 65 is expected to increase from 2,7 million in 2012 to 4,6 million in 2040. As a result of this prediction, the demand for nursing home beds may increase again (de Klerk, 2004).

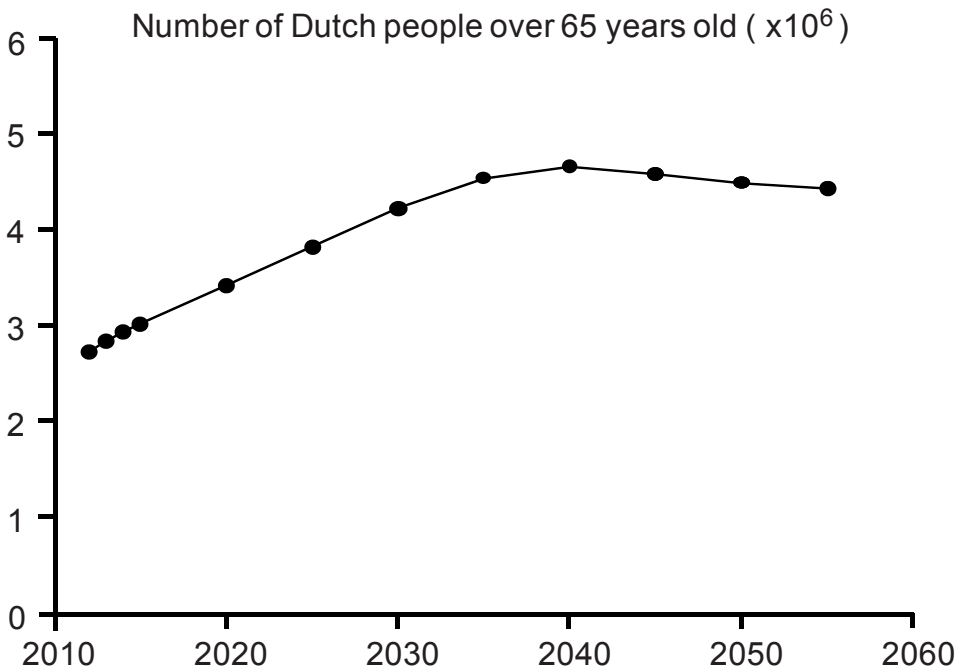


Figure 1. Prognosis of the growth of the Dutch population over 65 years old.

At the end of the 20th century, the large majority of the residents of Dutch nursing homes were edentulous (Kalsbeek, 2002). However, the number of edentulous elderly Dutch people is decreasing rapidly (Cune, 2007). Figure 2 shows the steady decline in the percentage of Dutch people over 65 years old with full dentures from 1981 to 2009 (CBS, 2011). In 1981 78% of the Dutch people over 65 wore full dentures. In 2009 this percentage had dropped to 41% and the curve suggests that this decrease will continue. This means that the percentage of elderly Dutch people who still have natural teeth will keep increasing. That people in the Netherlands retain their natural teeth to an advanced age is due to increased dental awareness, better oral self-care, a higher degree of professional care and effective measures of preventing dental diseases (Den Dekker, 2004). Therefore, in the future not only the demand for nursing home beds may increase again, but any future demand will stem more and more from elderly people who still have a natural dentition.

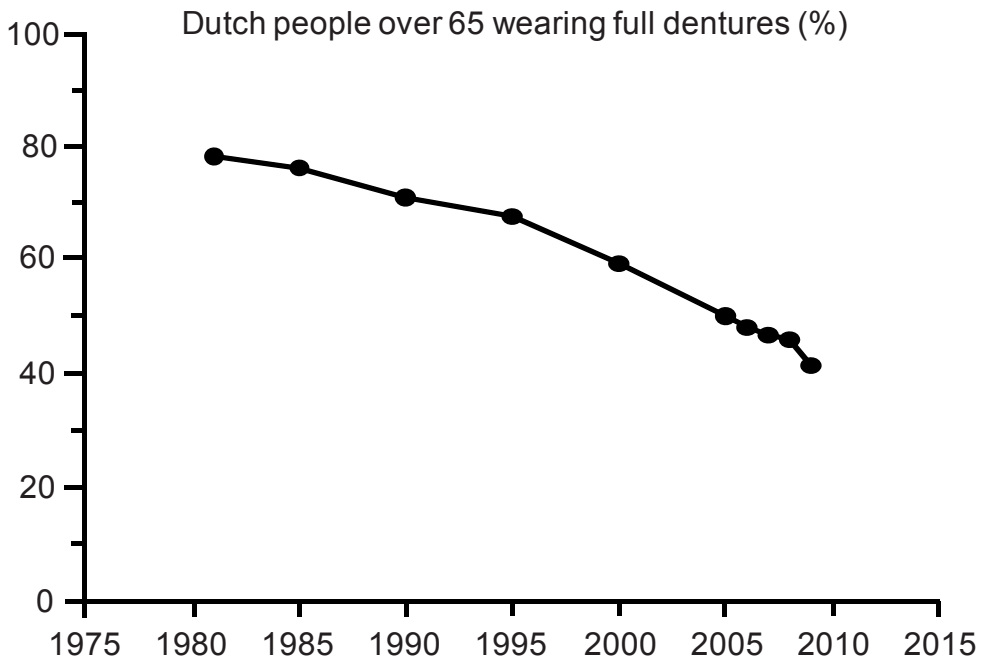


Figure 2. The decrease in the percentage of Dutch over 65 wearing full dentures 1981-2009.

The need for dental care in nursing homes

When the number of dentate nursing home residents increases, more attention has to be given to the oral health, oral hygienic care and the dental treatment needs of these residents (Moyon, 2005). Nursing home residents are by definition strongly dependent on care. Due to a lack of possibilities for self-care for oral hygiene, this task shifts to the staff of the nursing home. This task increases when more residents still have their natural dentition, since the care for a removable complete denture is easier to perform than the care for a natural dentition. Generally, dental diseases as caries and periodontal inflammation and breakdown occur when care for the oral hygiene is not given on the required level for maintaining healthy conditions (Inspectie voor de GezondheidsZorg, 2014). Upon admission to a nursing home the new residents often have a compromised oral health and often have not received dental treatment for several years (de Baat, 2011; Holmen, 2012). These factors are responsible for the increased attention for the dental care in nursing homes, particularly regarding the dentate residents (Fejerskov 2013, 2014). It should be noted that, still, edentulous residents also need professional dental care, albeit typically to a lesser extent than residents with a natural dentition.

Incidental dental care

Most nursing homes offer dental care on instigation by the medical and nursing staff. In this thesis we call this system of providing dental care “incidental dental care”. It means that the nursing home staff indicates whether consultation with a dentist in his private practice outside the nursing home is needed, or whether a dentist is asked to come to the nursing home to examine a resident. Based on the outcome of the dentist’s examination, it is decided in cooperation with the nursing home staff whether treatment can be done in the nursing home (without operational facilities), in the private practice of the dentist who examined the resident, in another dentist’s practice or in a hospital by a dentist or an oral surgeon.

Integrated dental care

Following the increased attention for oral health in nursing homes (MacEntee, 2012), more and more nursing homes have started to offer integrated dental care for their residents. This means that a dentist works in the nursing home for a certain number of hours per week, mostly with a dental assistant. The infrastructural facilities within the nursing home can vary from very basic to fully equipped offices with sterilization facilities and special lifts and chairs to make treatment of handicapped residents possible. The institutional dentist sees all new residents to assess their oral health and treatment needs. When treatment is indicated by the dentist, he or she discusses the treatment plan with the medical and nursing staff and, of course, with the resident or his/her delegate to determine whether, how and when treatment can be planned. Whether treatment is possible and desired, depends on the physical and mental condition and wishes of the resident and/or his/her delegate (Borreani, 2010). Also, the dentist is involved in the organization of the daily oral hygienic care by instructing and supporting the nursing staff for individual residents. On individual basis a schedule for periodic controls and treatment by the dentist is made (de Visschere, 2011).

Outline of this thesis

This thesis describes a number of studies performed in four Dutch nursing homes. Three of these homes offer integrated dental care. The fourth home offered incidental dental care. We studied this home to compare integrated and incidental dental care. The questions to be answered regarded:

- How many residents in the three nursing homes offering integrated dental care, need dental treatment? (Chapter 2)
- How does a nursing home offering integrated dental care compare to a nursing home offering incidental dental care? Are there differences in dental treatment needs and are there differences in other aspects regarding dental care? (Chapter 3)
- How do primary care nurses assess the dental treatment needs in nursing home residents? How does their assessment compare to the actual treatment need assessed by dentists? (Chapter 4)
- Does integrated dental care decrease the dental treatment needs of nursing home residents? (Chapter 5)

The contents of chapters 2 to 5 have been published in the journal "Special Care in Dentistry", formerly known as "Special Care Dentistry". Chapter 6 is a discussion of the methods and results, leading to conclusions and suggestions for future research in this field. Chapter 7 is a summary and chapter 8 a summary in the Dutch language.

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Chapter

2

Dental treatment needs in Dutch nursing homes offering integrated dental care

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Abstract

The purpose of this study was to determine the dental treatment needs of the residents in nursing homes (NHs) where integrated dental care has been offered without financial barriers. The dental status and surgical, prosthetic, restorative, and periodontal treatment needs were determined for 432 residents (average age 78.8 years) in three Dutch NHs. Although the subjects had no complaints, 72% had dental treatment needs. It was determined that treatment was necessary for 64% of the edentulous subjects (N = 316), 100% of the partially dentate subjects (N = 76), and 87% of the fully dentate subjects (N = 40). We concluded that when residents can no longer carry out oral hygiene independently, it is very difficult for them to maintain a level of oral health where their dental treatment needs have been met, especially for dentate residents.

Introduction

In the late 20th century, the large majority of residents of Dutch nursing homes (NHs) were edentulous. However, due to increased oral health literacy, better oral self-care, a higher level of professional dental care, and effective measures in preventing dental diseases, elderly people entering NHs today are more likely to be dentate. Consequently, more attention is being given to the oral health, oral hygiene care, and dental treatment of the 51,500 residents in the 334 Dutch NHs.¹ Several authors²⁻¹⁴ have written about how the need for oral care and treatment have increased as rates of edentulism have decreased in elderly NH residents in many western countries. However, little data are available on how oral care, and treatment offered in NHs has affected the dental status of the residents. Also, the organization of oral care and treatment in NH settings varies widely in different countries.^{1,3,4,6,8,9,11,12,14-16}

In the Netherlands, the community pays for the cost of a resident's stay in a NH, based on a general law for exceptional health care costs (those costs not covered by "normal" health insurance).¹ Nursing home residency is limited to persons with serious physical or psychological impairments. Residents of NHs generally are not able to carry out oral hygiene independently so the nursing staff must do it for them. The medical and nursing staff usually requests professional dental treatment when it is needed, after consulting with the resident and his or her relatives and legal guardians. Common oral problems include: pain, eating disorders, speech disturbances, or such symptoms as swelling, bleeding, bad breath, or poor esthetics.

However, a few years ago, some NHs began offering integrated dental care for their residents. The goal was to prevent problems with oral health and function, to overcome residual treatment needs of new residents, and to maintain optimal oral health for their residents. This implies that a dentist would examine all the residents and would regularly offer recalls and treatment in the NH facilities. The dental care is offered at no cost to the resident and in collaboration with the nursing and medical staff.

Dentists offering this integrated care must accept that their recommended dental treatment plan may not be accepted, since it may be contraindicated by the resident's medical or psychological condition, or because the resident (or his/her relatives or legal guardian) may refuse the suggested dental treatment plan.¹⁵ Logistical and infrastructural limitations may also prevent the treatment from being carried out.

The decision to carry out a dental treatment is based on the resident's right of self-determination, the institution's duty to provide good care and medical help, and the dental team's duty to perform the appropriate treatment that is in the resident's best interest. After deliberation, it is often concluded that the recommended dental treatment plan should not be done, therefore dental treatment needs may persist.

In this study, we present data quantifying dental treatment needs by studying it in three of the first NHs in the Netherlands to offer integrated dental care for their residents.

Material and methods

The study was carried out in three NHs, widely separated geographically from each other in the Netherlands. Table 1 shows the characteristics of the residents who were included in this study.

Table 1. Characteristics of the subjects and provided care.

Nursing home	A	B	C	Total
Number of residents	169	159	104	432
Age (mean and SD in years)	81.7 (10.5)	81.4 (10.7)	69.8 (19.3)	78.8 (14.1)
Age youngest-oldest	34.7–101.4	39.4–98.8	19.4–94.7	19.4–101.4
% somatic/psychogeriatric	36.1/63.9	63.5/36.5	68.3/31.7	53.9/46.1
Average duration (months)	28	18	52	30
Dentist hours per resident/year	2.3	1.1	1.6	1.7
Oral hygienist hours per resident/year	0	0	3.2	0.8

Nursing Home A had 175 beds. The average age of the residents was 81.7 years; the youngest was 34.7 and the oldest was 101.4 years of age. The average duration of stay was 28 months. Thirty-six percent of subjects resided in the NH for a somatic problem, versus 63.9% for a psychogeriatric one. The dental treatment room was a fully equipped dental office and the dentist worked 8 hours per week in the NH, averaging 2.3 hours of treatment per year per resident. He examined every new resident within a few days of admittance to the home and reported his findings and proposals for treatment in the resident's care file. Most suggested treatments were for surgical and prosthetic needs. Residents of the NH were invited to attend the dentist for recalls and treatment every 6 months, or when necessary or desired. The nursing staff provided daily oral care. The dentist had worked in the NH for more than two decades and could easily be approached by the staff for consultation, treatment planning, and organization of daily oral care for individual residents. During

the period of this study, none of the residents or nursing staff members spontaneously asked for dental treatment or had any complaints about oral health.

Nursing Home B had 180 beds and also mainly housed elderly residents. The average age was 81.4 years; the youngest resident was 39.4 years of age, the oldest 98.8 of age. The average duration of stay was 18 months. The reason for living in the NH was a somatic problem for 63.5% of the residents versus 36.5% due to psychogeriatric deficits. The dentist's treatment facilities were limited, with a dental treatment chair in a corner of a multifunctional medical treatment and consultation room. Dental treatment was confined to consultations, extractions, and minor prosthetic treatment. When more complex treatment was required, it was scheduled in the institution's dentist's private practice near the NH, at no cost to the resident. After an initial examination and treatments upon admittance to the NH, the medical and nursing staff would decide whether to schedule recalls and treatments. The nursing staff offered daily oral hygiene care. For more than 5 years, the dentist had worked 4 hours per week at the NH, averaging 1.1 hours per resident per year. He was well known by the staff, examined all new patients within a week of their being admitted to the NH, and reported his treatment plan in each resident's care file. During the period of this study, none of the residents or members of the nursing staff asked for treatment or had complaints about pain or oral health needs.

Nursing Home C had 125 beds. At a mean age of 69.8 years, these residents were significantly younger ($p < .001$) than the residents of the other two NHs. The reason for this was that this NH had a large department where many young residents were being rehabilitated after acute trauma (e.g., after traffic accidents). In addition, the NH specialized in caring for residents who had relatively rare neurological diseases, which required daily nursing care, even

for the younger residents. The youngest resident was 19.4 years of age, the oldest 94.7 of age. The average duration of stay in the NH was 52 months. The reason for residing in the NH was a somatic problem for 68.3% and for 31.7% it was psychogeriatric. The dentist worked 4 hours per week in a fully equipped dental treatment room and a dental hygienist was appointed for 8 hours per week. Residents received on average 1.6 hours with the dentist and 3.2 hours with the hygienist per year. The treatment facilities were specially adapted for patients with physical impairments. All dentate residents had their own dental treatment file and treatment predominantly consisted of periodontal and restorative treatment. Dentate residents were invited to see the dentist for periodic recall appointments, followed by treatment when necessary or desired, every 6 months. Dentate residents were also offered treatment in the NH by the dental hygienist at individually determined periods varying between 1 and 6 months. The daily hygiene care for some dentate residents was shared with the nursing staff and with the dental hygienist carrying out daily oral hygiene herself twice a week. Treatment of edentulous residents was carried out when suggested by the medical and nursing staff. The dentist and dental hygienist were very well integrated with the medical and nursing staff of the institution for more than 5 years. During the study period, none of the residents or members of the nursing staff asked for treatment or had complaints about pain or oral health problems.

For this study, the three dentists of these NHs and one dentist working in an academic center for special dental care examined and evaluated the oral status of the residents. In Home A, 169 of the 175 residents were studied, along with 159 of the 180 total residents in Home B, and 104 of the 125 residents in Home C. Reasons for nonparticipation were absence (24), too ill to be examined by the researchers (3), or refusal to participate in the study (21).

The intraoral examination was only done after obtaining formal written consent from the resident or his/her legal guardian in Home A and C. In Home B, written consent was obtained from the NH medical and managing directors, while residents or their legal guardians orally gave consent after their cooperation was requested. Working in changing teams of two (one of the researchers being the institution's dentist), the four dentists examined the mouth of the 432 participating subjects. Examinations were done under existing natural or artificial light with dental mirrors, without transporting the subject to the dental treatment facility. A research form was completed for every subject, which included demographic data, date and reason for admittance to the NH, dental status, replacement of teeth by partial or complete dentures, denture stability and retention, caries, mobility of teeth, plaque, calculus formation, the intraorally determined dental treatment needs (including surgical, prosthetic, restorative, and periodontal needs), and the health of the intra- and extraoral soft tissues. For this purpose, the four dentists had consensus meetings to plan how the various conditions should be scored and recorded, and when intraoral treatment should be indicated for surgical, prosthetic, restorative, and periodontal needs.

Surgical treatment needs, when scored, nearly always consisted of the need for extraction. Prosthetic treatment needs were indicated when removable prostheses were not present or were deemed to have inadequate function or retention. Restorative treatment needs were indicated when caries or inadequately functioning restorations were found and these were restored with composite restorative materials (Glass ionomers were not used in these three NHs). Periodontal treatment was indicated when there was a need to remove plaque and calculus by scaling and curettage.

Intraorally determined treatment need was recorded when the two investigating dentists agreed that oral treatment could improve the

subject's oral health and prognosis, regardless of the subject's (or his/her legal guardian's) wish to have dental treatment, or the medical condition or medication of the subject. It was rare that one of the investigating dentists considered treatment necessary while the other did not, since dental treatment need was only determined intraorally, without taking into account the subject's wishes or general health. In these rare cases of disagreement, no treatment need was recorded.

Dental status was classified as edentulous when no teeth were present in both jaws. Dentate subjects were classified as fully dentate when at least 10 teeth were present in each jaw, so the minimal number of teeth was 20. All configurations with between 1 and 19 teeth present were classified as partly dentate.

The procedures for the intraoral examination and recording in the registration form took an average of 10 minutes per subject.

Statistical analysis

The collected data were analyzed using a standard statistical program (SPSS 15.0, SPSS, Inc., Chicago, IL, USA), and descriptive statistics were used to present characteristics of the subjects and provided/needed care. Chi-square tests were used to test possible differences in dental status and treatment need between the three nursing houses. P-values less than .05 were considered significant.

Results

Dental status and age

The large majority of the subjects (73%, 316 persons) were edentulous; 76 subjects (18%) were partly dentate, and 40 (9%) were fully dentate. The average age of the edentulous subjects was 82.1 years; for the partly dentate subjects it was 78.1 years, and for the dentate subjects it was 53.7 years. In Nursing Home C, the number of fully dentate subjects was statistically significantly higher than in the other two NHs ($p < .001$). Table 2 presents the data and percentages for the three NHs.

Table 2. Dental status in relation to age.

Nursing home	A	B	C	Total
Number (%) edentulous residents	136 (80%)	124 (78%)	56 (54%)	316 (73%)
Average age edentulous residents (years)	82.6	82.8	79.2	82.1
Number (%) partly dentate residents	28 (17%)	26 (16%)	22 (21%)	76 (18%)
Average age partly dentate residents (years)	80.1	80.9	47.6	53.7
Number (%) fully dentate residents	5 (3%)	9 (6%)	26 (25%)	40 (9%)
Average age fully dentate residents (years)	65.4	64.9	47.6	53.7

Edentulous residents, their prosthetic status, and treatment needs

Of the 316 edentulous subjects, 230 (73%) wore dentures in both jaws, 36 (11%) wore a maxillary denture only, and 50 (16%) did not wear dentures at all. Prosthetic treatment need was determined for 201 of the edentulous subjects (64%). Residents in Home A had statistically significantly less treatment needs than the residents in the other two NHs ($p < .001$). The data and percentages are presented in Table 3.

Partly dentate residents, subdivision and treatment needs

Of the 76 partly dentate subjects, 41 (54%) were dentate in the maxillary and mandibular arches, 27 (36%) in the mandibular arch only, and 8 (10%) in the

maxillary arch only. The average number of teeth was 6.5 in the mandible and 4.0 in the maxilla. In the mandible, 6 subjects (8%) wore partial dentures; in the maxilla, 25 subjects (31%) wore partial dentures. All partly dentate subjects were found to have treatment needs (Table 4).

Table 3. Prosthetic status and treatment needs of the 316 edentulous residents.

Nursing home	A	B	C	Total
<i>Prosthetic status</i>				
Number of edentulous residents	136	124	56	316
Maxillary and mandibular dentures	108 (80%)	81 (65%)	41 (73%)	230 (73%)
Maxillary dentures only	14 (10%)	15 (12%)	7 (13%)	36 (11%)
No dentures	14 (10%)	28 (23%)	8 (14%)	50 (16%)
<i>Prosthetic treatment need</i>				
Maxillary and mandibular dentures	15 (11%)	67 (54%)	33 (59%)	115 (36%)
Maxillary dentures only	14 (10%)	15 (12%)	7 (13%)	36 (11%)
No dentures	14 (10%)	28 (23%)	8 (14%)	50 (16%)
<i>Treatment need (overall)</i>				
Treatment need	43 (32%)	110 (89%)	48 (86%)	201 (64%)
No treatment need	93 (69%)	14 (11%)	8 (14%)	115 (36%)

Table 4. Dental status and treatment needs of the 76 partly dentate residents.

Nursing home	A	B	C	Total
<i>Dental status</i>				
Number of partly dentate residents	28	26	22	76
Teeth in maxilla and mandible	15 (54%)	12 (46%)	14 (64%)	41 (54%)
Teeth in mandible only	9 (32%)	11 (42%)	7 (32%)	27 (36%)
Teeth in maxilla only	4 (14%)	3 (12%)	1 (4%)	8 (10%)
Average number of teeth in mandible	6.7	4.9	8.1	6.5
Average number of teeth in maxilla	3.9	3.0	5.5	4.0
Mandibular (partial) dentures	3 (11%)	1 (4%)	2 (9%)	6 (8%)
Maxillary (partial) dentures	10 (36%)	7 (27%)	8 (36%)	25 (33%)
<i>Specific treatment need</i>				
Surgical, extraction of all teeth	12 (43%)	9 (35%)	5 (23%)	26 (34%)
Surgical, single extractions	10 (36%)	11 (42%)	3 (14%)	14 (32%)
Prosthetic	14 (50%)	22 (85%)	13 (59%)	39 (51%)
Restorative	8 (29%)	12 (46%)	17 (32%)	41 (54%)
Periodontal	13 (46%)	11 (42%)	17 (31%)	41 (54%)
<i>Treatment need (overall)</i>				
Treatment need	28 (100%)	26 (100%)	22 (100%)	76 (100%)
No treatment need	0	0	0	0

Fully dentate residents, kinds of treatment need

Of the 40 fully dentate subjects, 4 (10%) needed single extractions, 4 (10%) needed prosthetic treatment, 21 (53%) needed restorative treatment, and 29 (73%) needed periodontal treatment. Five dentate subjects (13%) were determined to have no treatment needs (Table 5).

Table 5. Specific treatment needs of the 40 fully dentate residents.

Nursing home	A	B	C	Total
<i>Specific treatment need</i>				
Number of dentate residents	5	9	26	40
Surgical, single extractions	1 (20%)	2 (22%)	1 (4%)	4 (10%)
Prosthetic	1 (20%)	0	3 (12%)	4 (10%)
Restorative	2 (40%)	6 (67%)	13 (50%)	21 (53%)
Periodontal	2 (40%)	7 (78%)	22 (85%)	29 (73%)
<i>Treatment need (overall)</i>				
Treatment need	3 (60%)	8 (89%)	24 (92%)	35 (87%)
No treatment need	2 (40%)	1 (11%)	2 (8%)	5 (13%)

Overall dental treatment needs

A total of 312 subjects (72%) were found to have treatment needs. Residents of Home A had significantly fewer treatment needs than the residents in the two other homes ($p < .001$) (Table 6).

Table 6. Overall treatment need.

Nursing home	A	B	C	Total
Number of residents	169	159	104	432
Treatment need	74 (44%)	144 (91%)	94 (90%)	312 (72%)
No treatment need	95 (56%)	15 (9%)	10 (10%)	120 (28%)

Soft tissue lesions

Of the 316 edentulous subjects, 51 (16%) intraorally were found to have denture-related soft tissue lesions; this related prosthetic treatment need is included in Table 3. Of the 76 partly dentate subjects, 4 (5%) had a

caries-related fistula; this surgical treatment need is shown in Table 4. In the 40 fully dentate subjects, no soft tissue pathology was found. Extraorally, angular cheilitis was found in 43 subjects, 10% of the total 432 subjects studied. Dental treatment need for these subjects consisted of correction of vertical and lip support and is reported under prosthetic treatment need in Table 3 to 5. The data and percentages for the three NHs and for the studied groups are presented in Table 7.

Table 7. Soft tissue lesions.

Nursing home	A	B	C	Total
Number of edentulous residents	136	124	56	316
Denture-related lesions	14 (10%)	28 (23%)	9 (16%)	51 (16%)
Number of partly dentate residents	28	26	22	76
Tooth decay-related fistulae	1 (4%)	2 (8%)	1 (5%)	4 (5%)
Number of fully dentate residents	5	9	26	40
Soft tissue lesions	0	0	0	0
Number of residents (all)	169	159	104	432
Cheilitis angularis	20 (12%)	16 (10%)	7 (7%)	43 (10%)

Discussion

While none of the residents themselves and no members of the nursing or medical staff complained about the residents' oral health, oral treatment needs were found for 72% of the subjects, even though dental treatment in these NHs is offered free of cost for residents and all dentists were easy to approach for treatment. Other studies¹⁵⁻¹⁷ have reported that dentists often consider dental treatment necessary while NH residents themselves consider the suggested treatment unnecessary; our findings agree with these studies. However, the dental

treatment needs varied widely in each NH: Home A had 44% of the residents needing care, versus 91% and 90% in homes B and C. This difference can be explained by:

- The dentist's number of working hours per resident per year, being the highest in Home A (2.3 hours), versus the lowest in Home B (1.1 hours).
- The institution dentist's attitude toward prosthetic dentistry for elderly edentulous residents. The relatively low score in treatment need in Home A was due to the willingness and capability of the institution's dentist to make dentures for the edentulous residents, so that most edentulous residents were wearing well fitting and occluding maxillary and mandibular dentures. In his limited time, the dentist in Home B did less prosthetic work. The dentist in Home C focused on the dentate residents and also did not spend much time on the edentulous residents.
- The proportion of partly and fully dentate residents. All 76 partly dentate residents and 87% of the 40 fully dentate residents still required dental treatment. In the partly dentate residents, based on the intraoral examination, 26 residents needed extraction of all their teeth and construction of complete dentures, while 24 residents required single extractions. Reasons for not carrying out treatment were most often that it was denied by the resident or his/her legal guardian, or it was due to the resident's medical or psychological condition. It also was due to the attitudes and opinions of the institution's medical and nursing staff, and the limited period of time that a new resident was staying in the NH. Often it is decided that dental treatment had no priority, due to the poor health of a new resident. For the fully dentate residents, surgical and prosthetic treatment was less often indicated. However, the majority of the partly and fully dentate residents required care, especially periodontal

treatment. In Home C, this need was present even though the dental hygienist spent 3.2 hours per year per resident. Since she as well as the dentist spent most of their efforts on the 46% partly and fully dentate residents (48 persons), this suggests that the absence of independent daily oral care could not be fully compensated, despite the estimated annual 6 hours of treatment and care supplied by the dental hygienist and 3 hours by the dentist. The loss of independent daily oral care seems to make preservation of the natural dentition very difficult. Thus, a high proportion of partly and fully dentate residents had significant dental treatment needs. The findings suggest that for partly and fully dentate residents, even more care by the hygienist is necessary for prevention and that the 6 hours per year per resident spent in Home C, and the daily oral hygiene care provided by the nursing staff is not enough to preserve the natural dentition.

- The duration of the stay in the NH. New elderly residents often have extensive treatment needs when they enter the NH, and due to their health may have potentially shorter durations of residence and a higher dental treatment need. On the other hand, new younger residents (e.g., victims of traffic accidents) will often be dentate without extensive dental treatment needs when they enter the NH but probably will develop needs during their stay because they may have lost their ability for independent daily oral care. This latter group is a small proportion of the population we studied.
- The ratio of somatic/psychogeriatric problems of residents. Residents with psychogeriatric problems on average were older, stayed longer, and were more likely to be edentulous. So, prosthetic rehabilitation, as was done in Home A (with 63.9% residents with psychogeriatric problems), could reduce the dental treatment needs significantly.

Residents with somatic problems were on average younger, stayed a shorter time, and were more likely to be dentate or partly dentate. A high proportion of residents with somatic problems had higher dental treatment needs, since for partly dentate and fully dentate residents, recommended dental treatment often was denied due to their medical condition, the resident's wishes, and their shorter duration of stay. Also, younger dentate residents without the ability for independent oral care are prone to develop dental treatment needs.

Intraorally, soft tissue lesions were mostly found in edentulous subjects who wore dentures. The prosthetic treatment carried out in Home A led to more residents wearing maxillary and mandibular dentures, and also to fewer soft tissue lesions caused by ill-fitting dentures, especially compared to Home B.

The four fistulae found in the 76 partly dentate subjects were related to caries and did not result in complaints by the four residents. Extractions or endodontic treatments were indicated. However, the health and the preferences of the resident had to be considered. Although the rates of recommended surgical, restorative, and periodontal treatment were high, we did not see abscesses and other consequences of the unhealthy restorative, periodontal, and endodontal (and periapical) conditions. Possibly this was a result of the provided treatments and care in these NHs.

Of the 40 fully dentate subjects, 3 needed single extractions, 21 needed restorative treatment, and 29 needed periodontal treatment, but no soft tissue lesions were found. Possibly, the provided surgical, restorative, periodontal, and daily oral hygienic care prevented soft tissue pathology.

Extraorally, angular cheilitis was found in 10% of all subjects studied. The lowest rate was found in Home C. Possibly, this finding relates to the younger average age of the residents and the lowest rate of edentulousness. Angular

cheilitis is related to reduced vertical and horizontal lip support combined with weakened general health and reduced resistance to infection by microorganisms.¹⁸ The conditions required to develop this lesion were more likely to exist in Home A and B, with findings of 10% and 12%, respectively, in that population, compared to 7% in Home C. Considering the higher proportion of edentulous subjects wearing maxillary and mandibular dentures in Home A, the findings for Home A and B were interesting. Possibly, the high proportion of residents with psychogeriatric problems in Home A influenced this situation. However, our sample of subjects had a much lower rate than the 28% found by Peltola et al.⁹ in a population of 260 hospitalized elderly in Finland.

The intraoral examinations were conducted by two dentists, one of whom was the institution dentist. We chose this procedure so we could guarantee that when oral health problems were noticed during the examinations, treatment could be offered quickly and easily, when necessary and possible. The authors were conscious of the fact that, from a scientific point of view, this procedure could introduce bias in the evaluation of dental treatment needs. However, we believed that examination by two unprejudiced dentists, unknown to the institution, would not have served the interests of the residents; also, obtaining consent of the residents and institutions would likely have been more complicated. Additionally, we did not want the examination and documentation of the oral health data to be too time consuming or stressful for the frail residents, therefore complete periodontal charting and radiographic evaluation were not done. Further studies should be conducted to determine the dental treatment need in NHs with integrated dental care by comparing them to NHs where residents are not regularly examined by a dentist and where dental treatment is sought only when requested by the nursing and medical staff. Also, the appreciation of the nursing staff for the provided dental treatment and their valuation of the oral condition should be

studied. Finally, the effects of the provided integrated care should be studied by comparing the status of new residents with that of longer staying residents. These studies are in progress.

Conclusion

Integrated dental care, as offered to the 432 residents in the three studied NHs, resulted in an oral condition in which no residents or staff members complained about oral health or asked for dental treatment. However, according to the institution's dentists, 72% of the residents still needed dental treatment despite the average 1.7 hours of professional dental care offered annually per resident. Apparently, it is difficult for NH residents to maintain adequate oral health when they are no longer able to carry out daily oral hygiene independently. This study showed that a high rate of residents (up to 56%) without dental treatment needs can be achieved by replacing the dentures of elderly edentulous residents. For fully dentate residents and especially for partly dentate residents, achieving adequate oral health requires much effort and time. In one of the studied NHs, the dentist and the hygienist spent nearly all their time (3 hours for the dentist and 6 hours for the hygienist per resident per year) on restorative and periodontal treatment for the 48 partly and fully dentate residents. This resulted in only two subjects (4%) requiring no further dental treatment. We assume if these treatment and care were not offered, a more unfavorable situation, possibly with residents and staff complaining, could have occurred. On the other hand, we conclude that for partly and fully dentate residents of NHs, the annual per resident average of 3 hours of oral care with the dentist and 6 hours with the hygienist (in addition to the oral hygiene care provided by the nursing staff) seems insufficient to maintain adequate oral health. In this study, the most favorable rates of adequate oral health were found to be 69% among edentulous residents, 0% for partly dentate residents, and 40% for the few fully dentate residents. The increasing number and percentage of partly and fully dentate

new residents in Dutch NHs will therefore create an enormous increase in the need for dental treatment and oral hygiene care, as long as the goal remains achieving oral health without the need for dental treatment, when desired by the residents themselves and not prohibited by their medical and mental condition.

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Chapter

3

Integrated versus incidental dental care in nursing homes

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Abstract

Most Dutch nursing homes provide dental care incidentally, upon indication of the medical and nursing staff. However, integrated dental care is increasingly being offered, where a dentist works in facilities inside the home and examines all residents upon admission and periodically. To evaluate costs and effects of integrated versus incidental care, we studied the oral status and treatment needs of residents of two nursing homes in the same city (175 and 120 residents). In the home with integrated care, the dentist spent on average 2.2 hours/year per resident, with work costs of €229 and laboratory costs of €143. In the home with incidental care, these data were, respectively, 0.1 hour, €15, and €20. With integrated care, 55.6% of 175 residents had no oral treatment need (13.1% with incidental care), more edentulous residents wore dentures, less soft tissue pathology was found, and zero residents lived with unobserved pain (two with incidental care).

Introduction

In 2009, 58,498 care-dependent residents older than 65 years ¹ lived in 334 Dutch nursing homes ². In the large majority of these institutions, dental care is provided when indicated by the medical and nursing staff ³. In such instances, they request the consultation of a dentist in his private practice outside the nursing home, or ask the dentist to come to the nursing home to examine a resident. Based on the outcome of this examination, the dentist can decide whether treatment is possible in the nursing home or whether it has to be performed in his practice or in a hospital ⁴. Most nursing homes do not offer the facilities that are available in a fully equipped dental treatment room ⁵.

Many developed countries are now paying increased attention to the relationship between oral health, general health, and quality of life ^{6, 7, 8, 9, 10}; thus, more and more Dutch nursing homes are starting to offer integrated dental care¹¹. This means that a dentist works in the nursing home for a certain number of hours per week, usually with a dental assistant. These nursing homes provide varying infrastructural facilities—from very basic to fully equipped with sterilization facilities and special lifts and chairs to make treatment of handicapped residents possible. In these situations, the institutional dentist examines the oral health of all new residents. When treatment is indicated, the dentist discusses a treatment plan with the medical and nursing staff, as well as with the resident or his/her delegate to determine whether, how, and when treatment can be planned. Whether treatment is possible and wanted depends on the physical and mental condition of the resident, as well as the wishes of the resident (and/or his/her delegate) and their financial circumstances or insurance ^{12, 13, 14}. The dentist is also involved in organizing daily oral hygienic care for individual residents by instructing and supporting the nursing staff.

To evaluate the effects of integrated dental care, we previously studied the treatment needs of the residents in three nursing homes ¹¹. We concluded that

72% of the residents were in need of intra-oral treatment, but that none of the residents complained to the researchers about pain or disturbed function. These investigated nursing home residents had easy admission to integrated dental care without financial thresholds. Realizing this, we next wanted to perform a further study in a nursing home where dental care is provided incidentally by an external dentist after referral by the medical and nursing staff based on remarked pain, pathology, or disturbed function. However, such a study is complicated, since problems may rise when oral problems needing treatment are discovered by researchers and solutions have to be found.

We arranged to study the dental status and treatment need in a nursing home nearby one of the homes we studied before, after obtaining permission and obtaining cooperation of the direction and the dentist providing the incidental dental care. Part of this arrangement included promising to organize and provide care immediately in the other nursing home, when it was desired and indicated. The aim of the present study was to compare costs and effects on dental status and treatment needs of residents of nursing homes with integrated dental care versus incidental dental care.

Methods

This study was performed in the only two nursing homes in a city with 35,000 inhabitants. Home 1 is a public nursing home with space for 175 overnight residents. It houses a 25-m² dental treatment room that is equipped with a modern dental treatment unit. The institutional dentist works in the nursing home (with his dental assistant from his private practice) on average 8 hours per week during 48 weeks per year (384 hours per year with 175 residents, meaning 2.2 hours per resident annually). His practice is located 1 km from the nursing home. The nursing home has no sterilization facilities; thus, the instruments are cleaned and sterilized in the private practice. For appointments with the dentist inside the nursing home, the residents are transported and accompanied by the nursing staff. The dentist has worked in

the home for more than 20 years; he is easily approachable and well known by the medical and nursing staff. The dentist examines every new resident within a few days after entrance to the home. He reports his findings and proposals for oral treatment in the care file of the resident. It is then deliberated with the medical and nursing staff and with the resident (and/or the delegate of the resident) whether, when, and under which circumstances treatment and maintenance will be performed.

Oral care and treatment are delivered without costs to the resident. In accordance with the law called AWBZ (Algemene Wet Bijzondere Ziektekosten, translated: Exceptional Medical Expenses Act), the community pays the costs, including paying the dentist for his worked hours (including those of his assistant) and the dental technician for any individually produced prosthetic appliances. On average, the annual declarations for these costs are €40000 and €25000, respectively. The nursing home is required to make the room available to the dentist, and is responsible for the costs of the maintenance and depreciation of the treatment unit, estimated at €2500 per year. On average, the costs paid by the community (AWBZ) are €371 per resident per year, and the costs to be paid by the nursing home are €14 per resident per year.

The majority of the treatments are of surgical and prosthetic nature. Residents' dental needs only remain untreated when the condition of the resident is determined to contra-indicate the needed treatment, or when the resident (or his/her delegate) does not wish to undergo the advised treatment. When treatment is possible, dentate residents are seen for check-ups, periodontal, and restorative treatment at least every 6 months, but usually more frequently. Since no oral hygienist works in the nursing home, there is an intense collaboration between the dentist and the nursing staff in providing oral hygienic care for the dentate residents. Edentulous residents, when they or their delegates agree with treatment, are seen at least once a year for check-ups and treatment when indicated.

Home 2 is an institution based on a Roman Catholic foundation, and is situated in the same city, less than 1 km from Home 1. It has space for 120 overnight residents. There is no dentist working on a regular basis in the house itself. When a need is indicated by the medical and nursing staff, oral treatments are performed on incidental basis by a dentist at his private practice, which is across the street, less than 100 meter from the main entrance of the nursing home. Treatments are indicated by the medical and nursing staff based on medical examination by the nursing home physicians, remarked pain, or remarked disturbed oral function. Most treatments are of surgical and prosthodontic nature. On average, the dentist treats three residents per month, spending one hour per month (12 hours per year with 120 residents, meaning 0.1 hour per resident annually). On average, according to a statement from the dentist, the costs for these treatments are €150 per treatment hour (rate for AWBZ in private practice) and €200 for the products and repairs by the dental technician. The estimated costs per year are €4200 (12 months of €350). Per resident per year, this means €35 (€4200 divided by 120), of which €15 for the costs of the dentist and €20 for the costs of the work of the dental technician, to be paid by the community according to the AWBZ. Except for the transportation and accompanying the resident to the private practice, there are no costs to the nursing home for the care by the dentist. The nursing home staff is responsible for daily oral hygienic care. Quantitative data and costs per resident per year for both homes are displayed in Table 1.

After having obtained formal permission of the management of both homes for the intra-oral examination of their residents, the residents themselves (and/or their delegates) were asked for their cooperation. One resident in Home 1 and 14 residents in Home 2 decided not to participate. We inspected 169 out of 175 residents in Home 1, and 99 out of 120 residents in Home 2. Aside from the resident's wishes, the reasons for non-participation were absence for several reasons, severe illness, or very bad condition making participation impossible. The demographic data of the residents studied in the two homes are displayed in Table 2.

Table 1. Characteristics of dentists and dental costs.

	Home 1	Home 2
Number of residents	175	120
Dentist's working hours per year	384	12
Dentist's working hours per resident per year	2.2	0.1
Dentist costs AWBZ per resident per year	€229	€15
Dental laboratory costs AWBZ per resident per year	€143	€20
Nursing home equipment costs per resident per year	€14	-

Table 2. Demographic data of residents.

	Home 1	Home 2	p value*
Number of residents studied	169	99	
Women	110 (65.1%)	66 (66.7%)	0.79
Men	59 (34.9%)	33 (33.3%)	
Average age (yrs)	81.7	79.3	0.07
Average age at entrance (yrs)	79.4	77.5	0.17
Average duration of stay (yrs)	2.3	1.8	0.15
Residents staying 0–3 months	31 (18.3%)	15 (15.2%)	0.77
Residents staying 3–6 months	10 (5.9%)	7 (7.1%)	
Residents staying ≥ 6 months	128 (75.8%)	77 (77.8%)	
Somatic indications	61 (36.1%)	25 (25.3%)	0.07
Psycho-geriatric indications	108 (63.9%)	74 (74.7%)	

* Differences in number of residents in the two nursing homes were tested by Chi-square tests, and differences in age and duration of stay by the independent Student's t-test.

The residents' oral health and dental status were inspected by two dentists, one of whom was the institution dentist of Home 1. For every participating resident, a research form was completed that recorded demographic data

and the main reason for admittance (somatic or psycho-geriatric). The dental status was recorded, distinguishing between edentulous, partly dentate (configurations with 1-9 teeth), and completely dentate (having a dental arch with at least 10 teeth). The health of the intra-oral and extra-oral soft tissues of mouth and lips was monitored for soft tissue pathology. Finally, the need for dental treatment was determined intra-orally. A determination of "treatment need" was made when both dentist researchers agreed that oral treatment could improve the oral health of the resident, without taking in account the wishes of the resident (or his/her delegate) for treatment, nor the medical condition or medication of the resident. Treatment needs were categorized as being surgical, prosthetic, restorative, or periodontal.

The collected data were analyzed using a standard statistical program (SPSS 15.0, SPSS, Inc., Chicago, IL, USA) and descriptive statistics were generated.

Results

Table 2 describes the residents in the two nursing homes, in regard to gender, length of stay in the home, and somatic vs. geriatric indication. Chi-square tests and Student's t-tests revealed no significant differences in these numbers between homes. The average age of the residents and the average duration of the stay in the nursing homes are also given. The numbers and percentages of edentulous and dentate residents in the two nursing homes are given in Table 3.

Table 3. Numbers and percentages of edentulous and dentate residents in the two nursing homes.

	Home 1	Home 2	p value*
Number of residents	169	99	
Edentulous both jaws	136 (80.5%)	72 (72.7%)	0.14
Dentate both jaws	33 (19.5%)	27 (27.3%)	
Edentulous upper jaw	147 (87.0%)	82 (82.8%)	0.65
Partly dentate upper jaw	18 (10.7%)	14 (14.1%)	
Dentate upper jaw	4 (2.4%)	3 (3.0%)	
Edentulous lower jaw	137 (81.1%)	75 (75.8%)	0.38
Partly dentate lower jaw	25 (14.8%)	21 (21.2%)	
Dentate lower jaw	7 (4.1%)	3 (3.0%)	

* Differences in number of residents in the two nursing homes were tested by Chi-square tests.

Chi-square tests revealed no significant differences in the ratio of edentulous vs. dentate residents between the two nursing homes. The numbers of edentulous, partly dentate, and dentate residents were also similar in both nursing homes for the upper jaw and for the lower jaw (Table 3).

Table 4 gives details on the numbers and percentages of edentulous residents wearing or not wearing their dentures; the percentage of residents of Home 1 wearing their dentures (79.4%) was significantly higher ($p = 0.001$) than the corresponding percentage (59.7%) of Home 2.

Table 4. Numbers and percentages of edentulous and partly dentate residents wearing dentures.

	Home 1	Home 2	p value*
Number of edentulous residents	136	72	
Wearing upper and lower dentures	108 (79.4%)	43 (59.7%)	0.001
Wearing upper dentures only	14 (10.3%)	6 (8.3%)	
Wearing no dentures	14 (10.3%)	23 (32.0%)	
Number of partly dentate residents	29	24	
With partly dentate upper jaw	18	14	0.87
With partly dentate lower jaw	25	21	
Wearing upper partial denture	3 (16.7%)	2 (14.3%)	0.53
Wearing lower partial denture	2 (8.0%)	3 (14.3%)	

* Differences in number of residents in the two nursing homes were tested by Chi-square tests.

Table 5 shows the characteristics of soft tissue pathology. The percentages of soft tissue pathology were higher in Home 2 than in Home 1 for all detected types of intra-oral and extra-oral soft tissue lesions.

Table 5. *Characteristics of soft tissue pathology.*

	Home 1	Home 2
Number of residents	169	99
<i>Intra-oral soft tissue lesions</i>		
Denture-related traumatic ulcers upper jaw	3 (1.8%)	5 (5.1%)
Denture-related traumatic ulcers lower jaw	7 (4.1%)	9 (9.1%)
Local denture-related hyperaemia	4 (2.4%)	4 (4.0%)
Fistulae	1 (0.6%)	2 (2.0%)
Apical swelling	-	1 (1.0%)
Oncology (radiated adenocarcinoma)	-	1 (1.0%)
Spontaneously indicating pain at examination	-	2 (2.0%)
<i>Extra-oral soft tissue lesions</i>		
Rhagades	25 (14.7%)	26 (26.3%)

The numbers and percentages of intra-orally determined treatment need are given in Table 6. A significantly higher percentage of treatment need ($p < 0.001$) was observed for the residents of Home 2 (86.9% vs. 44.4% in Home 1). Table 6 also provides information on surgical, prosthetic, restorative, and periodontal treatment needs.

Table 6. Numbers and percentages on treatment need of residents in the two nursing homes (intra-orally determined).

	Home 1	Home 2	p value*
Number of residents	169	99	
With any treatment need	75 (44.4%)	86 (86.9%)	<0.001
Without any treatment need	94 (55.6%)	13 (13.1%)	
With surgical treatment need	22 (13.0%)	20 (20.2%)	
With prosthetic treatment need	57 (33.7%)	79 (79.8%)	
With restorative treatment need	9 (5.3%)	5 (5.1%)	
With periodontal treatment need	14 (8.3%)	9 (9.1%)	

* Differences in number of residents in the two nursing homes needing treatment were tested by Chi-square tests.

Discussion

Apart from the number of residents, the populations of both investigated nursing homes were comparable in all demographic aspects. No significant differences were present in gender, age, duration of stay, or somatic versus psycho-geriatric indications (Table 2). In Home 1, only 6 residents did not participate in the study, whereas the number of non-participating residents in Home 2 was 21, of which 14 did not want to participate. This was possibly a consequence of the different organization of dental care between the nursing homes; in Home 1, the institution dentist was known by most of the residents and most residents were used to periodical inspections and treatment.

The dental state of the residents in the two nursing homes did not differ significantly (Table 3). However, the degree of replacement of missing teeth in edentulous residents was significantly higher in Home 1 than in Home 2, such that many fewer residents of Home 1 remained without dentures (Table 4). We consider this difference to be a consequence of the differences in the organization of the dental care. Such an effect was not observed regarding the degree of replacement of missing teeth with partial dentures in partially dentate residents.

Soft tissue lesions of all found types were more frequent in residents of Home 2. Denture-related lesions were also found more frequently, in spite of fewer dentures being worn in Home 2. This outcome can mostly likely be attributed to the periodic checks by the dentist and the easy admittance to his office in Home 1. Rhagades are often observed in connection with a weak constitution combined with reduced occlusal height; thus, it is possible that the relatively less frequently found rhagades in Home 1 can be considered a consequence of the higher percentage of edentulous residents wearing dentures¹⁵.

Intra-orally determined treatment need was significantly lower in Home 1 than in Home 2 (Table 6). The percentage of residents in Home 1 who needed treatment (44.4%) was about half of the corresponding percentage from Home 2 (86.9%), whereas the percentage not needing treatment in Home 1 (55.6%) was four times larger than in Home 2 (13.1%). This is probably the result of the presence of the dentist in Home 1, who performed a lot of surgical and (mainly) prosthetic treatments, in combination with periodical check-ups and providing residents with easy admittance to treatment.

Regarding restorative and periodontal treatment need, no or less prominent differences were observed between the homes. This may be because a number of dentate residents from Home 1 did not want to be treated by the dentist, and because the suggested treatments often consisted of surgical

and prosthetic plans, that were not preferred by the resident and/or his/her delegate.

Conclusion

In comparison with incidental care, integrated dental care for nursing home residents is expensive and time consuming, but it strongly reduces the fraction of residents needing oral treatment. The greatest effects were seen in the surgical and prosthetic respect: more residents were edentulous and wore dentures. Also, fewer soft tissue problems were found and no residents had pain in Home 1 (versus 2 residents with unnoticed pain in Home 2). Since some residents have a weakened constitution that makes treatment not (yet) indicated, and because they can refuse the offered treatment, it is probably an unrealistic goal to reduce the fraction of residents needing intra-orally determined treatment to zero. However, the present results showed that 55.6% of residents in the home with integrated dental care had no oral treatment need, versus 13.1% in the home with incidentally offered dental care by an external dentist. These findings indicate that efforts of the nursing home staff and the dental team in offering integrated care significantly improved the dental status of the residents and reduced their treatment needs.

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Chapter

4

Assessment of the oral health condition of nursing home residents by primary care nurses

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Abstract

We interviewed 36 primary care nurses in three Dutch nursing homes regarding the functional oral health and dental treatment needs of 331 care-dependent residents (average age 77.8 years). The nurses assessed the residents' oral health condition as good (8.3 on a scale of 0–10). Edentulous residents wearing dentures were considered to have better functional oral health than dentate residents wearing partial dentures and edentulous residents not wearing dentures. According to the nurses, only 9% of the residents required dental treatment. This finding is in contrast with an intra-oral study of the same population, in which dentists determined that 73% of the residents needed dental treatment.

Introduction

People in the Netherlands and other European countries now retain their natural teeth to an advanced age.^{1,2} This is due to increased dental awareness, better oral self-care, a higher degree of professional care, and effective measures of preventing dental diseases. Consequently, more and more of the over 58,000 residents of the 334 Dutch nursing homes³ still have natural teeth. However, upon admission to a nursing home, residents often have compromised oral health and have not received dental treatment for several years.⁴ When combined with weakened somatic and/or psycho-geriatric conditions, these circumstances can place great demands on the medical and nursing staff as well as the nursing home facilities.^{5,6}

Some nursing homes now offer integrated dental care for their residents, aimed at providing dental treatment for new residents as well as achieving and maintaining optimal oral health and function.⁷ The residents are mostly incapable of caring for their oral hygiene by themselves.⁸ In cooperation with the nursing home staff, the dentist, oral hygienist, and dental assistant try to reduce the patients' difficulties with eating, drinking and oral hygiene. Members of the nursing and medical staff, together with the delegates or relatives of the residents, are involved in determining the need for oral treatments suggested by the dentist. This is based on the intra-oral diagnosis, as much data as possible about the physical and psychological conditions of the residents, and their needs. The decision to perform dental treatments is based on the wishes of the resident, the duty of the institution to maintain the quality of care, and the duty of the dental team to perform proficient treatment in the resident's interest. Thus, not all dental treatments indicated by dentists are performed. Some treatments may be inadvisable due to the medical or psychological condition of the resident, the wish of the resident not to undergo dental treatment, and/or logistical and infrastructural limitations.

A previous study by our group reported on data gathered by dentists on patients' dental statuses and the intra-oral dental treatment needs of the

populations of three nursing homes where integrated dental care is offered.⁷ In the opinion of the dentist researchers, 73% of the residents needed dental treatment. We were interested in whether these residents appreciated the oral care and treatments offered, and how they viewed their own oral health condition and treatment needs. However, most residents are not capable of filling out questionnaires or answering questions from interviewers due to their somatic and mentally compromised conditions.⁹ Therefore, in the present study, we asked the primary care nurses in three nursing homes to estimate the functional oral health condition of the residents and their treatment needs.

Primary care nurses observe on a daily basis the functional aspects of oral health (speech, chewing, eating problems due to pain, bad breath) and have an important influence on whether dental treatments are performed or not. Based on daily observations of the resident and contacts with patients' relatives, they gather useful information about the residents' functional oral condition and other aspects that may influence the indication for dental treatments. We did not expect the nurses to base their opinion about oral health conditions on possible restorative treatments, for example, needs due to caries or periodontal problems. Interviewers, without a professional dental background, gathered data from the primary care nurses using a structured format. The nurses answered questions regarding care dependency, functional oral health, and the dental treatment needs of each resident.

The aim of this study was to determine how primary care nurses assess the functional oral health conditions of residents in their care. In addition, we gathered information from the nurses related to this topic, including how oral health affects the residents, the Barthel score of the residents, a classification of the functional dental status, the residents' appreciation for the offered dental care, and the need for dental treatment. The assessment of the nurses will be discussed in relation with available data about the dental treatment needs of the same population of residents, as determined by dentist researchers in an intra-oral study.⁷

Materials and methods

The present study was conducted in three Dutch nursing homes with institutionally provided integrated dental care. We considered the populations of the three homes as one group of 480 residents. The average age of the residents was 78.8 years. In total, the three homes offered 16 hours per week of dental care from a dentist working together with a dental assistant, plus 8 hours care from an oral hygienist. The population and the infrastructure of the offered dental care were previously described in a study involving intra-oral examinations of the residents by dentist-researchers.⁷

We investigated how the 36 primary care nurses of the residents assessed the oral health condition and dental treatment needs by interviewing them about the oral health condition of each individual resident in their care. The primary care nurses answered the questions using the personal nursing care file, their observations of the resident, knowledge of the relatives and family of the individual resident, and their experience with the resident's daily care, including oral hygiene.

These primary care nurses in individual health care followed a 2-year supplementary course on individual guidance of nursing home residents. They are in contact with the relatives of the resident and have increased responsibilities for a limited number of residents (10-15 residents) to monitor their physical and mental conditions and plan, organize, and evaluate the resident's care. These nurses received 3-years of in-service education after high school. During this period, the nurses undergo theoretical training at a middle professional school outside the nursing home once a week. The course includes mainly nursing, social behavior, and anatomy and pathology. Oral care education makes up 20 hours of the course. Four days per week, the nurses follow an in-service training in a nursing home. After passing their exams, they obtain degrees as "nurses in individual health care".

In addition to the “nurse in individual health care” education, one must follow a 2-year program to become a “primary care nurse”. This program mainly involves training in:

- the development and evaluation of personalized nursing schedules
- communication and planning of care with relatives of the resident
- multidisciplinary management of care for nursing home residents
- maintaining records of each patient’s care and medication in their individual file.

During this course, the in-service student mainly communicates with the training institute by sending in nursing schedules of individual residents and evaluations of them. Theoretical training outside the nursing homes is conducted one day a month.

Questions to the primary care nurse were asked by three interviewers from the Julius Center for epidemiology and clinical research, University Medical Centre (UMC) Utrecht. These interviewers did not have a professional dental background and were not involved in the provided care. At the beginning of the interview, the primary care nurses were asked to appraise the functional oral health of each resident in their care with a single value. The literal translation of this first question is: “Please, give a score on a scale of 0-10 for the functional oral health condition of this resident, with 0 representing the worst possible condition and 10 the best possible condition?” Subsequently, the primary care nurses were asked eleven questions on aspects of the functional oral health and daily care of the residents and the resident’s appreciation of the provided dental care. These eleven questions are described in Table 1.

Table 1. Questions regarding the functional oral health condition of residents from interviews with primary care nurses; answers were given on a scale of 0–10, with 0 indicating the worst possible condition and 10 indicating the best.

1. In your opinion, is the resident happy with his/her oral condition?
2. Has the resident had any complaints?
3. In your opinion, can the resident eat properly?
4. In your opinion, can the resident eat anything he/she wants?
5. In your opinion, can the resident speak properly?
6. Does the resident sometimes suffer from a tooth-ache or sore spots?
7. In your opinion, does the resident need dental treatment now or in the near future?
8. In your opinion, is the resident capable of caring for his/her own oral hygiene, or does the nursing team need to be responsible for oral hygiene?
9. How much time per day does the nursing team spend on the oral hygiene of the resident?
10. What do you think is the resident's opinion about the care offered by the dentist?
11. In your opinion, does the offered dental care make sense for the resident?

For every studied resident, the following personal data were recorded: sex, date of birth, somatic or psycho-geriatric indication for admission to the nursing home, duration of stay in the home (0–3, 3–6, or ≥ 6 months). The Barthel index for functional evaluation of care-dependency^{10,11} was determined on a scale of 0–100 from the answers to 10 questions about care-dependency (the 10 items and the nurses' responses are presented in Table 3) and registering the outcomes following the protocol. The functional dental status was classified by the nurses as one of the following:

1. dentate, without removable prosthetic appliances
2. dentate, wearing removable prosthetic appliances
3. edentulous, wearing dentures
4. edentulous, not wearing dentures.

Statistical analysis

Descriptive statistics were used to present characteristics of the investigated residents. Unpaired t-tests were used to investigate the influence of gender and indication for admission on the oral health condition score. To determine the impact of dental status and duration of stay on the oral health condition score, one-way analysis of variance (ANOVA) was used (SPSS 20.0). Chi-square tests and t-tests were used to determine whether the group of residents in this study differed from the larger group examined intra-orally by dentists in another study.

Results

Descriptive data of the investigated group of residents

Characteristics of the residents, obtained from the interviews with all 36 primary care nurses, are listed in Table 2. The three interviewers obtained data regarding 331 residents, 122 males and 209 females. Only 331 of the 480 residents were registered in this study, due to the limited time available for the interviews (one week), temporary absence of a primary care nurse, absence of a resident, or residents not wishing to participate in the study. The indications for the stay were somatic and psycho-geriatric for 53.2% and 46.8% of the residents, respectively. The average age was 78.8 years and the average duration of the stay was 2.6 years. There were no significant differences in the composition of the groups of residents reported by the dentists and the primary care nurses with respect to gender, age, indication for admission, average duration of stay, and dental status.

Table 2. Characteristics of residents and scores by primary care nurses.

Number of residents	331
Men: number (percentage)	122 (36.8)
Women: number (percentage)	209 (63.2)
Somatic indication: number (percentage)	176 (53.2)
Psycho-geriatric indication: number (percentage)	155 (46.8)
Average age in years	77.8
Average duration of stay in years	2.6
Average Barthel score (scale of 0–100)	20
Dentate without removable appliances: number (%)	72 (22.3) ^a
Dentate with removable appliances: number (%)	36 (11.1) ^a
Edentulous with dentures: number (%)	183 (56.7) ^a
Edentulous without dentures: number (%)	32 (9.9) ^a

^a Dental status was classified by primary care nurses for 323 residents.

Of the 331 studied residents, 64 had been in the nursing home for less than three months, 32 for 3–6 months, and 235 for 6 months or longer. Table 2 lists the functional dental statuses of 323 residents as classified by the primary care nurses. The functional dental status could not be determined by the primary care nurse for 8 residents. The average Barthel score was 20. Table 3 summarizes the scores of the Barthel index items.

Table 3. Barthel scores given by primary care nurses.

1.	Resident needs help in daily personal care.	Yes: 95%
2.	Resident needs help when using the toilet.	Yes: 76%
3.	Resident had incontinency for discharge last week.	Yes: 55%
4.	Resident has incontinency for urine once a day.	Yes: 71%
5.	Resident needs help with eating.	Yes: 46%
6.	Resident needs help moving.	Yes: 65%
7.	Resident needs help getting clothed.	Yes: 79%
8.	Resident needs help climbing stairs.	Yes: 86%
9.	Resident needs help taking a bath or shower.	Yes: 96%
10.	(a) Resident's short term memory is impaired.	Yes: 55%
	(b) Resident's long term memory is impaired.	Yes: 44%

Evaluation of oral health by the primary care nurses

The primary care nurses evaluated the oral health condition of each resident on a scale of 0 to 10, giving an average score of 8.3 (s.d. 2.0). The scores did not differ according to gender (t-test, $p=0.87$) or indication for admission (somatic versus psycho-geriatric) (t-test, $p=0.28$). The duration of stay did not influence the oral health condition score (one-way ANOVA, $F(2, 328)=2.77$, $p=0.064$). However, the functional dental status did impact the oral health condition score (one way ANOVA, $F(3, 319)=5.6$, $p=0.001$). The scores according to different dental statuses are listed in Table 4. Post hoc Bonferroni tests showed that edentulous residents wearing dentures had a better oral health condition score (8.5 ± 1.8) than dentate residents wearing partial

dentures (7.3 ± 1.6 , $p=0.006$) and edentulous residents wearing no dentures (7.5 ± 2.2 , $p=0.031$).

Table 4. Average scores for functional oral health in the 4 classes of dental status.

Dental status class	Functional oral health score	Number of residents
Dentate without removable prosthetic appliances	8.4 ± 2.3	72
Dentate wearing removable prosthetic appliances	7.3 ± 1.6	36
Edentulous wearing dentures	8.5 ± 1.8	183
Edentulous not wearing dentures	7.5 ± 2.2	32
All residents	8.3 ± 1.9	331

The difference (8.4 vs. 7.3) between dentate residents without removable prosthetic appliances and dentate residents wearing partial dentures was almost significant ($p=0.068$). The average results of the questions in Table 1 regarding the functional aspects of oral health and daily care for the residents and the appreciation of the provided care by the residents are shown in Table 5.

Table 5. The primary care nurses' observations, opinions, and evaluations.

Average scores presented on a scale of 0 to 10, or a percentage, or in minutes.

Satisfaction of resident with oral condition	6.9
Complaints remarked (percentage)	30%
Capability to eat	6.6
Capability to eat anything the resident wishes	5.4
Capability to speak well	6.0
Sometimes complains of a tooth-ache, sore spots	7%
Treatment needed, now or in the near future	9%
Capable of self-care for oral hygiene	0.0
Time spent per day on oral hygiene by nursing staff	3.9 min.
Resident's opinion about the offered care by the dentist	6.5
Value of the offered dental care for the resident	6.7

Discussion

This study presents assessments by primary care nurses of the functional oral health condition and the dental treatment needs of residents from three nursing homes offering integrated dental care. The nurses characterized the functional oral health of the population as good, with an average score of 8.3 on a scale of 0-10. This oral health score is related to the functional dental status (4 categories: dentate with/without removable appliances, edentulous wearing/not wearing dentures). On average, edentulous residents wearing dentures were considered to be in better functional oral health than edentulous residents wearing no dentures and partly dentate residents wearing a removable prosthetic appliance. Edentulous residents wearing dentures were viewed as being as functionally healthy as dentate residents without removable prosthetic appliances. These results indicate that primary care nurses observed relatively little impairment of functional oral health in nursing home residents wearing complete dentures. Oral hygienic care in the

nursing home may play a role in this evaluation, as it may be easier to care for edentulous patients than partially dentate patients. Other studies have shown an apparent relationship between the quality of life of nursing home residents and oral health and wearing dentures.¹²⁻¹⁴

On further review of the data from the interviews, we found nurses thought only 9% of the residents in their care needed dental treatment soon. This finding agrees with the nurses' generally high opinions of the functional oral health condition of the residents. However, their answers to other questions suggested the residents were in poorer oral health than is indicated by this high functional oral health score and low need for dental treatment. In particular, the reports that 30% of residents had occasional complaints and many residents could not eat anything they wish (average 5.4 on a 0-10 scale), seems to contradict the high functional oral health score and the perception that so few residents needed dental treatment.

In another study, carried out in the same period as the interviews with the nurses, residents from the same population were examined intra-orally by dentists. In that study, 432 of the 480 residents participated, 101 more than in this study, in which only 331 residents are represented. In this study, 149 residents were not included because the resident or their primary care nurse was absent at the time of the interviews or the resident wished not to be included. However, no residents were left out because of their oral health condition. Furthermore, the two groups, which largely overlap, were comparable with respect to gender, age, indication for admission, average duration of stay, and functional dental status. Therefore, we can assume that the two groups are comparable with respect to oral health conditions and dental treatment needs.

The intra-oral examinations by the dentists showed that 73% of the residents

needed dental treatment, which contradicts with the opinion of the primary care nurses that only 9% of the residents required dental treatment. The main reason for this difference is that the nurses are not dentists and have not been educated to ascertain dental problems by intra-oral examination. Instead, the primary care nurses base their evaluation on daily observations of the resident's functional oral health. This includes observations of function during eating, speaking, during personal hygienic care, and possibly remarks from the resident on oral pain or discomfort. Apparently a nursing home resident can be perceived to be in good functional oral health in spite of dental treatment needs, such as caries.

However, when asked whether a resident needs dental treatment, a primary care nurse may also consider the wishes of the resident and/or relatives to not receive treatment, the reduced life time expectancy of most residents, and that the burden of undergoing dental treatment is too high for the resident. Dentists, on the other hand, may focus more on short and long term prevention of dental problems. They may be less willing to take risks on possible dental problems in the last phase of life of the residents.

Conclusion

The primary care nurses characterize the functional oral health condition of the nursing home population as good, with an average score of 8.3 on a scale of 0-10. The nurses judged the functional oral health condition of dentate residents and edentulous residents wearing dentures as equally high. The oral health of edentulous residents not wearing dentures and partly dentate residents wearing removable prosthetic appliances were judged to be reduced, significantly reduced when compared with edentulous residents wearing dentures. Aspects of daily oral hygiene care may have played a role in this outcome, since all residents were reported to be unable to perform this care themselves.

In the eyes of the nurses, 9% of the residents needed oral treatment. Dentist

researchers found, after intra-oral inspection of the same population, that 73% of the residents needed dental treatment. This shows that primary care nurses often perceive residents to be in good oral health despite dental treatment needs ascertained by dentists. However, the nurses based their opinion on daily observation of the residents and may consider the burden of undergoing dental treatment in relation to the general condition and life expectancy of the residents. In the intra-oral study, such considerations were not taken into account by the dentists, who possibly focused more on long-term prevention of pain and discomfort. We conclude that it is not clear when and under what conditions dental treatment is beneficial for care-dependent elderly residents in nursing homes. Further research is needed on this subject.

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Chapter

5

Effects of integrated dental care on oral treatment needs in residents of nursing homes older than 70 years

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Abstract

- Aim:** To determine effects of integrated dental care in older nursing home residents.
- Methods:** In three nursing homes offering integrated dental care, we studied the oral treatment need of 355 residents older than 70 years. To determine effects of integrated care, we discriminated between short-stay residents (≤ 6 months) and long-term residents (> 6 months).
- Results:** Treatment need, determined intra-orally by two dentists, remains high among short-stay residents (78%) and long-term residents (67%). The association between treatment need and length of stay was not significantly affected by indication for stay (somatic vs. psycho-geriatric). All dentate residents needed oral treatment, except one long-term resident. However, among edentulous residents, particularly with a psycho-geriatric indication for stay, treatment need appeared to reduce significantly in time, from 74% to 57%.
- Conclusion:** Despite integrated dental care, oral treatment need remains in virtually all dentate residents and more than half of edentulous residents.

Introduction

Increasingly, residents of Dutch nursing homes possess their natural teeth when they enter the home. This is due to the circumstance that the Dutch population, as a whole, maintains natural dentition into old age.¹ In a previous report on dental treatment needs in three Dutch nursing homes,² it was noted that 26.9% of the residents appeared to have at least some of their natural teeth. These homes offer integrated dental care in an effort to improve and maintain the oral health to their residents. This dental care means that all new residents are examined by the institutional dentist to assess their oral health. When the dentist considers treatment indicated, based on the intraoral inspection, a treatment plan is set up. This plan is discussed with the medical and the nursing staff and, of course, with the new resident or his/her delegate. Whether treatment is possible and desired depends on the physical and mental condition and wishes of the resident and/or delegate. The dentist has to accept that the treatment plan, or a part of it, may not be accepted. The plan may be contraindicated by the resident's physical or mental condition, or the resident (or his/her relatives or legal guardian) may refuse the suggested dental treatment. When pain or swellings due to inflammation are observed during the first inspection, mostly treatment to eliminate these acute treatment requiring conditions is quickly accepted and performed as soon as possible. Whether treatment is accepted and performed or not, the dentist (and the oral hygienist when available) is (are) also involved in the organization of the daily oral hygienic care by instructing and supporting the nursing staff. The residents are offered periodical recalls for control and maintenance on a schedule of at least two recalls per year. The integrated dental care is offered at no cost to the resident.

We wanted to investigate whether offering the integrated dental care in time reduces the number of residents who need dental treatment. We reasoned that the older residents, with no or limited possibility of performing oral self-care, and who were often in arrears with their dental treatments, would

be most likely to need the attention of the institutional dental care system.³⁻⁹ Therefore, for the present study, we focused our interest on the oral treatment need in nursing home residents that were over 70 years old.

To test whether the integrated dental care in time reduces the number of residents needing dental treatment, we divided the residents in two groups. One group comprised short-stay residents (≤ 6 months of stay) and the other group comprised long-term residents (> 6 months of stay). In addition, we distinguished between edentulous and dentate residents. Also, we distinguished between residents with a somatic indication for stay, for example revalidation after a hip fracture, and residents with a psycho-geriatric indication, for example dementia. The aim of this study was to describe the development of dental status and treatment need over time and to determine whether the efforts of the dental team could show a reduction in treatment need, and if so, in which groups.

Materials and methods

This study included residents of three Dutch nursing homes with institutionally provided dental care. Details of the investigated population, methods of obtaining permission for the descriptive study without any intervention and the protocols for dental care were previously reported in detail.² Briefly, the populations of the three institutions were considered a single group of 480 residents. Of these, 432 were included in the study. Residents that did not participate were absent during the study period (24 residents), had a severe illness, which prevented oral inspection (3 residents), or refused to participate in the study (19 residents or their delegates). For this study we also excluded residents younger than 70 years, after which 355 residents remained.

For the residents in all three homes a total of 16 h of dental work per week, plus 8 h of oral hygiene per week was available. Within a week after admittance, all new residents were assessed by the dentist to determine oral

health and to identify urgent (pain, inflammation, swelling) and long-term treatment needs. When treatment was indicated, a discussion was convened with the resident, his/her delegate, the medical staff, and the nursing staff to determine whether, when, and which treatment should be performed.

For this study, four dentists performed oral assessments on 355 participating residents. They were the three nursing home dentists and one dentist gerodontologist of the department of Prosthodontics and Special dental care of the University Medical Center of Utrecht. The dentists always operated in teams of two, while one of the two was the institution dentist. A research form was developed and was completed for every participating resident. We recorded demographic data and the date and reason for admittance (somatic or psycho-geriatric). The dental status was recorded as either edentulous or dentate, including partial and complete dentition. The classification of Kennedy and Applegate 10 was used to describe the distribution of teeth in the partly dentate dental arch, as follows:

Class 1 – bilateral shortening of dental arches

Class 2 – unilateral shortening of the dental arch

Class 3 – space in a lateral area

Class 4 – space in the anterior area

When the status of residents with partial dentition did not fit one of these classes, dentition was classified as “unclassified”. When no teeth were missing or missing teeth were replaced with fixed restorations, and when at least the first molars were present, the dentition was classified as a complete arch. In addition, the number of occlusal units in the anterior and lateral regions was assessed bilaterally. The unilateral maximum was 3 occlusal units in the anterior regions and 6 in the lateral regions. Taking into account that we only recorded a maximum of 2 molars, when a third molar was present, one molar was counted as 2 premolars. The health of the intra-oral and extra-oral soft tissues was also monitored.

Finally, oral treatment need was determined for all investigated residents, fully dentate, partially dentate or edentulous. For this purpose, the four dentists had consensus meetings to plan how the various conditions should be scored and recorded, and when intraoral treatment should be indicated for surgical, prosthetic, restorative, and periodontal needs. During the assessment of a subject, the two investigating dentists needed to agree that treatment would improve the subject's oral health. Surgical treatment need, when scored, nearly always consisted of the need for extraction. Prosthetic treatment need was indicated when removable prostheses were absent in edentulous or partly dentate residents, or were deemed to have inadequate function or retention. Restorative treatment need was indicated when caries or inadequately functioning restorations were found. Periodontal treatment was indicated when plaque and calculus should be removed by scaling and curettage. It was rare that one dentist considered some specific treatment necessary while the other did not, since dental treatment need was only determined intra-orally, without taking into account the subject's wishes or general health. In these rare cases of disagreement, no treatment need was recorded. In addition, overall treatment need was scored 'yes' if at least one of the four specific treatment needs was indicated.

Statistical analysis

The collected data were analyzed with a standard statistical program (SPSS 15.0, SPSS Inc., Chicago, IL, USA). Descriptive statistics were used to express the characteristics of the residents and treatment need. Chi-square tests were used to test for possible differences in the numbers of residents and treatment needs between groups with different lengths of stay (0-6 months vs. longer than 6 months) and different indications (somatic vs. psycho-geriatric). P-values ≤ 0.05 were considered significant.

Results

We included 355 residents in this study: 110 males and 245 females. See table 1 for details about their average ages and length of stay at the oral examination. 29% of the residents had stayed 6 months or less and 71% had stayed more than 6 months (Table 2).

Table 1. Demographic data for nursing home residents

Characteristic	Value	Range
Total number of residents	355	
Women	245 (69%)	
Men	110 (31%)	
Age at entrance of home (y)	81.8 ± 7.8	[40.5 – 100.2]
Age at examination (y)	84.1 ± 6.9	[70.0 – 102.6]
Length of stay (y)	2.3 ± 3.6	[0 – 37.8]

Table 2. Dental status of residents with different indications (somatic versus psycho-geriatric) and different lengths of stay (0-6 months versus longer than 6 months)

Subgroups	All residents Edentulous (Partially) Dentate			p-value
	(N=355)	(N=284)	(N=71)	
Stay 0-6 months	103 (29%)	85 (83%)	18 (17%)	0.45
Stay > 6 months	252 (71%)	199(79%)	53 (21%)	
Somatic Indication	168 (47%)	130 (77%)	38 (23%)	0.24
Psycho-geriatric Indication	187 (53%)	154 (82%)	33 (18%)	

Nearly half the residents (47%) had a somatic indication for the stay, and the remainder had a psycho-geriatric indication. Most residents were edentulous (80%), and one fifth was (at least partly) dentate. No significant differences

were observed in the proportions of edentulous and dentate residents between those with somatic vs. psycho-geriatric indications for stay or between residents that had stayed 6 months or less vs. those that had stayed longer.

Among the edentulous residents, 202 residents had replaced missing teeth with dentures in the upper and lower jaws; 32 residents had dentures in only the upper jaw, and 50 residents did not wear dentures. Of the 71 (at least partly) dentate residents, 42 had teeth in both jaws, 26 had teeth only in the lower jaw, and 3 had teeth only in the upper jaw. Of the 26 residents with teeth only in the lower jaw, 12 wore a denture in the upper jaw, and 14 did not wear dentures. Of the 3 residents with teeth only in the upper jaw, one wore a denture in the lower jaw and two did not wear dentures. The natural teeth were characterized according to the Kennedy-classification (Table 3).

Table 3. Dental status and distribution of natural teeth according to the Kennedy-classification

Dental status (N=355)	Lower jaw*	Upper jaw*
Edentulous	287	310
Dentate:	68	45
Complete arch	12	10
Kennedy class 1	23	7
Kennedy class 2	2	1
Kennedy class 3	3	3
Kennedy class 4	2	2
Mutilated	26	22

* Values indicate the number of residents with the observed status in the indicated jaw.

The 71 (at least partly) dentate residents had an average of 5.1 teeth in the upper jaw and 7.4 teeth in the lower jaw. Among the 42 residents with teeth in both the upper and lower jaws, the unilateral numbers of occlusal units in the anterior region (range = 0 to 3) were 1.7 (right) and 1.6 (left). Among these residents, the numbers of occlusal units in the posterior region (range = 0 to 6) were 1.6 (right) and 1.8 (left).

Intraoral soft tissue pathology was mainly related to wearing dentures. Denture-related ulcers were observed in the maxilla in 9 residents and in the mandible in 32 residents. Denture-related hyperemia was detected in 6 residents. Two residents presented with a fistula of dental origin.

Oral treatment needs

Table 4 gives an overview of the overall and specific treatment needs (surgical, prosthetic, restorative, and periodontal) determined in this study. Among the 355 residents, 70% met the criteria that treatment was required and 30% did not. One resident's record of a specific treatment need was incomplete. The most frequently observed need was for prosthetic care, needed in 62% of residents.

Table 4. Overall and specific oral treatment needs

Treatment need (N=354*)	Need N N (%)	No need N (%)
Overall	249 (70%)	105 (30%)
Surgical	48 (14%)	306 (86%)
Prosthetic	219 (62%)	125 (38%)
Restorative	27 (8%)	327 (92%)
Periodontal	42 (12%)	312 (88%)

* One resident not completely examined for treatment needs, so 354, not 355.

Table 5 shows the difference in overall oral treatment needs between resident subgroups. Oral treatment was needed in fewer long-term than short-term residents (67% vs. 78%), but the difference was not quite significant ($p=0.053$). In the subgroups according to indication for stay, no significant difference in treatment need was observed between long-term and newer residents (somatic indication $p=0.37$; psycho-geriatric indication $p=0.10$). All (partly) dentate residents, except one long-term resident, needed oral treatment. In these dentate residents we also found no effect on specific treatment needs of either length of stay or indication for stay. In the edentulous residents, significantly fewer long-term residents needed treatment (59%) compared to short-term residents (73%; $p=0.03$). The reduction in treatment need was only observed in edentulous residents with a psycho-geriatric indication for stay (57% long-term vs. 74% short-term, $p=0.049$). Among edentulous residents with a somatic indication for stay, the need for oral treatment was not significantly affected by length of stay (63% long-term vs. 72% short-term, $p=0.32$).

Table 5. Influence of length of stay on oral treatment need in all residents and those with different dental statuses and indications for stay

Group (N)	Length of stay	Need N (%)	No Need N (%)	No data N	Total N	p-value
All residents (355)	< 6 months	80 (78%)	23 (22%)	-	103	0.053
	> 6 months	169 (67%)	82 (33%)	1	252	Somatic
indication (168)	< 6 months	46 (78%)	13 (22%)	-	59	0.37
	> 6 months	78 (72%)	31 (28%)	-	109	
Psycho-geriatric ind. (187)	< 6 months	34 (77%)	10 (23%)	-	44	0.10
	> 6 months	91 (64%)	51 (36%)	1	143	
Edentulous residents (284)	< 6 months	62 (73%)	23 (27%)	-	85	0.03
	> 6 months	118 (59%)	81 (41%)	-	199	
Somatic indication (130)	< 6 months	33 (72%)	13 (28%)	-	46	0.32
	> 6 months	53 (63%)	31 (37%)	-	84	
Psycho-geriatric ind. (154)	< 6 months	29 (74%)	10 (26%)	-	39	0.049
	> 6 months	65 (57%)	50 (44%)	-	115	
Dentate residents (71)	< 6 months	18 (100%)	0 (0%)	-	18	0.55
	> 6 months	51 (98%)	1 (2%)	1	53	
Somatic indication (38)	< 6 months	13 (100%)	0 (0%)	-	13	-
	> 6 months	25 (100%)	0 (0%)	-	25	
Psycho-geriatric ind. (33)	< 6 months	5 (100%)	0 (0%)	-	5	0.66
	> 6 months	26 (96%)	1 (4%)	1	28	

Discussion

In considering the dental status of older residents of nursing homes, outsiders often think that edentulous residents wear dentures and dentate residents “have their own teeth”. In the present study, most older residents (80%) of the investigated nursing homes were edentulous, and of those, most (70%) wore dentures in the upper and lower jaws. Of the 71 dentate residents, only 16,9% had a complete dentate arch in the lower jaw and only 14,1% had a complete arch in the upper jaw. Thus, the large majority of dentate residents only had a limited number of teeth and occlusal units. The average numbers of teeth per dentate jaw and the average numbers of occlusal units in the frontal and distal areas were quite low.

A large majority (78%) of the short-stay residents aged over 70 years (in this study, the average age of this group was 81.7 years) were in arrears with dental treatment. When we divided the residents into groups that had stayed for \leq months and those that had stayed > 6 months, the two groups were comparable in dental status (similar proportions of edentulous and dentate residents). However, the oral treatment needs in the newer residents tended to be higher than in the long-term residents (78% vs. 67%, $p=0.053$). The relationship between treatment need and length of stay was not significantly different between residents with a somatic indication and those with a psycho-geriatric indication for stay.

However, duration of stay and dental status (edentulous vs. partly dentate) interacted with respect to oral treatment need. Among the subgroup of edentulous residents a significant reduction in time of oral treatment need was observed (73% short-term vs. 59% long-term, $p=0.03$). This inverse relation between oral treatment need and duration of stay was present only in the edentulous residents with a psycho-geriatric indication for stay (74% vs. 57%; $p=0.049$). Among edentulous residents with a somatic indication, the length of stay did not significantly affect treatment need (72% short-term vs. 63% long-term, $p=0.32$).

The reduction in treatment need in long-term edentulous residents with psycho geriatric indications may be explained by the status of this group at admission. Often, this subgroup of residents had ill-fitting dentures or no dentures. In these cases, the prosthetic treatment offered was non-invasive and reversible. Perhaps for that reason, treatment was more readily accepted by the residents and their delegates. The edentulous residents with somatic indications may more often have worn dentures at admission. However, those dentures typically had qualitative shortcomings, according to the dental researcher, and therefore were deemed in need of treatment. In those cases, the residents may have refused prosthetic treatment, because they had no or little complaints about their existing dentures.

All dentate residents needed dental treatment, except one long-term resident. Among the dentate residents, no significant differences in specific treatment needs could be shown between subgroups, either when grouped by the length of stay or by the indication of stay. However, these results may have been influenced by the low numbers of residents in these subgroups.

Thus, we could not show that in nursing homes that offer integrated dental care, generally the number of residents that needed oral treatment was reduced over time. Reduction of treatment need could only be shown in long-stay edentulous residents with a psycho-geriatric indication for stay. Despite the efforts of the institutional dental teams, the need for oral treatment persisted in virtually all (at least partly) dentate residents. One potential explanation may be that it is complicated to implement oral hygiene protocols in nursing homes.¹¹⁻¹³ When a resident lacks the ability to perform self-care sufficient to maintain natural dentition, it is difficult to maintain good oral health in a nursing home.

The persistent need for oral treatment among dentate residents, despite the fact that oral care was offered without financial thresholds, did not indicate that integrated dental care is irrelevant for dentate residents. Initial assessments, within a week after arrival of new residents, and subsequent treatments were not part of this study. An earlier study showed that the need for treatment would have been greater if only incidental care had been provided.¹⁴ It is possible that the institution dentists limited their treatments to eliminating observed pain and inflammation that arose from endodontic problems. These pain eliminating treatments were probably accepted readily by residents and their delegates. However, these “emergency” treatments often did not eliminate all treatment needs for those residents. The institution dentists may have been reluctant to perform irreversible treatments in dentate residents without complaints, even when it would have eliminated all of their oral treatment needs. Irreversible treatments may constitute a burden to the resident, which must be weighed against other considerations regarding the health and well-being of the resident.

When asked, institution dentists confirmed their reluctant attitude towards restorative treatments in weakened older residents, who did not complain themselves about their oral health. According to the dentists the conditions for preparation with rotating instruments and for placing restorations with light curing materials are often unfavorable. Furthermore, the prognosis of the restorations often is unpredictable with little or no self-care for oral hygiene by the resident. For surgical interventions the physical and mental condition of the resident can easily form obstructions and for periodontal treatments the mostly required high frequency is considered too much a burden for the resident. Prosthetic treatment however, according to the institution dentists often can lead to relatively quick improvement of the oral condition with little burden to the resident.

Conclusion

Even after a prolonged stay in homes with integrated dental care, still two-third of the residents are found to need dental treatment after intra-oral assessment. Virtually all (partly) dentate residents and over half of edentulous residents needed dental treatment. Only a modest reduction in treatment need was observed among long-term edentulous residents with a psycho geriatric indication for stay. The elimination of all treatment needs, particularly in (at least partly) dentate older residents, will remain a challenge for dental teams in nursing homes.

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Chapter

6

Discussion and recommendations for further research

Discussion and recommendations for further research

This study was carried out with the aim to gain insight in the dental status and treatment needs of nursing home residents and to study possible effects of offering integrated dental care to nursing home residents.

When this study started, little was known about the actual dental treatment needs of residents in nursing homes that offer integrated dental care. As described in the introduction, this study originated from a postgraduate program to educate dentists to dentist-geriatrics. Three dentists in this program offered integrated dental care in three nursing homes. The nursing home dentists were well known to the residents, their delegates and relatives, and the medical, nursing and managing staff. They were therefore in a good position to explain the need for research in this field and to obtain cooperation of all involved. It was decided to determine the dental status and possible treatment needs of the residents in these homes by intra-oral inspection. We ascertained surgical, periodontal, restorative and prosthetic treatment needs. Furthermore, we determined the number of residents who presented one or more of these treatment needs. The inspections were performed objectively, without taking into account the resident's wish to receive dental treatment. Nor did the resident's physical and mental condition or medication influence the inspections.

The intra-oral inspections were performed in teams of two dentists. To avoid bias, the main inspection was performed by a dentist who was not involved in the treatment of the resident. The second dentist was connected to the nursing home and noted the findings. In case of doubt the two dentists deliberated until they concurred about the treatment needs. In the same way, dental treatment needs were also determined in the residents of a fourth nursing home. This home offered incidental dental care by an external dentist, after referral by the medical and nursing staff based on reported pain, pathology, or disturbed function. The external dentist gave permission for

the inspection and provided data about his incidental work for the residents. Together with the intra-oral inspections, demographic data about the residents were obtained, such as age, reason for admittance to the nursing home, and duration of stay.

The dental treatment needs in nursing homes offering integrated dental care (Chapter 2).

The intra-oral inspections showed that 72% of the 432 nursing home residents, who participated in our study, needed dental treatment. This high percentage is remarkable, since in all three houses integrated dental care was accessible and free of charge. However, the percentages differed strongly between the nursing homes: 44% (home A), 91% (home B) and 90% (home C).

The differences in dental treatment need between the homes may be explained by differences in resident population (age, dental status, indication for stay, duration of stay), the infrastructure with regard to dental care, and the number of dentist hours and the number of oral hygienist hours per resident per year.

The residents of homes A and B had on average the same age, 81.7 and 81.4 years, and high rates of edentulism, 80% and 78% respectively. The residents in home C were younger, on average 69.8 years, and less residents were edentulous, 54%. In home A residents were treated by a dentist on average 2.3 hours per year, against 1.1 hours in home B and 1.6 hours in home C.

In home C lived many, relatively young, long-stay residents with a somatic indication and a natural dentition. These residents often needed complicated care in general and were, for instance, not able to maintain oral hygiene themselves. This home had appointed an oral hygienist, who treated the dentate residents on average about 6 hours per year per resident. The institution dentist mainly provided restorative and periodontal care to the 46% dentate residents. Therefore, the 1.6 hours of dental treatment per resident

per year in home C most likely translates to over 3 hours of treatment per dentate resident per year. Although they received relatively much treatment by the dental team, virtually all dentate residents (96%) in home C still presented a need for dental treatment. Among the edentulous residents in home C, who received much less dental care, treatment need was also high: 84%.

In homes A and B also virtually all (partly) dentate residents were found to need dental treatment. The relative low dental treatment need (44%) in home A may be explained by a combination of factors. First of all, much more residents (80%) in home A were edentulous than in home C (54%). In home B also most residents (78%) were edentulous, but they received less dental treatment than in home A, on average 1.1 hours per year vs. 2.3 hours in home A. Another factor is that most residents in home A had a psycho-geriatric indication, 64%, compared to 37% and 32% in homes B and C respectively. Elderly residents with a psycho-geriatric indication tend to stay longer in the nursing home than elderly residents with a somatic indication. As a result the residents in home A, at the moment of the dental examination, had stayed on average 28 months in the home, compared to 18 months in home B. This means that the dentist in home A had more time for prosthetic rehabilitation in, predominantly, elderly long-stay residents and that this effectively reduced dental treatment needs.

This study showed that, at the time of the intra-oral examinations, reducing the number of residents with any dental treatment needs was mainly achieved by prosthetic treatment of elderly edentulous residents, particularly those with a psycho-geriatric indication. Our findings also suggest that virtually all nursing home residents with a natural dentition, still present some treatment need. With the younger residents in home C this was the case, despite regular restorative treatment by the institution dentist and an additional 6 hours per year of care by an oral hygienist. Dentate nursing home residents generally are not able to clean their teeth themselves. The daily oral hygiene care provided

by the nursing staff is insufficient to preserve the natural dentition. With the older dentate residents, it seems that as long as no acute problems as pain or swelling were observed, often restorative and/or periodontal problems are left untreated.

The elderly Dutch population will grow significantly in the coming decades. This will likely lead to an increased demand for nursing home care. Moreover, an increasing percentage of elderly Dutch who enter a nursing home will still have their natural dentition. These developments indicate that the demand for oral care in nursing homes is likely to increase even more.

Integrated vs. Incidental dental care (chapter 3)

We compared the dental treatment needs in nursing home A, that offered integrated dental care, with the treatment needs in a fourth nursing home, D, that offered incidental dental care. Integrated care means that the institution has a dentist who examines all residents on entry in the home and makes a treatment plan. Incidental care means that the nursing home staff calls the external dentist when they or the resident consider dental treatment necessary. Homes A and D were located in the same town. Home A had 175 residents and home D had 120 residents, who were comparable in demographic data.

We found that in home D 87% of the residents needed dental treatment, compared to only 44% in home A. In the study described in chapter 2, we concluded that the relatively low treatment need observed in home A was mainly the result of prosthodontic treatment in elderly edentulous residents. In home D also the majority, 72%, of the residents were edentulous, a little less than in home A, 80%. The fact that in home D the portion of (partly) dentate residents, who almost always present dental treatment need, was a little higher than in home A, cannot explain that in home D dental treatment need was twice as high. Apparently, the incidental care in home D resulted in much less

prosthodontic treatment. This is also reflected by the incidence of denture-related soft tissue pathology, 20% in home D vs. 9% in home A. Furthermore, in home D 32% of the edentulous residents did not wear dentures, which was scored as needing dental treatment, compared to only 10% in home A.

We conclude that in home D, with incidental dental care, treatment needs in edentulous residents, such as ill-fitting dentures that are not worn or even the absence of dentures, are generally not seen as sufficient reason for dental treatment. In home A, that offered integrated dental care, the institution dentist put much effort in eliminating prosthodontic problems, resulting in a relatively low treatment need of 44%. The integrated dental care in home A came at a price: € 229 per resident per year for the dental team and € 143 laboratory costs. The costs of the incidental care in home D were much lower: € 15 per resident per year for the dental team and € 20 for the laboratory.

Assessment of dental treatment needs by primary care nurses (chapter 4)

As described earlier, intra-oral inspection by dentists showed that 73% of the residents in three nursing homes offering integrated dental care, still presented arrears in dental treatment. We were interested in whether these residents appreciated the oral care and treatments offered, and how they viewed their own oral health condition and treatment needs. However, asking nursing home residents about their oral health and the dental treatment needs is often complicated, due to their somatic and/or mentally compromised condition. Therefore, we asked the primary care nurses in three nursing homes to estimate the functional oral health condition of the residents and their treatment needs. Primary care nurses, based on daily observations of the resident and contact with patients' relatives, gather information about the residents' functional oral condition and other aspects that may influence the indication for dental treatments. To avoid bias, the nurses were not interviewed by the nursing home dentists, but by independent experts without a professional dental background.

The primary care nurses judged the oral health condition of the residents as good, 8.3 on a scale of 0-10. According to the nurses only 9% of the residents required dental treatment, which stands in stark contrast to the 73% found by the dentists. Apparently, the nurses perceive residents in good functional oral health, who do have treatment needs ascertained by dentist researchers. This finding fits with what we observed in the home offering incidental dental care, where particularly prosthodontic problems were left untreated. The residents themselves often do not complain, but the nursing staff also do not perceive arrears in dental treatment to the extent that they would arrange a visit to the dentist. Furthermore, the nurses based their opinion on daily observation of the residents and may also have considered the burden of undergoing dental treatment in relation to the general condition and life expectancy of the residents. In the intra-oral study, such considerations were not taken into account by the dentists, who possibly focused more on long-term prevention of pain and discomfort.

Effect of integrated dental care (chapter 5)

We wanted to investigate whether staying in a nursing home that offers integrated dental care, reduces the number of residents who present dental treatment need. We focused on the oral treatment needs in residents who were 70 years or older. The effect of dental care in elderly nursing home residents has our special interest, because of the expected strong increase in the number of elderly Dutch people, who also more and more retain their natural teeth into their old age. Originally 432 residents of three nursing homes, that offered integrated dental care, participated in our study. After exclusion of residents younger than 70 years, 355 residents remained. We divided these 355 residents in two groups: a short-stay group (n=103), who at the time of the oral inspection had lived in the home for less than 6 months, and a long-stay group (n=252) who had stayed longer than 6 months. The residents had been examined by the institution dentist when they entered the home, and received immediate treatment in case of pain and swelling. Our

intra-oral inspections nearly always took place after the initial screening. We compared the treatment needs in the short-stay and long-stay groups. Virtually all (partially) dentate residents, irrespective of length of stay, presented some dental treatment need. The specific (surgical, restorative, periodontal, prosthetic) treatment needs tended to be numerically lower in the long-stay group, but were not statistically significantly different from the short-stay group. The low number of dentate residents that we investigated, 18 in the short-stay group and 53 in the long-stay group, may have obscured a possible long-term effect of the integrated dental care on the specific treatment needs in these residents. It seems safe, however, to suggest that offering integrated dental care at least prevents further deterioration of the oral health of the (partially) dentate residents. In the edentulous residents with a somatic indication the reduction in treatment need, short-stay 72% vs. long-stay 63%, was also not statistically significant. Only in edentulous residents with a psychogeriatric indication a significant reduction in treatment need with length of stay was observed: short-stay 74% vs. long-stay 57%. This finding confirms what we observed in chapter 2, where we concluded that the relative low treatment need (44%) in nursing home A was related to a high percentage of edentulous residents with a psycho-geriatric indication. These residents had stayed relatively long in the home, during which they had received effective prosthodontic treatment.

Even despite a reduction in treatment need after receiving prolonged integrated dental care, still more than half the residents present a need for dental treatment. The reasons for these treatment needs are manifold. Lack of oral self-care or insufficient daily oral care by the nursing home staff may lead over and over again to dental treatment need. Residents, or their delegates, may refuse treatment. Also, the physical and/or mental condition of the resident may contra indicate oral treatment. Limitations in the dental facilities in the nursing homes can make some treatments difficult to perform. Referral to a specialist can have drawbacks that outweigh the dental treatment

need. Finally, and not unimportantly, the attitude and interest of the institution dentist may affect the extent of the dental care.

Conclusions

- Intra-oral examination of residents living in three nursing homes that offer integrated dental care, showed that a large majority of these residents, 72%, presented some need for dental treatment. The percentages differed strongly between the nursing homes, which is likely due to differences in the resident population and the annual amount of professional dental care.
- Virtually all (partly) dentate residents, who made up almost one quarter of the entire group, showed a dental problem. This indicates that residents generally cannot care for their teeth themselves. Also, the daily oral hygiene care provided by the nursing staff is insufficient to preserve the natural dentition, even with six hours annually of treatment by a dental hygienist, as was provided for younger nursing home residents. With these (partly) dentate residents the institution dentist treats or prevents pain and swelling, but treatment needs that are not urgent, such as complicated endodontics, are often left untreated.
- Almost two-thirds of the edentulous residents, 64%, showed arrears in dental treatment as a result of, for example, badly fitting dentures or wearing no dentures at all. The lowest need for dental treatment was observed among elderly edentulous residents with a psycho-geriatric indication.
- In a nursing home that offers incidental dental care, twice as many residents, 87%, show dental treatment needs compared to a comparable population in a home with integrated dental care. As the

treatment need among dentate residents is virtually universal, this means that with incidental dental care less initiatives are taken to improve the oral status of edentulous residents. Such initiatives will not come from the residents, as they seldom complain about their oral status.

- The nursing home staff generally perceive the oral health of the residents in their care as good without need for dental treatment, while intra-oral examination by a dentist does show treatment need. This means, that the nursing staff do not perceive arrears in dental treatment, such as badly functioning or absent dentures, to the extent that they would arrange a visit to the dentist.
- A longer stay in the nursing home, and thereby receiving more dental care, was associated with less treatment need particularly among elderly edentulous residents with a psycho-geriatric indication for stay. These residents tend to stay longer in the nursing home than residents with a somatic indication for stay. This means that the institution dentist has more time and opportunity to plan and carry out prosthodontic treatment.

Our finding that about three-quarters of the nursing home residents presented a need for dental treatment, corresponds to other studies with clinical oral examination of elderly living in institutions. Percentages of more than 80% of the residents needing dental treatment are common.^{1,2,3} In residents wearing dentures incidences of over 70% of denture-related pathology of the oral mucosa are reported.^{4,5} Regarding dentate residents, studies report tooth decay in 70% of the residents^{4,6}, or that virtually all dentate residents needed dental treatment⁷, like we found in our study. Peltola et al.⁸, who found that three-quarters of the dentate long-term hospitalized elderly in their study needed dental treatment, remarked that they may have underestimated

the needs, because of the difficulty of examining the frail and medically compromised elderly. That statement may, to a greater or lesser extent, be true for many of the studies mentioned here.

In some of the studies mentioned above, the residents were asked whether they thought they needed dental treatment.^{1,3,7} Invariably the subjective treatment need was a small fraction of the need according to the clinical examinations. This is similar to the fact that the residents in the nursing homes with integrated dental care that we studied, seldom complained about their dental status, despite the treatment needs that we ascertained. Our study has shown that these needs are also not perceived by the nursing home staff who provide daily oral care for the residents. However, we have also established that providing integrated dental care can lead to a significant reduction in the number of nursing homes residents needing dental treatment, particularly through prosthodontic treatment of edentulous residents. This may improve the lives of these residents, as studies indicate that denture therapy can improve the oral health-related quality of life in the elderly.^{9,10}

Recommendations for further research

When new residents arrive in a nursing home, they sometimes present with pain or swelling in the oral region or some other acute dental problem. These residents are treated immediately by the institution dentist. The effects of this aspect of the integrated dental care are not part of this study. Intra-oral examination of a sizeable group of newly arrived residents before they receive dental treatment, may serve as a reference to gain insight in the effect of this side of the integrated dental care.

The study described in this book is in fact a cross-sectional study in which we have determined the dental treatment need of the nursing home residents at one single moment. Subsequently we have identified different groups in the population, and compared the treatment needs in these groups. A longitudinal

study with repeated observations of the treatment need within each resident, starting with a zero measurement as described above, would give a more precise insight in the effects of the integrated dental care. It should be kept in mind, however, that the population under investigation includes many residents with a compromised health. For these residents repeated intra-oral examination could be an unreasonable burden. The condition of the resident also makes precise intra-oral examination difficult for the researchers.

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Chapter

7

Summary

Summary

This thesis deals with integrated dental care in nursing homes. In the introduction, chapter 1, the increasing number of older dentate Dutch citizens is described and predicted in the light of the oral status and dental treatment needs of present and future residents of nursing homes. Four questions were raised to be answered by the results of this study. The used methods of investigation and the results were published in four articles in the Journal of Special Care Dentistry, being presented in this thesis as chapter 2-5.

In chapter 2, a study on the dental treatment needs of the residents of three nursing homes offering integrated dental care is described. Dentist researchers intra-orally examined the residents and found that 72% were in need of dental treatment. However, the percentage differed strongly between the homes: 44%, 91% and 90% respectively. The reasons for these differences must be sought in differences between the homes in the input of working hours of the dental team, the attitude of the institution dentist towards surgical and prosthetic treatments in older nursing home residents, the average age of the residents, the indication for intake in the home and the percentage of (partly) dentate residents.

In chapter 3 a nursing home offering integrated dental care is compared to a home offering incidental dental care. In the home offering integrated dental care, the average overall treatment needs appeared lower (44,4% versus 86,9%), the costs for the dental team and the laboratory costs per resident were higher (per year 229€+143€ versus 15€+20€) and less edentulous residents were not wearing dentures (10,3% versus 32%). Soft tissue pathology was found about twice as often in the home offering incidental care. The main cause for these differences must lie in the different ways in which dental care is offered in the nursing homes.

Chapter 4 describes a study in which 36 primary care nurses in the three homes offering integrated dental care were interviewed about the oral health of the residents in their ward. The nurses generally judged the oral health of the residents in their care as good (8,3 on a scale of 0-10). According to these nurses, only 9% of the residents required dental treatment. Edentulous residents wearing dentures were given a remarkably high score for their oral health in functional respect. The difference between the judgments of the treatment needs by the nurses (9%) and the dentists (72%) is explained by the differences in education and method of evaluation. The nurses base their evaluation on daily observations of function during eating, speaking, personal hygienic care and possibly remarks from the resident on oral pain or discomfort. Apparently a nursing home resident can be perceived in good functional oral health, even when intra-oral examination by a dentist reveals a need for dental treatment. Furthermore, dentists may focus more on prevention of dental problems and may be less willing to take risks on possible dental problems.

The study presented in chapter 5 is about the effect of integrated dental care on the oral treatment needs in elderly residents (70+) during their stay in the nursing home. Residents who had stayed shorter than 6 months were compared with those who had stayed longer than 6 months. In most subgroups of residents the specific treatment needs seemed reduced in the long-stay residents. However, a statistically significant reduction could only be shown in edentulous residents, especially those with a psycho-geriatric indication for stay. That the effect of the integrated dental care was most obvious in edentulous residents with a psycho-geriatric indication may be explained by the fact that they, on average, have a longer duration of stay. Another factor may be that prosthetic treatment is reversible and forms a relatively light burden for the resident.

Chapter 6 is the general discussion with conclusions and suggestions for further research. It is concluded that, according to dentist researchers, the dental treatment need among nursing home residents is high (72%) and remains high during their stay, in spite of the offered integrated dental care. When the input of working hours of the dental team was relatively high, as was the case in one of the investigated homes, the percentage of residents needing treatment was just 44%, particularly as a result of prosthodontic treatment of edentulous residents. Elimination of all or most dental treatment needs will remain a challenge for dental teams in nursing homes, especially for dentate residents. The appreciation for the care by the first care nurses was high and in their eyes only a limited number of residents (9%) needed care.

Further research is necessary in the field of the indication for dental treatment in new and long staying nursing home residents. These indications are complex, as these residents often have a weakened health. Acute and long term treatments must be planned in cohesion with the other somatic and/or psycho-geriatric treatment needs to stabilize and improve the condition of the resident.

Chapter

8

Samenvatting

Samenvatting

Dit proefschrift gaat over geïntegreerde tandheelkundige zorg in verpleeghuizen. In de inleiding, hoofdstuk 1, wordt het toenemende bevolkingssegment van de oudere Nederlanders beschreven en voorspeld voor de komende jaren. Dit in het licht van de tandheelkundige status en de behandelbehoeften van huidige en toekomstige bewoners van verpleeghuizen. Vier vragen worden gesteld die door de resultaten van de beschreven studie zullen worden beantwoord. De gebruikte methoden in het onderzoek en de resultaten werden gepubliceerd in 4 artikelen in *Special Care in Dentistry*. In dit proefschrift vormen zij de hoofdstukken 2-5.

In hoofdstuk 2 wordt een studie beschreven naar de tandheelkundige behandelbehoeften van de bewoners van drie verpleeghuizen waar geïntegreerde tandheelkundige zorg wordt aangeboden. Geïntegreerde tandheelkundige zorg betekent dat de aan het verpleeghuis verbonden tandarts alle nieuwe bewoners onderzoekt en dat aan de bewoners van het huis regelmatige controles en behandelingen worden aangeboden in de inpatient aanwezigheid van faciliteiten voor onderzoek en behandeling. De tandheelkundige zorg wordt aangeboden zonder extra kosten voor de bewoner en wordt georganiseerd in samenwerking met de medische en verpleegkundige staf. Het bleek dat, wanneer de tandarts-onderzoekers intra-oraal de tandheelkundige status vaststelden en de tandheelkundige behandelbehoeften bepaalden, 72% van alle bewoners tandheelkundige behandeling nodig hadden. Per onderzocht verpleeghuis was dit percentage echter sterk verschillend, namelijk 44%, 91% en 90%. De oorzaken van deze verschillen moeten worden gezocht in de input aan werkuren van het tandheelkundig team, de opstelling van de tandarts ten opzichte van chirurgische en prothetische behandelingen bij oudere bewoners, de gemiddelde leeftijd van de bewoners, de indicatie voor opname in het verpleeghuis en het percentage (gedeeltelijk) betande bewoners.

In hoofdstuk 3 wordt een verpleeghuis dat geïntegreerde tandheelkundige zorg aanbiedt, vergeleken met een huis dat incidentele tandheelkundige zorg aanbiedt. Onder incidentele zorg wordt verstaan dat een, niet in het huis op regelmatige basis aanwezige, externe tandarts wordt geconsulteerd op initiatief van de medische en/of verpleegkundige staf. Dit naar aanleiding van opgemerkte pijn, pathologie of verstoorde orale functie bij een bewoner. De behandelbehoefte in het huis met geïntegreerd aangeboden tandheelkundige zorg bleek lager (44,4% versus 86,9%), de kosten voor het tandheelkundig team plus de tandtechnische kosten per jaar per bewoner/bed waren hoger (229€+143€ versus 15€+20€) en minder edentate bewoners functioneerden zonder een gebitsprothese (10,3% versus 32%). Pathologie van de zachte weefsels werd in het huis met de incidentele zorg ongeveer twee keer zo vaak aangetroffen. De oorzaak voor de aangetroffen verschillen moet liggen in de verschillen in de aangeboden zorg.

Hoofdstuk 4 beschrijft onderzoek waarin 36 eerst verantwoordelijk verplegenden (EVV's) van de drie tehuizen met geïntegreerde tandheelkundige zorg wordt gevraagd naar de mondgezondheid van de bewoners op hun afdeling. De verplegenden beoordeelden de mondgezondheid van de bewoners als goed (8,3 op een schaal van 0-10). Volgens hen had slechts 9% van de bewoners tandheelkundige behandeling nodig. Edentate bewoners die een kunstgebit droegen werden opmerkelijk goed beoordeeld voor hun mondgezondheid in functioneel opzicht. De oorzaak voor het verschil in beoordeling van de behandelbehoefte moet gezocht worden in de verschillen in opleiding en de methode van beoordeling: De verplegenden baseren hun oordeel op hun dagelijkse observatie van de functie bij het eten, spreken, het ontvangen van persoonlijke hygiënische zorg en eventuele opmerkingen van de bewoner over pijn of ongemak. Kennelijk kan een verpleeghuisbewoner beoordeeld worden als bewoner met een goede mondgezondheid in functioneel opzicht, terwijl tandartsen op basis

van intra-oraal onderzoek behandel noodzaak vaststellen. Tandartsen zijn waarschijnlijk meer gericht op preventie van tandheelkundige problemen en zijn waarschijnlijk minder geneigd risico's te nemen op het krijgen van pijn en ongemakken door problemen die voorkomen kunnen worden door tijdige behandeling.

In hoofdstuk 5 wordt een onderzoek gepresenteerd naar de effecten van geïntegreerde tandheelkundige zorg in de tijd gedurende het verblijf in het verpleeghuis. Het bleek dat bij vergelijking tussen oudere bewoners die korter dan 6 maanden verbleven en bewoners die langer dan 6 maanden verbleven, in bijna alle onderscheiden behandelbehoeftes en groepen van bewoners de behandel noodzaak leek af te nemen. Echter, de afname was alleen statistisch significant bij edentate bewoners, in het bijzonder die met een psychogeriatrische opname-indicatie. De bevinding dat effecten van geïntegreerde tandheelkundige zorg het duidelijkst waren bij edentate bewoners met een psychogeriatrische opname-indicatie, kan mogelijk worden verklaard door de gemiddeld langere verblijftijd van deze bewonersgroep. Een andere factor kan zijn dat prothetische behandeling niet invasief en reversibel is en relatief weinig belastend voor de bewoner.

In hoofdstuk 6 wordt de algemene discussie over het onderzoek gepresenteerd, worden conclusies getrokken en aanbevelingen gedaan voor verder onderzoek. De conclusie is dat volgens tandarts-onderzoekers de tandheelkundige behandel noodzaak bij verpleeghuis-bewoners hoog is (72%) en hoog blijft gedurende het verblijf, ondanks de aangeboden geïntegreerde zorg. Volgens de eerst verantwoordelijk verplegenden had slechts 9% van de bewoners behoefte aan tandheelkundige behandeling. Als het aantal werkuren van het tandheelkundig team wordt uitgebreid, zoals in een van de onderzochte huizen, daalt het percentage van bewoners met behandel noodzaak. In het betreffende huis daalde het tot 44%. Eliminatie

van alle, of de meeste behandelbehoeften zal een uitdaging blijven voor de tandheelkundige behandelteams in verpleeghuizen, vooral voor betande bewoners.

Verder onderzoek is nodig op het gebied van de indicatie voor tandheelkundige behandeling van de nieuwe en langer verblijvende bewoners van verpleeghuizen. Deze indicatie is complex, omdat deze bewoners vaak een zwakke gezondheid hebben. Acute zorg en zorg op de lange termijn moet worden gepland in samenhang met de andere somatische en/of psychogeriatrische behandelbehoeften om de conditie van de bewoner te stabiliseren en zo mogelijk te verbeteren.

Curriculum vitae

Paulus Franciscus Maria Gerritsen werd op 8 maart 1945 geboren in Goes. Na zijn aanvankelijke opleiding Gymnasium A in Zundert, voltooide hij het Gymnasium B aan het Bisschoppelijk College te Sittard.

Zijn tandheelkundige studie werd aangevangen aan de Universiteit Nijmegen. Na zijn kandidaatsexamen in Nijmegen voltooide hij zijn tandheelkundige studie aan de Gemeente Universiteit van Amsterdam, faculteit Tandheelkunde, in 1974.

Zijn eerste stappen in een tandheelkundige praktijk zette hij bij collega Klinkert te Goes, daarna in de praktijk van collega Bruynzeel te Zierikzee. Hij startte zijn eigen praktijk in april 1976 aan de Nassaulaan te Goes. Hij beëindigde zijn praktijkvoering aldaar in juni 2014. Als tandarts geriatric is hij nog werkzaam binnen de SVRZ locatie ter Valcke te Goes.

Na zijn werkzaamheden in deeltijd bij de schooltandverzorging Noord- en Zuid-Beveland van 1978 tot 1984, verbond hij zich als tandarts aan het verpleeghuis Ter Valcke. In 1997 werd aldaar, op verzoek van hem, een praktijkkamer ingericht zodat reguliere tandheelkunde kon plaatsvinden.

Gezien zijn interesse in de beroepsbelangen van de tandheelkunde, werd hij in diverse bestuursfuncties benoemd, achtereenvolgens als penningmeester, secretaris en voorzitter van de afdeling Zeeland van de NMT, lid van de financiële commissie van de NMT, lid van het bestuur van het toenmalig Ziekenfonds en Aanvullingsfonds Midden-Zeeland, lid van de Afdelingsraad Zeeland, en later voorzitter Regionale Begeleidingscommissie en Centrale Klachtencommissie Zuidwest-Nederland van de NMT tot 2010. En dichter bij huis, voorzitter van de Weekenddienstgroep de Bevelanden.

Om het sociale leven binnen zijn gemeenschap niet te verwaarlozen was hij 10 jaar secretaris van de Sociëteit Van Ongenuchten Vrij te Goes, 6 jaar voorzitter van de golfvereniging Reymerswael en een jaar voorzitter van de Kiwanisclub Goes-De Bevelanden.

In 2004 ontving hij uit handen van de Voorzitter van De Nederlandse Vereniging van Gerodontologie, dr. A. van Andel, de registratie Tandarts-Geriatrie. Prof. dr. C de Putter en hij waren de eerste twee geregistreerden voor deze nieuwe differentiatie. In 2014 behaalde hij zijn herregistratie. Paul heeft een dochter, Charlotte, getrouwd met Johannes, en twee kleinkinderen, Noortje en Annelot.

Dankwoord

Dit proefschrift zou nooit tot stand zijn gekomen zonder de plezierige samenwerking met een aantal mensen, die ik graag zou willen vermelden.

Prof. dr. C. de Putter, promotor .

Beste Kees, eind jaren negentig, begin jaren 2000 leerden we elkaar kennen tijdens een vergadering van de wetenschappelijke vereniging van de Gerodontologie (NVGd). Je doel was het oprichten van een differentiatie geriatrische tandheelkunde en je zocht tandartsen die zich wilden en konden verdiepen in de tandheelkundige gezondheid van de kwetsbare oudere mens. Samen met G.R.E. Schuil en J. van Twillert, vormden wij een viertal dat zich liet bijscholen door hoogleraren en professionals verbonden aan het UMC Utrecht. Tijdens deze studie ontvingen wij de opdracht van de toenmalige Ziekenfondsraad (heden CVZ) om een onderzoek in te stellen naar de tandheelkundige gezondheidssituatie van verpleeghuisbewoners. Met zelf ontworpen formulieren bezochten en onderzochten wij in drie verpleeghuizen de dentitie van de bewoners en alle gegevens werden nauwkeurig geregistreerd. Helaas ontviel ons door een motorongeluk onze vriend en collega Gerard Schuil. Niet veel later verhuisde Jan van Twillert naar Ameland en vanwege de afstand was hij gedwongen zijn taken in Utrecht te beëindigen. Desondanks zijn wij samen verdergegaan en zowel het onderzoeksrapport als de differentiatie tandarts-geriatrie zijn beide tot stand gekomen. Tijdens deze periode hebben we veel congressen bezocht in binnen- en buitenland. In Groningen, Londen en Luzern was de top van de geriatrische tandheelkunde bijeen, alwaar je mij introduceerde bij beroemde buitenlandse collega's. Ook na het aanbieden van het rapport "Een Tandje Erbij" aan dr. J den Dekker, de tandheelkundig adviseur van de Ziekenfondsraad, heb ik het contact in het UMC Utrecht mogen behouden en op die manier de benodigde stappen gezet naar de publicaties in Special Dental Care, de grondslag voor dit proefschrift. Zonder jouw kennis en kunde, en je begeleiding zou het onmogelijk geweest zijn dit resultaat te behalen. Daarom mijn dank voor het in mij gestelde vertrouwen.

Dr. J.H. Abbink, co-promotor.

Beste Jan, hoewel jij in een later stadium betrokken werd bij het onderzoek, was je invloed op het tot stand brengen van de laatste publicaties in SDC en het manuscript duidelijk merkbaar. Transparant schrijven, statistiek en duidelijkheid waren door jou het motto van elke bijeenkomst samen. Zo leerden wij elkaar kennen en begrijpen. Je begeleiding was onmisbaar. Ook aan jou mijn dank voor je in mij gestelde vertrouwen.

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Lofwaardig hebben de paranimfen, mijn broer Harry Gerritsen en mijn collega Rutger Batenburg, kaakchirurg in ADRZ en ZeelandCare, mij gesteund voor en tijdens mijn promotie en verdienen zij mijn oprechte dank.

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