The development and application of an oral health care model for institutionalised older people

Luc De Visschere

UNIVERSITEIT GENT

Wie zijn geestdrift behoudt,
wordt wellicht ouder van jaren,
maar nooit oud

- Camille Huysmans -

Het leuke aan de ouderdom is
dat je kan fluiten
terwijl je je tanden poetst

- Jack Carter -

Aan Christine,
Wouter en Nele,
Tom en Marlies en Klara,
Josefien

Met dank aan de familie Schepens, Mannens, Van Laere, Coussens, Sintobin en Defeau

The development and application of an oral health care model for institutionalised older people

Luc De Visschere

Thesis submitted in partial fulfilment of the requirements for the degree of
'Doctor in de Tandheelkunde'

2010, Ghent University (Belgium)

Promotor:	Prof. dr. Jacques Vanobbergen – Ghent University
Co-promotor:	Prof. dr. Cees de Baat – Radboud University Nijmegen Medical Centre
Advisory committee:	Prof. dr. Jacques Vanobbergen – Ghent University
	Prof. dr. Cees de Baat – Radboud University Nijmegen Medical Centre
	Prof. dr. Jos Schols – Maastricht University
	Prof. dr. Ronald Verbeeck – Ghent University

NOTICE

The present research has been published, accepted or submitted for publication:

International Journals with peer review

Vanobbergen J., De Visschere L. Factors contributing to the variation in oral hygiene practices and facilities in long-term care institutions for the elderly. Community Dental Health. 2005, 22: 260-265.

De Visschere L., Vanobbergen J. Oral health care for frail elderly people: actual state and opinions of dentists towards a well-organised community approach. Gerodontology 2006, 23 (3): 170-176.

De Visschere L., Grooten L., Theuniers G. and Vanobbergen J. Oral hygiene of elderly p eople in long-term care institutions – A cross-sectional study. Gerodontology, 2006 Dec 23 (4): 195-204.

G.J. van der Putten, L. De Visschere, J. Vanobbergen, J.M.G.A. Schols, C.,de Baat. The guideline oral health care for dependent residents in long term care facilities, 2007: dire necessity. Tijdschr Gerontol en Geriatr 2008; 39: 202-207.

L.M.J. De Visschere, G.J. van der Putten, C. de Baat, J.M.G.A. Schols, J.N.O. Vanobbergen. De Richtlijn Mondzorg voor ouderen in zorginstellingen. Effectiviteit en implementatie in Nederland en Vlaanderen. Ned Tijdschr Tandheelkd 2009;116: 23- 27.

De Visschere L., The impact of undergraduate geriatric dental education on attitude of recently graduated dentists towards institutionalised elderly people. European Journal of Dental Education. 2009 Aug 13(3):154-161.

De Visschere L, van der Putten GJ, Vanobbergen J, Schols J and de Baat C. An oral health care guideline for institutionalized older people. Gerodontology 2010; in press

De Visschere L, Schols L, van der Putten GJ, de Baat C and Vanobbergen J. Effect evaluation of a supervised versus non-supervised implementation of an oral health care guideline in nursing homes: a cluster randomized controlled clinical trial. Gerodontology 2010, in press.

Gert-Jan van der Putten, Luc De Visschere, Jos Schols, Cees de Baat, Jacques Vanobbergen. Supervised versus non-supervised implementation of an oral health care guideline in (residential) care homes: a cluster randomized controlled clinical trial. BMC Oral Health 2010, 10:17. www.biomedcentral.com/1472-6831/10/17.

De Visschere L., De Baat C, Schols JMGA, Deschepper E, Vanobbergen J. Evaluation of the implementation of an 'oral hygiene protocol' in nursing homes: a 5-year longitudinal study. Community Dent Oral Epidemiol. 2009 submitted, February 2010 1st revision, September 2010 accepted.

De Visschere L, de Baat C, De Meyer L, Van der Putten GJ, Soderfeldt B, Vanobbergen J. Journal of Advanced Nursing, JAN, May 2010 submitted

Abstracts published in journals or abstract books

Vanobbergen J, De Visschere L. Variations in oral hygiene procedures in long-term care institutions for elders. 8th Conference of the European Association of Dental Public Health. Yvaskylä, August 2003, Community Dental Health 2003; 20: 194-abstractbook pg 91.

De Visschere L, Vanobbergen J. Oral hygiene procedures and facilities and oral cleanliness of elders living in long-term care institutions. 9th Conference of the European Association of Dental Public Health. Porto September 2004, Community Dental Health 2004; 21: 247.

De Visschere L, Vanobbergen J. Dental care to frail elderly people: opinions of dentists towards a structured approach. 1st European Symposium on Gerodontology Geneva, 22-23 April 2005.

L. De Visschere, J. Vanobbergen. Effectevaluatie van een mondhygiëneprotocol voor ouderen die in rusthuizen en rust- en verzorgingstehuizen verblijven. Symposium Mondgezondheid en Welzijn Gent 26 juni 2006.

De Visschere L, Van der Putten GJ, de Baat C, Schols JMGA, Vanobbergen J. Possible enabling and disabling factors when implementing an oral hygiene protocol in nursing homes. Meeting European College Gerodontology. Katowice Poland June 2007.

De Visschere L, Van der Putten GJ, de Baat C, Schols JMGA, Vanobbergen J. Recently graduated dentists' knowledge and perception of older people. 12th congress of the European Association of Dental Public Health. Ghent-Leuven September 2007.

Van der Putten GJ, Vanobbergen J, De Visschere L, Schols JMGA, de Baat C. Association of some specific nutrients with periodontal disease in older adults. Meeting European College Gerodontology. London GB September 2008 (Winner of the GABA-award).

De Visschere L, De Schepper E, Vanobbergen J. A 5-year longitudinal study of the implementation of an oral hygiene project in nursing homes: effect evaluation. Meeting European College Gerodontology, Frankfurt Germany March 2009.

De Visschere L, De Baat C, Schols J, De Schepper E, Vanobbergen J. Effect evaluation of the implementation of an 'oral hygiene protocol' in nursing homes: a 5-year longitudinal study. EADPH, Trömso, Norway September 2009.

De Visschere L, De Baat C, Schols J, Vanobbergen J. A 5-year longitudinal study of the implementation of an oral hygiene protocol in nursing homes: process evaluation by focus groups. WCPD, Phuket, Thailand September 7-10, 2009.

De Visschere L, Vanobbergen J, De Baat C, Schols J.M, De Schepper E. The implementation of an oral hygiene protocol in nursing homes. Proceedings of the 15th Congress of the BaSS 2010. Hosting the Annual Meeting of the European College of Gerodontology. Thessaloniki, Greece 22-25 April, 2010. Abstract book, p. 289.Winner of the Gaba-Award.

De Visschere L, Vanobbergen J, De Baat C. Process evaluation of the implementation of an oral hygiene protocol. Proceedings of the 15th Congress of the BaSS 2010. Hosting the Annual Meeting of the European College of Gerodontology. Thessaloniki, Greece 22-25 April, 2010. Abstract book, p. 287.

De Visschere L, de Baat C, De Meyer L, Van der Putten GJ, Vanobbergen J. Barriers and enabling factors to the implementation of an oral health protocol in nursing homes: a qualitative study. 20th Congress of the International Association of Disability and Oral Health. Ghent, Belgium, 25-28 August, 2010.

De Visschere L, Schols J, Van der Putten GJ, de Baat C, Vanobbergen J. The implementation of an oral health care guideline in nursing homes. EADPH, 15th Annual Congress of the EADPH September, 9-11, 2010 Constanta, Romania. Oral Health and Dental Management in the Black Sea Countries, Volume IX,3(33): 165.

Other publications

De Visschere L. Dossier: I. Praktische richtlijnen voor mondzorg bij hulpbehoevende ouderen. Het Verband. 20e Jaargang, Jan-Feb-Maart 2005: 21-28.

De Visschere L, Van der Putten G-J, de Baat C, Schols J, Vanobbergen. Possible enabling and disabling factors when implementing an oral hygiene protocol in nursing homes. J. Archives of Public Health 2006; 64(6): 231-249.

Van der Putten GJ, De Visschere L, Vanobbergen J, de Baat C, Schols JMGA. Will an oral hygiene protocol increase the quality of life of institutionalized elderly people? A randomized controlled trial. 2nd Austrian-German geriatric congress. Vienna May 2007.

Vanobbergen J, Nuytens P, van Herk M, De Visschere L. Dental students' attitude towards anti-smoking programmes: a study in Flanders, Belgium. Eur J Dent Educ. 2007 Aug; 11(3): 177-83.

Van der Putten GJ, Vanobbergen J, De Visschere L, et al. Association of some specific nutrient deficiencies with periodontal disease in elderly people: A systematic literature review. Nutrition 2009; 25(7-8): 717-722.

Feyen L., De Visschere L., Daems M., Decaluwe F. en Vanobbergen J. Evaluatie van mondgezondheidspromotie naar kansarme kinderen in Vlaanderen. KYS als case study. VVT Congres Hasselt, Belgium 14 – 16 mei 2009.

Vanobbergen J., De Visschere L., Ceuppens A. en Van Emelen J. Socio-demographic Determinants for Oral Health Risk Profiles. WCPD, Phuket, Thailand September 7-10, 2009.

Publications as chapter of books

Vanobbergen J, De Visschere L. Het internet als informatiebron bij evidence-based besluitvorming. In: C. de Baat et al. Het Tandheelkundig Jaar 2007. Hoofdstuk 1 p. 1-14. Bohn Stafleu Van Loghum 2007, ISBN 978 90 313 47701.

M Reners, H Reychler, M Reynaert, J Vanobbergen. Mondzorg, een praktische gids. Uitgeverij Albe De Coker 2009. Van Den Noortgate N., De Visschere L. Hoofdstuk 10. Mondzorg in geriatrie, 2009 ISBN 978-90-783-2210-8.

L Martens, D Declerck, R Leroy, J Vanobbergen. De Mond, spiegel van gezondheid. Uitgeverij Acco 2009. Luc De Visschere, Jackie Vanobbergen. Hoofdstuk 19. Kwetsbare ouderen, 2009. ISBN 978-90-334-7398-2.

L Martens, D Declerck, R Leroy, J Vanobbergen. De Mond, spiegel van gezondheid. Uitgeverij Acco 2009. Luc De Visschere. Hoofdstuk 35. Terminale levensfase, 2009. ISBN 978-90-334-7398-2.

CONTENTS

GENERAL INTRODUCTION AND OBJECTIVES

GENERAL INTRODUCTION AND OBJECTIVES

The proportional increase of the ageing population is certainly one of the most important events in the recent development of our society. Strongly driven by qualified medical care the average life expectancy rises each year. Although a longer life does not always means better health expectancy. The quality of life of a significant proportion of older people causes great concern. The elderly population group is characterised by a huge diversity. Older adults are a complex combination and expression of individual genetic predispositions, lifestyles, socialisation and environments, wealth and education. In particular this diversity is mainly observed in health status including oral health status.

Compared to other age groups, heterogeneity in functionally dependency is definitely greater among 65 and older. The most important factors responsible for this heterogeneity are the long life history of the person's behavioural attitudes, the cumulative effect of risk factors, the increasing co-morbidity and strongly related poly-pharmacy. Due to the reciprocal effect of overall health on oral health it is important that both remain as long as possible in optimal condition. Systemic diseases affect oral health and vice versa[1,2]. Several medications have also a negative effect on oral health by inducing xerostomia, hyposalivation, mucosal lesions, and disturbed hemostasis[3]. Hyposalivation is a specific problem because saliva plays a major role in protecting both hard and soft oral tissues[4]. Furthermore, several aspects of oral health are affecting quality of life and well-being[5-7]. Oral health influences mastication, food selection, weight, speech, taste, hydration, appearance, and psycho-social behaviour and is thereby a concern not only for the older people themselves, but also for their relatives and care providers[8-11].

The key factor in realizing and maintaining good oral health is daily oral hygiene care by removing the oral bacterial plaque, mainly composed of pathogenic gram-negative germs[12,13]. In recent decades, a significant increase in oral health care delivery led to a remarkable oral health improvement. Although a large proportion of patients experiences a positive impact from a more preventive approach, mostly based on self-care, important risk groups are identified for which a more targeted approach is needed.

Besides dentists and dental hygienists, nurses are very important health care professionals in taking care of the oral health of elderly people and in providing continuity of care for the most care dependent group. Nurses are often assigned coordinating, support-

ing and executing tasks in oral health care[14-16]. These competences implicate an accurate knowledge, positive attitude and proper skills. A lot of quantitative and qualitative surveys reveal lack of knowledge, improper attitude and skills, lack of time, shortage in personnel and residents' uncooperativeness as important barriers resulting in inadequate oral health in institutionalised older people, in particular those with dementia syndrome.

A discrepancy exists between care givers' objective to optimize oral health and the observed oral hygiene levels of institutionalised elderly. In order to eliminate this discrepancy and to optimize oral care, better insights should be gained in aspects related to poor oral hygiene and inadequate oral health. Accordingly new strategies have to be developed in order to promote optimal oral health.

Primary oral health prevention avoids the development of an oral disease, while secondary prevention activities aim to detect oral diseases in an early stage, thereby increasing opportunities to anticipate progression of the disease and emergence of symptoms. Tertiary prevention reduces the negative impact of an already established oral pathological condition by restoring function and reducing disease-related complications.

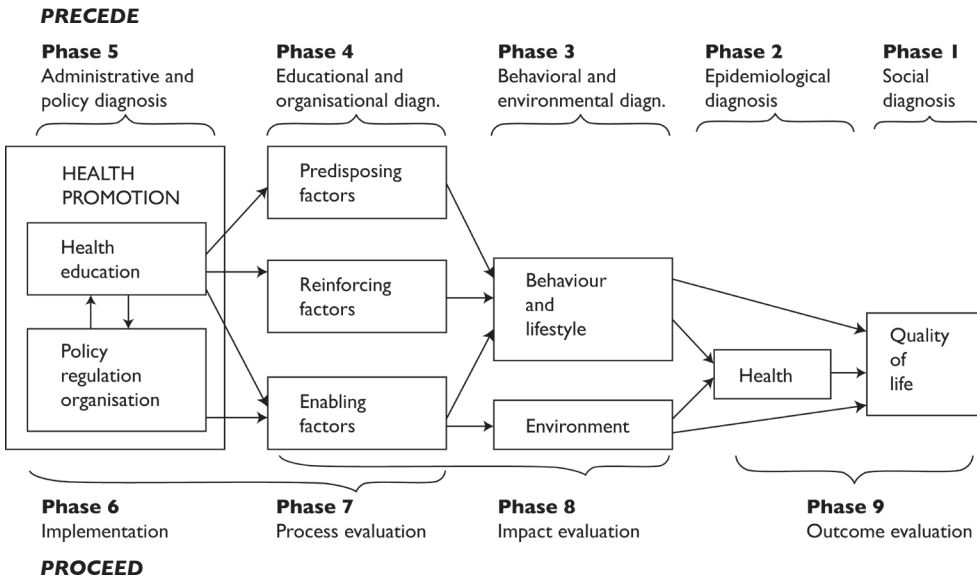
These above mentioned preventive key actions and a common risk approach, although not widely accepted by all stakeholders in the intramural care environment, are important issues in developing new oral health care models for frail older people.

Health education, prevention and protection are essential elements in new approaches[17]. Health education is one of the several possible intervention strategies which focus on lifestyle change in recognition of the importance of behavioural, cultural, social and economic factors as determinants of a disease. In order to achieve optimum oral health, effective 'oral health education' intends to produce changes in knowledge and to bring about some shift in belief or attitude. Furthermore it may facilitate the acquisition of skills and may effect changes in behaviour and life style.

Different approaches can be used in health education mostly based and facilitated by theoretical planning models. Two commonly used planning models are the communication-behaviour change model of Mc Guire and the precede-proceed model of Green and Kreuter[18]. The first offers a way of designing public health communication campaigns based on an information-persuasion model which merely serves to influence knowledge and attitudes without necessarily impacting on behaviour. The latter provides a compre-

hensive structure for assessing health and quality-of-life needs and for designing, implementing, and evaluating health promotion and other public health programs to meet those needs. PRECEDE[a] consists of five phases and PROCEED[b] is composed of four additional phases (figure 1).

Figure 1. Precede-Proceed model (Green & Kreuter)



In the present doctoral study the development and application of an oral health care model for institutionalised elderly people was based on the precede-proceed model. The present study started with a data collection on oral hygiene practices and related facilities in nursing homes in Flanders. Next, oral hygiene levels were studied. Poor oral hygiene levels and lack of structured oral health care approaches were observed. Determinants facilitating or impeding the use of oral health protocols, whether or not in a structured manner, were examined.

The introduction of innovative care paths is widely recognized as a complex process[19]. Most experts in healthcare improvement emphasize the importance of acquiring a good understanding of the problem, the target group, its setting and the obstacles to change in order to develop more effective strategies for change[20-22]. When starting innovative care paths, it is important to gain insight into determinants that may facilitate or impede the

a Predisposing, Reinforcing, and Enabling Constructs in Educational Diagnosis and Evaluation
b Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development
c Actie Mondzorg voor Ouderen in Rusthuizen (Action Mouth Care in Older people in Nursing Homes)
d Aktief Begeleide Richtlijn Implementatie Mondzorg (Actively Supervised Implementation of an 'Oral Healtcare Guideline')

whole implementation process.[23] All these refer to the PRECEDE phases of the precede-proceed planning model. The next step was the implementation and evaluation of an oral hygiene protocol (PROCEED). Accordingly, two oral health care promotion projects were planned and developed: the AMOR[c] and the ABRIM[d] project. These projects aimed to improve oral hygiene and to influence care givers' attitude towards oral health care. During the development of the protocols and the implementation strategies the main determinants detected were taken into account. AMOR included a non-supervised implementation of an oral hygiene guideline and ABRIM a supervised implementation of an 'oral health care protocol', based on guidelines developed by the Dutch Association of Nursing Home Physicians. Different aspects of both projects were evaluated by quantitative effect and qualitative process evaluation methods.

Results of both investigations are reported in this thesis aiming to present a scientific basis for fine tuning the development of adequate implementation of oral health protocols, in order to improve the oral health and oral health care in frail elderly. In particular, the present study focused on adequate oral hygiene, a milestone in preventive dentistry, and had the intention to persuade care providers to integrate oral hygiene into the daily care plan. The group of institutionalised older people is well defined and relatively easy accessible compared to the group of home dwelling older people. Therefore it was decided to conduct this study in nursing home residents hoping to be able to apply the acquired experiences to older people residing in other settings.

The overall aim of this doctoral thesis was to define and to understand the oral health problem of institutionalised elderly in Flanders and to explore the way how to deal with it. In particular, the objectives were:

- To explore the oral health of institutionalised older people in a European context and the variations in oral hygiene levels and related practices and facilities in nursing homes in Flanders.
- To explore opinions of dentists towards new concepts in developing a community approach.
- To assess the impact of undergraduate geriatric dentistry education on knowledge of ageing and on attitudes towards institutionalised older people, as perceived by recently graduated dentists.

- To explore the long-term effect of implementing an oral hygiene protocol in nursing homes.
- To develop a protocol based on guidelines, approved by evidence based assessment tools.
- To compare a supervised versus a non-supervised implementation of the "Oral health care Guideline for Older people in Long-term care Institutions" in long-term care institutions.
- To gain insight into factors potentially influencing the effectiveness and impact of an implementation protocol, aiming the integration of an oral hygiene protocol in nursing homes.

The content of this thesis

The first part, 'exploring the field', describes, in a European context, the oral health of institutionalised older people together with aspects regarding oral health care delivery (Chapter 1). Chapter 2 and 3 handle about the actual oral hygiene levels and related practices as observed in nursing homes in Flanders. Chapter 4 describes the oral health care delivery, targeting older adults, as provided and experienced by Flemish dentists and explores dentists' opinions towards concepts in developing a community approach. In chapter 4 undergraduate geriatric dentistry education as offered in all dental schools in Belgium is investigated together with the impact of this education on recently graduated dentists' knowledge on ageing and on their attitudes towards institutionalised elderly people.

The second part 'AMOR-ABRIM project' reports quantitatively the results of a non-supervised implementation of an oral hygiene protocol during a 5 year period (Chapter 6). The development of a supervised implementation strategy based on an Oral Health Care Guideline for dependent residents in long term care facilities is described in chapter 7. The effect evaluation of this supervised implementation (6 months) in nursing homes in Flanders is reported in chapter 8. Chapter 9 gains insight into factors potentially influencing the effectiveness and impact of an intervention aiming the integration of an oral hygiene protocol in nursing homes. The main focus lies on barriers and enabling factors. This qualitative analysis will be help full in the interpretation of the outcome results as measured during the effect evaluation. Finally this dissertation is completed with a discussion and final conclusion.

REFERENCES

1 Seymour GJ, Ford PJ, Cullinan MP, Leishman S, Yamazaki K: Relationship between periodontal infections and systemic disease. Clin Microbiol Infect 2007, 14(Suppl 4):3-10.
2 Rautemaa R, Lauhio A, Cullinan MP, Seymour GJ: Oral infections and systemic disease - an emerging problem in medicine. Clin Microbiol Infect 2007, 13:1041-1047.
3 Ciancio SG: Medications' impact on oral health. J Am Dent Assoc 2004, 135:1440-1448.
4 Moore PA, Guggenheimer J: Medication-induced hyposalivation: etiology, diagnosis, and treatment. Compend Contin Educ Dent 2008, 29:50-55.
5 Tsakos G, Steele JG, Marcenes W, Walls AW, Sheiham A: Clinical correlates of oral health-related quality of life: evidence from a national sample of British older people. Eur J Oral Sci 2006, 114:391-395.
6 Kandelman D, Petersen PE, Ueda H: Oral health, general health, and quality of life in older people. Spec Care Dentist 2008, 28:224-236.
7 Mariño R, Schofield M, Wright C, Calache H, Minichiello V: Self-reported and clinically determined oral health status predictors for quality of life in dentate older migrant adults. Community Dent Oral Epidemiol 2008, 36:85-94.
8 Nordenram G, Rönnberg L, Winblad B: The perceived importance of appearance and oral function, comfort and health for severely demented persons rated by relatives, nursing staff and hospital dentists. Gerodontology 1994, 11:18-24.
9 Nitschke I, Müller F: The impact of oral health on the quality of life in the elderly. Oral Health Prev Dent 2004, 2(Suppl 1):271-275.
10 Ikebe K, Matsuda K, Morii K, Nokubi T, Ettinger RL: The relationship between oral function and body mass index among independently living older Japanese people. Int J Prosthodont 2006, 19:539-546.
11 Ikebe K, Morii K, Matsuda K, Nokubi T: Discrepancy between satisfaction with mastication, food acceptability, and masticatory performance in older adults. Int J Prosthodont 2007, 20:161-167.
12 Hancock EB, Newell DH: Preventive strategies and supportive treatment. Periodontology 2000 2001, 25:59-76.
13 Attin T, Hornecker E: Tooth brushing and oral health: how frequently and when should tooth brushing be performed? Oral Health Prev Dent 2005, 3:135-140.
14 Boyle S. Assessing mouth care. Nurs Times 1992; 88(15):44-46.
15 Wardh I, Hallberg LR, Berggren U, Andersson L, Sorensen S. Oral health care--a low priority in nursing. In-depth interviews with nursing staff. Scand J Caring Sci 2000; 14(2):137-142.
16 Brady M, Furlanetto D, Hunter RV, Lewis S, Milne V. Staff-led interventions for improving oral hygiene in patients following stroke. Cochrane Database Syst Rev 2006;(4):CD003864.
17 Tannahill A. What is health promotion? Health Educational Journal 1985; 44: 167-168.
18 Adair P., Ashcroft A. Theory-based Approaches to the Planning and Evaluation of Oral Health Education Programmes, , Chapter 12; In Pine C., Harris R. Community Oral Health. Quintessence Publishing Co.Ltd 2007, 1-85097-1627.
19 Fleuren M, Wiefferink K, Paulussen T. Determinants of innovation within health care organizations: literature review and Delphi study. Int J Qual Health Care 2004; 16(2):107-123.
20 Grol R. Personal paper. Beliefs and evidence in changing clinical practice. BMJ 1997; 315(7105):418-421.
21 Rashidian A, Eccles MP, Russell I. Falling on stony ground? A qualitative study of implementation of clinical guidelines' prescribing recommendations in primary care. Health Policy 2007; 85: 148-61.
22 Shiffman RN, Michel G, Essaihi A, Thornquist E. Bridging the guideline implementation gap: a systematic, document-centered approach to guideline implementation. J Am Med Inform Assoc 2004; 11: 418-426.
23 Grol RTPM, Wensing MJP. Implementatie. Effectieve verbetering van de patiëntenzorg. Maarssen: Elsevier gezondheidszorg, 2006.

PART I: EXPLORING THE FIELD
I.A. EUROPEAN CONTEXT

CHAPTER 1

THE APPROACHES OF ORAL HEALTH PROBLEMS OF INSTITUTIONALISED OLDER PEOPLE IN A EUROPEAN CONTEXT

INTRODUCTION

The process of ageing can be defined as a gradual transition from a condition of highly adaptable inadaptation (youth) to a state of increasingly inadaptable adaptation (old)[1]. On the one hand, population ageing is one of humanity's greatest triumphs and on the other hand one of the greatest challenges.

The absolute numbers and proportion of older people within the society is increasing and will continue to do so for the next century. This phenomenon also occurs in Flanders (Belgium) together with an expected significant increase of disability of older people until 2050[2].

Ageing is a progressive, degenerating, lessening function of organs and tissues resulting in an inevitable accumulation of non-repaired damage. A number of degenerative conditions such as diabetes, osteoporosis, cancer and Alzheimer's play an important role in the process of ageing and increased co-morbidity. As a result of this co-morbidity, older people need help in daily living activities from family, friends or professional caregivers as long as possible at home and, if necessary in long-term care institutions[3].

The Katz index (table 1) is a tool for assessing a patient's ability to perform activities of daily living in the areas of bathing, dressing, toileting, transferring, continence, and feeding. In each category, a score of one indicates complete independence in performing the activity and zero indicates that assistance is required, so that the total score ranges from zero to six.

Table 1. Categories of degree of dependency based on Katz index

Category O	Physical independent and not demented
Category A	Physical dependent for bathing and/or dressing Mental independent but disoriented in time and space
Category B	Physical dependent for bathing, dressing, transferring and/or toileting Mental dependent, disoriented in time and space and dependent for bathing and/or dressing
Category C	Physical dependent for bathing, dressing, transferring and/or toileting and/or feeding and incontinent. Mental dependent, disoriented in time and space and dependent for bathing, dressing, transferring, and/or toileting and/or feeding and incontinent

Today, the supply of elderly care has become more diverse. The wide range of elderly care forms can be categorized into three groups, namely residential (intramural) care, semi-residential (transmural) care and ambulant (extramural) care. In most Central European countries, the new forms of elderly care are situated in the group of semi-residential and formal ambulant care. Several Central European countries went through a movement from institutions over intermediate forms of provision or institutions to domiciliary support services. In Flanders, for instance, there are currently residential care forms (nursing and rest homes and service flats), but also semi-residential care forms (centres for short-stay, day-care centres…) and ambulant forms of elderly care (family care providers, home nursing, volunteer aid,…). This differentiation is relatively new and was initiated by the Decree on the Elderly (1985). To cope with the increasing demand of care for the growing group of older people attention was paid to the development of home care and other intermediate forms of care (such as service flats and day care centres). In 1998, the Home Care Decree went a step further by enlarging the supply of home services and by ameliorating the financial accessibility. Since 1999, home care and informal care are facilitated by diminished personal contributions (also known as the Flemish care insurance), and since 2001, there are benefits for non-medical help or services given by home carers or informal carers to people with serious care needs. All this resulted in a shift from intramural residential care to ambulant care[4].

Besides, the care sector does not only have to be prepared for an increase in care demands, but also for changing care demands. Today, important aspects are quality of life, quality of living and housing, group living for demented older people, and continuity of care as much as possible in the same setting. This is not easy, as the sector is characterized by several other challenges as well, such as a high pressure of work and shortage of care personnel and financial challenges[5]. Obviously the introduction of innovative (oral) care paths is not going to be straightforward..

From the 256.340 care dependent older in Belgium, 136.170 reside at home and 120.170 in nursing homes. Intramural care is still well-organised in Belgium by 1.614 nursing homes across the country, of whom 752 in Flanders. Only 20 (2.6%) of Flemish nursing homes have a capacity > 200 residents, 30% between 200-101, and 67.4% <101.

Nursing homes offer a homelike environment when staying at home, whether or not supported by home or transmural care, is no longer appropriate. By decree, a nursing home is a residential setting where older people live and receive both personal and nursing care provided by registered nurses and care-aides. Nursing homes are occupied by elders who are physically or mentally frail or people who need regular attention from a nurse. Elderly evolving from degree of dependency O – Cd (Katz index) can stay in the same nursing home. In relation to their degree of dependency all residents are entitled to receive daily care including oral health care.

1. ORAL HEALTH

Oral health is an essential part of general health and quality of life during lifespan. The World Oral Health Report 2003 outlined following important principles for disease control and oral health promotion in the 21ste century: oral health is integral and essential to general health, oral health is a determinant factor for quality of life and is strongly associated with general health. Yet, oral health is often neglected in general health promotion. These outlines remain important until the end of life.

A large number of worldwide reports show that oral health of older people generally and frail elderly in particular, is of growing concern in many countries. Within the intent of this chapter, available data about oral health topics of institutionalised elderly in Europe, related to the context of this thesis, are summarised with respect to the scope of this thesis.

A literature search was performed using PubMed Central (PMC). Database PubMed was explored using the following search string: [oral health AND (nursing homes OR institutionalised elderly) AND x]. The x was replaced by the name of the consecutive countries of interest. Only studies reported after 1995 were eligible and references list was checked by title and abstract for a first selection. Finally only articles with epidemiological data on different oral health care aspects on institutionalised elderly were included.

Epidemiological data are summarised in tables 2-4. Any comparison between epidemiological data of different countries was difficult, as they vary in the methodology and diagnostic criteria.

1.1 Oral hygiene

In the medical, dental and nursing literature strong evidence exists that adequate oral hygiene is an important determinant factor of oral health . High dental and denture plaque scores give rise to many oral health complaints such as caries (in particular root caries), periodontal diseases, oral candidiasis[6,7], denture stomatitis[7,8] and halitosis[9]. A high plaque score is a significant predictor for the number of teeth lost in the institutionalised older population[10]. Moreover, neglected oral hygiene may increase morbidity and mortality in frail older people. Studies performed in different European countries revealed inadequate oral hygiene levels in institutionalised elderly (table 2[11-27]). Exploring results of dental and denture plaque levels revealed the existence of a spectrum of different diagnostic criteria for the assessment of plaque, which hampers international comparability. These findings emphasize the need for an international agreement on clinical validated criteria for the assessment of oral hygiene for different age groups.

Nevertheless, it was obvious that oral hygiene was insufficient for both remaining teeth and dental prostheses of residents in nursing homes in Flanders (the Northern part of Belgium). One could even argue that the oral hygiene levels were the lowest of those already reported.

Dental plaque scores were worse than denture plaque scores evoking the hypothesis that nurses provide assistance for denture cleaning but virtually no assistance for brushing the remaining teeth of dentate older people[13].

Denture plaque scores, recorded on the mucosal surfaces, were significantly higher than those on the oral surfaces. This finding was in agreement with findings from McCabe et al.[28] and Keng and Lim[29] and was useful in developing oral hygiene guidelines. Residents and care providers should be told to pay more attention to the inner sites of the dentures[13].

Some authors emphasized the need for successful oral health programs, standards practices and facilities, and protocols for oral health care in this population[30-42]. Actually, little research is done on the implementation of oral hygiene protocols in nursing home setting and the impact of this protocol on the level of oral hygiene[42].

In Flanders, all examined institutions used neither written reports on the oral health status of the residents nor a structured oral hygiene protocol. A structured oral health protocol with an oral assessment by admission[35] and the subsequent development of an individual oral hygiene protocol together with regular dental examination[32] has been suggested as an important part of an intervention program aiming to reach acceptable levels of oral health of institutionalised elderly[30,34,36,41,43]. Involvement of the management of the institutions and adequate theoretical and practical training of nurses are important aspects in this structured approach[42].

1.2 Dental status

In Belgium nearly no data exists on the dental status of older people. Empirically one can argue that actual older people's oral health is far from acceptable due to the high prevalence and incidence of caries in the past century.

1.2.1 Dentate versus edentulous

Childhood and adolescence of the cohort of elderly actually residing in nursing homes was characterised by high prevalence of caries. A high proportion of teeth was already affected early in life, and growing older, total extraction and construction of conventional dentures to restore the lost function and aesthetics remained the only available solution. In Flanders about 53% of individuals >65 years have remaining natural teeth, in nursing home residents this proportion drops to 36%. The latter proportion is comparable to the Netherlands and Norway, but lower than in Sweden, Italy and Germany and much lower than in France (table 2). The mean number of remaining teeth is 10 evenly distributed in both jaws. About one out of six dentate residents has >20 natural teeth.

Over the past three decades, oral health has improved significantly. Nowadays, with improved dental care and regular checkups and growing emphasis on prevention, the proportion of elderly people with natural teeth is increasing together with an increasing complexity of the oral status due to removable or fixed prostheses, whether or not implant supported.

According to the reports of the National Health Interview Surveys[44], organised in Belgium every fourth year, the results for Flanders reported an increasing number of eden-

tulousness in the age groups of 75+ from 2001 and 2004, with proportions of 53,5% and 61% respectively. Both surveys did not include institutionalised subjects.

A recent survey in Ghent, Flanders, including institutionalised elderly, reported that only 4,5% of all participating residents were edentulous with no dentures. The highest proportion (33%) of institutionalised elders being edentulous without dentures was reported for Greece. Compared to other countries the proportion in Flanders is low and can be partly explained by the fact that reimbursement fees by the Health Insurance System for full dentures are high[13]. Nevertheless, a study performed in long-term care facilities in Liège (the Southern part of Belgium, Wallonia) reported poor oral health status (edentulous without dentures or with only one complete denture) with increased difficulties eating hard foods, increased mashed food consumption, decreased eating with pleasure and at higher risk of under-nutrition[12].

1.2.2 Caries

Not all older people have an equal chance to develop caries. Major determinants are the general health status, living conditions and lifestyle, the amount of saliva and the number of exposed root surfaces. Large population-based dental longitudinal studies (at least 3 years) of individuals over 50 years of age performed in Iowa, North Carolina, Ontario and South Australia revealed that older people are a caries-active group, experiencing new disease at a rate which is at least as great as that of adolescents[45]. Surveys demonstrate that the prevalence of root surface caries is much higher than the prevalence of coronal caries. Studies of incidence illustrate a greater ongoing development of both types of caries in the elderly than in other populations[46].

In Europe, only a few studies (table 3) reported data on caries prevalence in institutionalised elderly with a range 34.7%-72%. International literature indicates in general coronal and root caries prevalence in older adults of 50% and 65%, respectively. As recently demonstrated by Ellefsen, this prevalence is higher in people with dementia syndrome. Mean coronal caries scores were almost three times as high (2.9 vs 1.0 surfaces), and mean root caries scores were more than two times as high (4.1 vs 1.7 surfaces) in those with a dementia syndrome than in those without, although the differences were not statistically significant. Alternatively, the mean total number of DS (coronal plus root) was

statistically significantly higher in participants with dementia than in those without (7.0 vs 2.7, $p<0.05$)[47].

1.2.3 Periodontal disease

Data regarding periodontal disease in institutionalised elderly people are scarce and not easy to interpret or to compare. Epidemiological studies in Norway and recently in Germany indicate a high prevalence of gingival inflammation (table 3). Data of the third National Health and Nutrition Examination Survey (NHANES III) in the U.S. illustrate that dental calculus, gingival bleeding, and gingival recession are most common in the oldest age groups in the US[48]. Regarding the population of elders in Flanders one can assume that the prevalence of periodontal disease should also be very high. In Flanders, as part of the AMOR-project, mobility of residents' teeth was scored in 13.7% (table 3).

1.2.4 Other oral complaints

The most frequent oral mucosal lesions in edentulous or partly edentulous older individuals relate mainly to ill-fitting or inadequate maintained removable prostheses. Dry mouth due to insufficient saliva is common in elderly people and is not a consequence of aging. The proportion of older persons suffering from hyposialia is estimated at 10% to 40%.

Many elders are medicated and it is known that anticholinergics, antidepressants, antihypertensives and anxiolytics can have a negative impact on saliva production. Several studies indicate an increasing risk with more different medications. A Kenniscentrum (KCE) report on the consumption of medications in nursing homes revealed a mean of 8 different medications per resident with a range 0–22. Most medication was for chronic use (88%), 3% needed medication in acute situations and 9% "if necessary". The highest consumption (68% of residents) was found for benzodiazepines or anti-psychotics, 50% used laxative and 46% antidepressants[49].

Table 4 summarises data on mucosal lesions gathered in elderly in nursing homes in different European countries. Proportion varied between 10.8% and 48% for oral mucosal lesions and between 18% and 43% for dry mouth.

2. ORAL HEALTH SERVICES

As the number of edentate elderly people increases[50,51] and the number of those presenting with advanced restorations expands[52], the importance of regular oral and dental care in older age groups increases and becomes a priority. Despite this, it has been shown that oral health care is often only accessed in emergency situations and at the discretion of home carers[41,53] highlighting the lack of a systematic approach to organising continued dental care for residents[53-55].

2.1 Subjective, objective treatment need and demand for oral health care

A great difference exists between the subjective an objective need for dental treatments in the oldest age groups. Subjective or perceived oral health need is the need as experienced by the care receiver, while the objective need refers to the need determined by the professional oral health provider. The latter is equal to the normative need.

Keeping in mind some heterogeneity in the reported data, table 4 shows percentages between 24% and 44% for the subjective treatment need, while the objective treatment need varies between 43.3% and 86%. Other studies revealed a very low demand for preventive and curative oral health care among elderly people[56-58].

Under-reporting of symptoms is common in elderly people and perceived treatment needs are usually lower than professionally assessed need[59].

Data from the Health Interview Survey in Belgium, gathered by the Scientific Institute of Public Health in 2004, revealed a strong decrease in mean number of annual contacts with a dentist in the oldest age groups compared to the younger groups (0.5 mean annual contacts with a dentist versus 1.8 for adults 35-44 years of age). Furthermore, this survey demonstrated that preventive dentistry hardly exists in individuals of over 75 years of age[43].

In Belgium no research was performed to explore factors who can explain this low demand. A study of Frenkel et al. suggested that the reason for this low level of dental consultation may lie with nursing home residents failing to report symptoms, with carers failing to alert nursing staff to reported problems, or with nurses failing to act on clients' expressed needs[27]. Other barriers to dental care include factors such as low dental access[60].

2.2 Oral health care delivery

One of the biggest challenges in the near future will be the delivery of adequate professional oral health care for institutionalised elderly. A high need exists for more coordinated, seamless continuing oral health care service, tailored to the actual needs of the elderly individuals, both at home or in institutions[60].

Homebound, chronically ill, and institutionalised elderly people are considered to be a high-risk group in the oral health services. For these people, special dental care programs are available on-site in Denmark, Norway, and Sweden and are almost free of charge for the patient. Eligibility for non-institutionalised older adults to be enrolled in these programs is based on a medical evaluation. However, dentists are not well disposed and consequently not well organised to offer domiciliary dental services. Stereotypical views and misconceptions about the aged, ignorance of gerontology and geriatrics[61], not being interested and ill-prepared, not attracted to work in nursing homes, to busy in practice, interference with leisure and limited possibilities to treatment[62] seemed to be important barriers.

In general, these services are limited to prosthetic treatment and extractions and rarely to adequate restorative dentistry[63,64]. Non published data gathered in the AMOR-project illustrated that 54.4% (n=511) of the elderly were even unable to consult a dentist outside the institutions.

In Flanders there is no complementary reimbursement by the National Health Service for treatments provided by dentists outside the dental surgery. Furthermore, a study[65] performed in dentists in Antwerp in 2000 revealed that little domiciliary oral health care was offered and most dental treatments occurred in emergency situations. Oral health interventions were mostly performed individually rather than community based and prevention or oral health promotion projects didn't exist (see in extensu chapter 3).

2.3 Oral health professionals

2.3.1 Workforce

Historical, cultural and political factors of a country are important influencing factors on the effective oral health care workforce. Dentists and Dental Associations adopted often a conservative and protective attitude. In some countries this meant, that in the

past, the extension of the dental team with auxiliaries was hampered. However, at present it appears that dental auxiliaries are trained to different levels of competency in most countries[66]. Comparing Belgium to other European countries it is remarkable that dental hygienists still do not exist. Since 2008 dental assistants are trained but actually the curriculum does not take into account geriatric oral health care.

The number of dentists in Flanders is controlled by the National Government by limiting the number of dentists admitted to the dental profession (84 per year) during the period 2002-2010.

As the Flemish population grows older, the dental population also does. In 2007, 64.30 % of all dentists (N=4051) in Flanders was older than 45, nearly one fifth (14.42%) of all dentists was younger than 35 years of age and 21.28 % was between 36-45 years of age[67]. Furthermore, in the past decade more female dental students have enrolled in dental schools resulting in a gradual feminisation of the dental profession. In 2003, 43.4% of all Flemish dentists were women. Almost 75% of dentists between 40 and 50 years of age were men whereas sixty eight percent in the age group younger than 40 were women. In a quantitative assessment of male and female career patterns in dentistry, Decaluwe revealed that female dentists scored lower than male dentists in each career phase. Female dentists reported other goals and other ways of working and they paid more attention to preventive dentistry[68].

In terms of quality, an ideal oral health workforce should be appropriately trained to deliver the most effective oral health care and treatment for the whole population with much attention to the at risk populations.

2.3.2 Educational aspects

Lack of knowledge related to geriatric oral health care has been reported in a study on dental students' knowledge performed by Wood and Mulligan[69].

Several authors have mentioned the need for an innovative dental curriculum concerning the geriatric dentistry[70-75]. Community partnership programs integrated in the undergraduate curriculum, have been considered of additional value for both the community and students[76].

The current status of geriatric dentistry education in dental schools of 34 European countries has been surveyed by Preshaw and Mohammad[71]. Within the limits of the 42% response rate, it was concluded that geriatric dentistry education was integrated in the curricula of European dental schools. Although the education format varied considerably, the range of topics was broad. The same trend was observed regarding geriatric dental education at different dental schools in Belgium with significant differences amongst dental schools indicating the lack of a single format of teaching geriatric dentistry in Belgium (see chapter 5).

2.4 Barriers and enabling factors in the delivery of geriatric oral health care

In order to improve geriatric oral health care delivery one has to take into account a broad spectrum of influencing factors as reported in different European countries. Some of these factors are already mentioned above. In order to develop and implement an oral health care model for institutionalised elderly people it can be valuable to keep these factors in mind. These factors, partly barriers, partly enabling factors, will be related to both, to the care receivers and to the care providers.

2.4.1 Factors related to the care receiver

General health is an important factor for elderly who need (professional) oral health care. Co-morbidity and cognitive impairment declining residents' self-care and mobility are important barriers to access professional oral health care. Structural factors, such as living condition (at home, service flat, nursing home), financial strength and coverage by health insurance are important factors with impact on the affordability and the acceptability of oral health care. Furthermore, the role of psycho-social factors as stressors (such as life-events) and other mechanisms dealing with these stressors (individual coping style) and social networking are important[77]. Not just the current socio-economic status, but the socio-economic situation during lifespan can be an influencing factor on accessibility. Finally, factors related to oral health are important: oral status (dentate or edentulousness), perceived need, expressed demand and attitude towards oral health care. The actual generation of elderly people is less likely to complain of oral conditions and is mostly not concerned about their oral health[78-80].

2.4.2 Determinants related to the oral health care provider

At the side of the care provider also important psycho-social factors influencing positively or negatively the delivery of dental services towards institutionalised elderly were reported. Age, gender, and education were reported as influencing factors, although sometimes with different outcomes[81,82]. In the past, oral health policies including preventive strategies showed low priority to the delivery of oral health care to elderly people in nursing homes[83-86]. Structured oral health protocols with clear oral health care routines are not apparent[29,37] and professional dental care is mostly delivered in cases of emergency[84,86]. Other service barriers mentioned in the literature are unwillingness of dental professionals to visit residents in home premises, long waiting lists and lack of resources to assist residents with access to dental services[83].

REFERENCES

1 Krapp E. On ageing. Proc R Soc Med 1953; 46(11):957-963.
2 Lafortune G, Balestat G and the Disability Study Expert Group Members. Trends in Severe Disability Among Elderly People: Assessing the Evidence in 12 OECD Countries and the Future Implications. OECD Health Working Papers, 2007. http://www.google.com/search?hl=en&q=OECD+HEALTH+WORKING+PAPERS+2007+disability+&btnG=Search.
3 Strandberg T. Aging as a phenomenon. A Challenge for the Oral Health Care. Congres Helsinki September 2–4, 2004.
4 Declercq and Van Audenhoven (2004) in Innovation in the elderly care sector: at the edge of chaos - Document Transcript Knowledge partner RESEARCH REPORT innovation in the elderly care sector: at the edge of chaos K. Verleye, P. Gemmel September 2009.
5 Jozef Pacolet, Denise Deliège, Caroline Artoisenet, Griet Cattaert, Véronique Coudron, Xavier Leroy, Annick Peetermans, Christian Swine. Vergrijzing, Gezondheidszorg, en Ouderenzorg in België. Working paper DGSOC, (1) Maart 2005.
6 Darwazeh AM, Al Refai S, Al Mojaiwel S. Isolation of Candida species from the oral cavity and fingertips of complete denture wearers. J Prosthet Dent 2001; 86(4):420-423.
7 Pires FR, Santos EB, Bonan PR, De Almeida OP, Lopes MA. Denture stomatitis and salivary Candida in Brazilian edentulous patients. J Oral Rehabil 2002; 29(11):1115-1119.
8 Khasawneh S, al Wahadni A. Control of denture plaque and mucosal inflammation in denture wearers. J Ir Dent Assoc 2002; 48(4):132-138.
9 Honda E. Oral microbial flora and oral malodour of the institutionalised elderly in Japan. Gerodontology 2001; 18(2):65-72.
10 Shimazaki Y, Soh I, Koga T, Miyazaki H, Takehara T. Risk factors for tooth loss in the institutionalised elderly; a six-year cohort study. Community Dent Health 2003; 20(2):123-127.
11 Gluhak C, Arnetzl GV, Kirmeier R, Jakse N, Arnetzl G. Oral status among seniors in nine nursing homes in Styria, Austria. Gerodontology 2010; 27(1):47-52.
12 Lamy M, Mojon P, Kalykakis G, Legrand R, Butz-Jorgensen E. Oral status and nutrition in the institutionalized elderly. J Dent 1999; 27(6):443-448.
13 De Visschere LM, Grooten L, Theuniers G, Vanobbergen JN. Oral hygiene of elderly people in long-term care institutions--a cross-sectional study. Gerodontology 2006; 23(4):195-204.
14 Peltola P, Vehkalahti MM, Wuolijoki-Saaristo K. Oral health and treatment needs of the long-term hospitalised elderly. Gerodontology 2004; 21(2):93-99.
15 Tramini P, Montal S, Valcarcel J. Tooth loss and associated factors in long-term institutionalised elderly patients. Gerodontology 2007; 24(4):196-203.
16 Cohen C, Tabarly P, Hourcade S, Kirchner-Bianchi C, Hennequin M. Quelles réponses aux besoins en santé buccodentaire des personnes âgées en institution. Presse Med. 2006; 35 : 1639-1648.
17 Jäger S, Kôster-Schmidt A, Schade M, Heudorf U. Mundhygiene und Mundgesundheit bei Bewohnern von Altenpflegeheimen. Bundesgesunsheitsbl 2009; 52: 927-935.
18 Nitschke I. Geriatric oral health issues in Germany. Int Dent J 2001; 51(3 Suppl):235-246.
19 Triantos D. Intra-oral findings and general health conditions among institutionalized and non-institutionalized elderly in Greece. J Oral Pathol Med 2005; 34(10):577-582.
20 Kossioni AE, Karkazis HC. Socio-medical condition and oral functional status in an older institutionalised population. Gerodontology 1999; 16(1):21-28.
21 Ferro R, Besostri A, Strohmenger L, Mazzucchelli L, Paoletti G, Senna A et al. Oral health problems and needs in nursing home residents in Northern Italy. Community Dent Health 2008; 25(4):231-236.
22 Kalsbeek H, Schuller A.A, Kivit M.M, de Baat C. Mondzorg in verpleeg- en verzorgingshuizen en instellingen voor verstandelijk gehandicapten. Ned Tijdschr Tandheelkund 2006; 113: 90-95.
23 Samson H, Strand GV, Haugejorden O. Change in oral health status among the institutionalized Norwegian elderly over a period of 16 years. Acta Odontol Scand 2008; 66(6):368-373.
24 Soderpalm Andersen E, Soderfeldt B, Kronstrom M. Oral health and treatment need among older individuals living in nursing homes in Skaraborg, Vastra Gotaland, Sweden. Swed Dent J 2006; 30(3):109-115.
25 Sweeney MP, Williams C, Kennedy C, Macpherson LM, Turner S, Bagg J. Oral health care and status of elderly care home residents in Glasgow. Community Dent Health 2007; 24(1):37-42.
26 Adam H, Preston AJ. The oral health of individuals with dementia in nursing homes. Gerodontology 2006; 23(2):99-105.
27 Frenkel H, Harvey I, Newcombe RG. Oral health care among nursing home residents in Avon. Gerodontology 2000; 17(1):33-38.
28 McCabe JF, Murray ID, Laurie J, Kelly PJ. A method for scoring denture plaque. Eur J Prosthodont Restor Dent 1996; 4(2):59-64.
29 Keng SB, Lim M. Denture plaque distribution and the effectiveness of a perborate-containing denture cleanser. Quintessence Int 1996; 27(5):341-345.

30 Hardy DL, Darby ML, Leinbach RM, Welliver MR. Self-report of oral health services provided by nurses'aides in nursing homes. J Dent Hyg 1995; 69(2):75-82.
31 de Baat C, Bruins H, van Rossum G, Kalk W. Oral health care for nursing home residents in The Netherlands--a national survey. Community Dent Oral Epidemiol 1993; 21(4):240-242.
32 Ettinger RL. Oral care for the homebound and institutionalized. Clin Geriatr Med 1992; 8(3):659-672.
33 Johnson TE, Lange BM. Preferences for an influences on oral health prevention: perceptions of directors of nursing. Spec Care Dentist 1999; 19(4):173-180.
34 Berkey DB. Dr. Steven Gordon, DDS, Memorial Lecture. Current state of oral health care in institutionalized older adults. Spec Care Dentist 1996; 16(4):143-146.
35 Hoad-Reddick G. A study to determine oral health needs of institutionalised elderly patients by non dental health care workers. Community Dent Oral Epidemiol 1991; 19(4):233-236.
36 Adams R. Qualified nurses lack adequate knowledge related to oral health, resulting in inadequate oral care of patients on medical wards. J Adv Nurs 1996; 24(3):552-560.
37 Call RL, Berkey DB, Gordon SR. The activities of the advisory dentist in the long-term care facility. Gerodontics 1986; 2(1):35-38.
38 Kambhu PP, Levy SM. Oral hygiene care levels in Iowa intermediate care facilities. Spec Care Dentist 1993; 13(5):209-214.
39 Logan HL, Ettinger R, McLeran H, Casko R. Common misconceptions about oral health in the older adult: nursing practices. Spec Care Dentist 1991; 11(6):243-247.
40 Strayer M, Henry R. Developing practice guidelines for institutionalized older dental patients. Spec Care Dentist 1996; 16(4):165-169.
41 Knabe C, Kram P. Dental care for institutionalized geriatric patients in Germany. J Oral Rehabil 1997; 24(12):909-912.
42 Vanobbergen JN, De Visschere LM. Factors contributing to the variation in oral hygiene practices and facilities in long-term care institutions for the elderly. Community Dent Health 2005; 22(4):260-265.
43 Nitschke I, Hopfenmuller W. [Dental care in homes for the elderly and aged. Organization and opinion of home management]. Dtsch Stomatol 1991; 41(11):432-435.
44 Institute Epidemiology Unit Activities. Health Interview Survey, Scientific Institute of Public Health. Update: 11/04/2005. www.iph.fgov.be/epidemio/epien/index4.htm.
45 Thomson WM. Dental caries experience in older people over time: what can the large cohort studies tell us? Br Dent J 2004; 196(2):89-92.
46 Saunders RH, Jr., Meyerowitz C. Dental caries in older adults. Dent Clin North Am 2005; 49(2):293-308.
47 Ellefsen B, Holm-Pedersen P, Morse DE, Schroll M, Andersen BB, Waldemar G. Caries prevalence in older persons with and without dementia. J Am Geriatr Soc 2008; 56(1):59-67.
48 Albandar JM, Kingman A. Gingival recession, gingival bleeding, and dental calculus in adults 30 years of age and older in the United States, 1988-1994. J Periodontol 1999; 70(1):30-43.
49 Kenniscentrum (KCE). http://www.kce.fgov.be/index_nl.aspx?SGREF=5269&CREF=8560
50 MacEntee MI, Weiss R, Waxler-Morrison NE, Morrison BJ. Factors influencing oral health in long term care facilities. Community Dent Oral Epidemiol 1987; 15(6):314-316.
51 Vigild M, Brinck JJ, Christensen J. Oral health and treatment needs among patients in psychiatric institutions for the elderly. Community Dent Oral Epidemiol 1993; 21(3):169-171.
52 Jokstad A, Ambjornsen E, Eide KE. Oral health in institutionalized elderly people in 1993 compared with in 1980. Acta Odontol Scand 1996; 54(5):303-308.
53 Paunovich E. Assessment of the oral health status of the medically compromised homebound geriatric patient: a descriptive pilot study. Spec Care Dentist 1994; 14(2):80-82.
54 Morishita M, Takaesu Y, Miyatake K, Shinsho F, Fujioka M. Oral health care status of homebound elderly in Japan. J Oral Rehabil 2001; 28(8):717-720.
55 Kuc IM, Samaranayake LP, van Heyst EN. Oral health and microflora in an institutionalised elderly population in Canada. Int Dent J 1999; 49(1):33-40.
56 Karkazis HC, Kossioni AE. Oral health status, treatment needs and demands of an elderly institutionalised population in Athens. Eur J Prosthodont Restor Dent 1993; 1(4):157-163.
57 Mojon P, MacEntee MI. Estimates of time and propensity for dental treatment among institutionalised elders. Gerodontology 1994; 11(2):99-107.
58 Vigild M. Benefit related assessment of treatment need among institutionalised elderly people. Gerodontology 1993; 10(1):10-15.
59 Schou L, Eadie D. Qualitative study of oral health norms and behaviour among elderly people in Scotland. Community Dent Health 1991; 8(1):53-58.
60 Hally J, Clarkson JE, Newton JP. Continuing dental care for Highlands elderly: current practice and attitudes of dental practitioners and home supervisors. Gerodontology 2003; 20(2):88-94.

61 Kiyak HA, Milgrom P, Ratener P, Conrad D. Dentists' attitudes toward and knowledge of the elderly. J Dent Educ 1982; 46(5):266-273.
62 MacEntee MI, Weiss RT, Waxler-Morrison NE, Morrison BJ. Opinions of dentists on the treatment of elderly patients in long-term care facilities. J Public Health Dent 1992; 52(4):239-244.
63 Longhurst RH. Availability of domiciliary dental care for the elderly. Prim Dent Care 2002; 9(4):147-150.
64 Burke FJ, Wilson NH. Measuring oral health: an historical view and details of a contemporary oral health index (OHX). Int Dent J 1995; 45(6):358-370.
65 De Visschere L, Vanobbergen J. Oral health care for frail elderly people: actual state and opinions of dentists towards a well-organised community approach. Gerodontology 2006, 23 (3): 170-176.
66 www.google.dk/search?hl=da&source=hp&q=oral+health+care+providers+workforce+Europe&meta=&aq=f&oq=
67 Riziv. Internal document 2010.
68 Decaluwe F, De Boever JA. [Woman and career: an unhappy marriage? A study model: dentistry]. Rev Belge Med Dent 2002; 57(4):293-313.
69 Wood GJ, Mulligan R. Cross-sectional comparison of dental students' knowledge and attitudes before geriatric training: 1984-1999. J Dent Educ 2000; 64(11):763-771.
70 Plasschaert AJM, Holbrook WP, Delap E, Martinez C, Walmsley AD. Profile and Competences for the European Dentist. 1-24. 2004. ADEE.
71 Preshaw PM, Mohammad AR. Geriatric dentistry education in European dental schools. Eur J Dent Educ 2005; 9(2):73-77.
72 Nitschke I, Muller F, Ilgner A, Reiber T. Undergraduate teaching in gerodontology in Austria, Switzerland and Germany. Gerodontology 2004; 21(3):123-129.
73 Matear D. Why do we need education in geriatric dentistry? J Can Dent Assoc 1998; 64(10):736-738.
74 van Waas MAJ. De geriatrische tandheelkunde in het tandheelkundig onderwijs. Ned Tijdschr Tandheelkd 105, 362-364. 1998.
75 Mersel A, Mann J, Malve D, Anaise J. Israeli dental students' attitudes toward elderly patients. Spec Care Dentist 1984; 4(6):261-263.
76 Beaulieu E, Dufour LA, Beaudet R. Better oral health for infants and toddlers: a community based program. J Dent Hyg 2000; 74(2):131-134.
77 Stronks K, van de Mheen DH, Mackenbach J. Achtergronden van sociaaleconomische gezondheidsverschillen. Een overzicht van de literatuur en een onderzoeksmodel. In: Raes V, Kerkhofs E, Louckx F, eds. Sociale ongelijkheid en verschillen in gezondheid. Brussel: VUBpress; 1993:11-26).
78 Chalmers JM, Pearson A. A systematic review of oral health assessment by nurses and carers for residents with dementia in residential care facilities. Spec Care Dentist 2005; 25(5):227-233.
79 Jablonski RA, Munro CL, Grap MJ, Elswick RK. The role of biobehavioral, environmental, and social forces on oral health disparities in frail and functionally dependent nursing home elders. Biol Res Nurs 2005; 7(1):75-82.
80 Fitzpatrick J. Oral health care needs of dependent older people: responsibilities of nurses and care staff. J Adv Nurs 2000; 32(6):1325-1332.
81 Nitschke I, Ilgner A, Müller F. Barriers to provision of dental care in long-term care facilities: the confrontation with ageing and death. Gerodontology 2005; 22 (3): 123-129.
82 Newton JP. Whether you're a big fish, a little fish or an old and wise fish… Gerodontology 2004; 21(1): 1-2.
83 Paley GA, Slack-Smith LM, O'Grady MJ. Aged care staff perspectives on oral care for residents: Western Australia. Gerodontology 2004; 21(3):146-154.
84 Vanobbergen JN, De Visschere LM. Oral hygiene procedures and facilities and their predisposing factors in long-term-care institutions for elderly. Community Dental Health 2005;-In Press.
85 Brady M, Furlanetto D, Hunter RV, Lewis S, Milne V. Staff-led interventions for improving oral hygiene in patients following stroke. Cochrane Database Syst Rev 2006;(4):CD003864.
86 Frenkel H, Harvey I, Needs K. Oral health care education and its effect on caregivers' knowledge and attitudes: a randomised controlled trial. Community Dent Oral Epidemiol 2002; 30(2):91-100.

Table 2. Epidemiological data

Country	*n (ages)*	*Mean age (SD)*	*Dentate (%) (Mean number teeth)*	*Edentoulous* *F/F: Complete upper and lower denture* *F/-: Complete upper denture* *-/F: Complete lower denture* *-/-: No dentures*	*Oral Hygiene*	*Attidude towards oral hygiene*
Austria (Gluhak) 2007	681	84.1 80.7 (men) 85.1 (women)	48.3% (9.9) (men 12.8; women 8.8)	51.7% 69% complete or partial dentures	mOHI 2.3 men; 2.2 women	63.93% carried oral hygiene themselves
Belgium (Lamy) 1999	120 (65-96) no cognitive impairement	81	39% (10.4) 34% with partial dentures	61% 12,5% -/- 38% F/F 10.5% F/- or -/F		
Belgium (Flanders) (De Visschere) 2006*	359 (>75)	84.9	36% (10.34) 16% > 20 teeth	64% 4.5% -/- 47.6% F/F 11.4% F/- 0.6% -/F	Dental plaque 2.17 4% < 1 and 30% = 3 Denture plaque 2.13 5% ≤ 1 46.5% > 2 2.08 upper 2.11 lower $p < 0.001$ 1.93 oral 2.33 mucosal $p < 0.001$	
Finland (Peltola) 2000	260 (>60)	83.3 78.7 (men) 84.8 (women)	42% (12.4) 18% > 20 teeth	58% -/- 18%	Clean dentures extremely rare Dental hygiene = poor	
France (Tramini) (2003-2004)	321 (>65)	81.1 (men) 83.3 (women)	73.1% 33.6% (≥ 20 teeth)	26.9% 9% -/-		40% (adequate dental hygiene) 41.6% (adequate denture hygiene)
France (Cohen) (2003)	756 (>65)	83			n = 480 55.2% plaque 37.3% food rest	
Germany (Jäger) (2007)	131 (49-97)	80 60% >80	46.6% 9.9% > 16	53.4% 61.8% F/- 49.6% -/F	(dentate) (dentures) 9.8% (PLI ≤ 1) 55.6% (DHI 8 -10)(u) 23.0% (PLI 1-≤ 2) 49.2%(DHI 8 -10)(l) 67.2% (PLI > 2) Tongue coating 74% partly or totally	
Germany (Nitschke) (1990-1993)	170	82	31.8% (3.3)	69.2%		
Greece (Triantos) (2005)*	166 (>65)	81	21% (11.5)	79% 33% -/-		68% (daily) 5% (2-3 days) 2% (1 week) 7% (never)
Greece (Kossioni) (1999)*	257 (>65)	83.7	38.0% (11.5)	62%		
Italy Ferro) (2002)	595 (46-103)	83.2	57% 8.4 (9.4% + remaining roots) 72.2% (1-12) 53% (with fixed or removable prostheses)	43% 14,6% -/- 24.5% F/F 3.5% F/- or -/F	85.9 (poor oral hygiene)	
The Netherlands (2006)*	337 (>60)		30% 31% (> 20 teeth) (60-79) 15% (> 20 teeth) (> 79)	70% 8% -/-	40% Poor (dentate) 10% Poor (dentures)	
Norway (Samson) (2004)	173 (56-101)	86.5	34% (12.3)	66% 35% (only dentures) 23% (teeth and dentures) 8% -/-		
Sweden (Söderpalm Andersen) (2006)*	172 (63-97)	84.9	58% 22 (1-9 teeth) 36 (> 10 teeth)	42%	(Only for dentate) 12% (no visible plaque) 47% (visible plaque, no gingivitis) 41% (abundant plaque)	(brushed 2x p/d) 60% dentate 42% denture wearers
United Kingdom (Sweeney) (2008)	288		26%	74% 62% F/F 22% F/-	80% dentate with debris	
United Kingdom (Adam) (2006)	135 (>65) (A) no/mild dementia (B) moderate/ severe dementia	(A) (B) 84.48 80.78		(A) (B) 93 stability ok 76 76.7 retention ok 76 91.4 occlusion ok 66.7 82.1 vertical height ok 71.4	(A) (B) 2.12 Mean plaque 2.14 1.43 Mean calculus 2.04	
United Kingdom (Frenkel) (2001)	412 (84.5) Intervention Control	(C) (I) 84.0 84.9	(C) (I) 19.9% 19.4%	Denture wearers (C) (I) 79.6 80.6	(C) (I) 2.12 Mean dental plaque 2.13 2.80 Mean denture plaque 2.82	

* year of publication (A) No/mild dementia; (B) Moderate to severe dementia; (u) Upper; (l) Lower

Table 3. Epidemiological data

Country	n (ages)	Mean age (SD)	Caries	Peridontal disease (%)	Bleeding Index	Calculus
Austria (Gluhak) 2007	681	84.1 80.7 (men) 85.1 (women)	DMFT 25.6	84.1% acute periodontal inflammation		
Belgium (Lamy) 1999	120 (65-96) no cognitive impairement	81	46.9% Broken teeth 53.3% Caries			
Belgium (Flanders) (De Visschere) 2006*	359 (>75)	84.9		13.7% Mobility		76.7%**
Finland (Peltola) 2000	260 (>60)	83.3 78.7 (men) 84.8 (women)				
France (Tramini) (2003-2004)	321 (>65)	81.1 (men) 83.3 (women)				
France (Cohen) (2003)	756 (>65)	83	34.7% persons need conservative dentistry			55% Calculus
Germany (Jäger) (2007)	131 (49-97)	80 60% >80		n = 59 15.3% CPITN 1 23.7% CPITN 2 18.6% CPITN 3 42.4% CPITN 4	n = 61 3.3% (BI >10%) 0.0% (BI 10 - <20%) 6.6% (BI 20 - <50%) 90.2% (BI 50 - 100%)	
Germany (Nitschke) (1990-1993)	170	82	DMFT 26.4			
Greece (Triantos) (2005)*	166 (>65)	81				
Greece (Kossioni) (1999)*	257 (>65)	83.7				
Italy Ferro) (2002)	595 (46-103)	83.2				
The Netherlands (2006)*	337 (>60)					
Norway (Samson) (2004)	173 (56-101)	86.5	72% persons with decayed teeth DMFT 23.2	n = 89 0% (healthy) 7% (bleeding) 28% (bleeding + calculus) 43% (bleeding,calculus, pockets 4 - 5 mm) 22% (bleeding, calculus, pockets ≥ 6 mm)		
Sweden (Söderpalm Andersen) (2006)*	172 (63-97)	84.9				
United Kingdom (Sweeney) (2008)	288					57% dentate with calculus
United Kingdom (Adam) (2006)	135 (>65) (A) no/mild dementia (B) moderate/ severe dementia	(A) (B) 84.48 80.78	(A) (B) Mean number decayed 1.11 0.8			(A) (B) Mean calculus 1.43 2.04
United Kingdom (Frenkel) (2001)	412 (84.5) Intervention Control	(C) (I) 84.0 84.9		(C) (I) 0 = no inflammation; 1= marginal gingivitis; 2 = severe gingivitis 1.31 1.36		

Table 4. Epidemiological data

Country	*n (ages)*	*Mean age (SD)*	*Other oral diseases and complaints*	*Objective Treatment needed*	*Subjective Treatment need*
Austria (Gluhak) 2007	681	84.1 80.7 (men) 85.1 (women)		81.1% prosthetic	25.9% prosthetic
Belgium (Lamy) 1999	120 (65-96) no cognitive pairement	81		Stability Retention 66% good (upper) 70% good (upper) 52% good (lower) 41% good (lower) Not able to chew raw carrots 53%	
Belgium (Flanders) (De Visschere) 2006*	359 (>75)	84.9	n = 309 Cheilitis Angularis 4.5%** **n = 313 Oral mucosal lesions** 12.1% upper 14.1 lower Dry mouth** Dentate 18.2% Edentate 17% Halitosis** Dentate 18.5% Edentate 4.7% Pain** Dentate 14.2% Edentate 5.6%		
Finland (Peltola) 2000	260 (>60)	83.3 78.7 (men) 84.8 (women)	25% of denture wearers suffer from denture stomatitis 19% Angular Cheilitis	25% prosthetic / 37% fillings / 49% periodontal / 42% extractions	
France (Tramini) (2003-2004)	321 (>65)	81.1 (men) 83.3 (women)		28.7% Halitosis	
France (Cohen) (2003)	756 (>65)	83	10.8% at least one oral mucosal lesion	86% 15% Halitosis 53% Extraction one or more teetsh 34.9% Conservative dentistry 57% Prosthetic need 45.2 Relining 39.2 No occlusal pairs	51.4% very positive perception of OHRQoL (GOHAI >50)
Germany (Jäger) (2007)	131 (49-97)	80 60% >80		Restorative treatment need 45%	
Germany (Nitschke) (1990-1993)	170	82		Denture treatment need 65%	Majority was very satisfied with their dentures
Greece (Triantos) (2005)*	166 (>65)	81	17.2% Denture induced stomatitis 10.5% Atrophy of tongue papillae 9.8% Fissured tongue	46.2%	
Greece (Kossioni) (1999)*	257 (>65)	83.7	43% xerostomia		
Italy Ferro) (2002)	595 (46-103)	83.2		Oral health maintenance Some 82% Urgently 40% Edentate treatment needs 70.9% re-lining Dentate treament needs 74.8% professional cleaning 54.5% tooth or root extractions 33.4% caries restorations	Overall 50% highly or rather satisfied with oral conditions Treatment needs 46% none* 24% poor 12% medium 8% high * 52% edentate / 42% dentate
The Netherlands (2006)*	337 (>60)			Occlusal contacts 60-79 yrs old 45% = 0 > 79 72% = 0 Retention dentures Upper 12% poor Lower 31% poor	Dentate Edentate Functional complaints with Chewing 36% 33% Biting off 42% 56% ($p < 0.05$) Taste 8% 10% Speech 13% 16% Pain 38% 38% Dry mouth 50% 62% ($p < 0.05$) Food rest 78% 72% Halitosis 20% 8% ($p < 0.001$)

Country	*n (ages)*	*Mean age (SD)*	*Other oral diseases and complaints*	*Objective Treatment needed*	*Subjective Treatment need*
Norway (Samson) (2004)	173 (56-101)	86.5	n = 90 36% Stomatitis		
Sweden (Söderpalm Andersen) (2006)*	172 (63-97)	84.9	Oral mucosal lesions 45% maxilla 48% mandibula	Need 10% None 54% Hygiene treatment 34% More extensive treatment 2% Emergency Remaining roots and decayed 10% (upper) 13% (lower) Increased mobility 8% Poor Stability Retention 18% upper 18% upper 23% lower 26% lower Oral mucosal lesions 45% upper 48% lower	Some kind of oral problems 24%
United Kingdom (Sweeney) (2008)	288		19% Erythematous candidosis 5% Ulcer 4% Leukoplakia	Dental treatment need Required 47% Urgent 6% 60 patients with oral lesions 54% Candida species 26.7% Staphyloccus Aureus of which 15% MRSA Oral hygiene (79% of dentate) Conservative / extraction (33% + 5% urgent) Dentures (7%) Soft Tissue (all participants) (17% + 5% urgent)	38% Mucosal lesions 19% Erythematous candidosis 5% Ulceration
United Kingdom (Adam) (2006)	135 (>65) dementia	(A) (B) 84.48 80.78			
United Kingdom (Frenkel) (2001)	412 (42-102) 84.5	Invervention (I) Control (C) (C) (I) 84.0 84.9	16.6% Pin-point erythema 14.5% Diffuse erythema 2.1% Hyperplasia	20% Current oral problem 27.8% Denture soreness 26.7% Ill-fitting dentures 13.3% Lost dentures 16.7% Caries, fractured or sensitive teeth 5.5% Calculus and bleeding gums	

* year of publication (A) No/mild dementia; (B) Moderate to severe dementia
** as reported by nurses (unpublished data Amor)

PART I: EXPLORING THE FIELD
I.B. SITUATION IN FLANDERS

CHAPTER 2

FACTORS CONTRIBUTING TO THE VARIATION IN ORAL HYGIENE PRACTICES AND FACILITIES IN LONG-TERM CARE INSTITUTIONS FOR ELDERS

This chapter has been published as:
Factors contributing to the variation in oral hygiene practices and facilities in long-term care institutions for elders

Jacques N. Vanobbergen, Luc M. De Visschere
Community Dental Health (2005) 22, 260-265

ABSTRACT

Objective: This study was designed to explore variations in oral hygiene practices and facilities in long-term care institutions for elders. Reported level of caregivers' knowledge related to oral health, reported work-climate, management, size of the institution and the mean age and degree of dependency of residents were evaluated.

Methods: Sixteen nursing homes were selected, using stratified random sampling, in the region of Ghent (Flanders). Nine different strata were used based on size and management. Factors thought to be associated with the variation in oral hygiene practices and facilities were collected from 225 caregivers (75%) through a structured 45-item questionnaire. The questionnaire was validated and tested for reliability during a test-retest prior to the start of the study. The relation between rates of oral hygiene practices and facilities and explanatory variables was investigated using correlation analysis and subsequently by multiple regression analysis.

Results: The best fitted regression model explained 30% of oral hygiene practice variation. The most predictive variable was the knowledge of caregivers, which explained 17% of the variation, while mean age explained 7% and managerial behaviour 6.3%. There was a trend towards a negative relationship with mean age, degree of dependency and size of the institution.

Conclusion: Most of the variance in oral health practices and facilities in long-term care institutions for elders in Ghent remains unexplained. Knowledge, mean age and managerial behaviour were the most likely explanatory variables.

INTRODUCTION

As in most West-European countries, one of the most important objectives of the Belgian Oral Health Care system in the future is the provision of adequate care for the elderly. In 2000 7.2 % of the total population of Belgium was older than 75 years and 3.5 % older than 80 years. The same percentages, approximately 6.9 % and 3.4 % respectively were found in Flanders, the northern part of Belgium. By 2030 it is estimated that the percentages will increase to 9.4 % and 5.7 % respectively[1].

In Flanders about 55,000 persons older than 75 (15%) are living in retirement homes or long-term care institutions. Based on data reported in 1999, 40 % of this group have a low or moderate degree of functional dependency, 60 % are nearly totally dependent[2].

No epidemiological data exists on the oral health or the oral hygiene of institutionalised elders in Flanders. Considering the international literature, one can assume that the amount of care is likely to increase in the future due to the fact that elders become more dependent and have a more complicated oral status with more restored teeth, implants and fixed prostheses[3,4]. In the medical, dental and nursing literature there is general agreement that effective oral hygiene is one of the determining factors in the control of oral problems[5]. Since ageing people become more vulnerable it is recommended that oral hygiene should be an integral part of total care[6]. Oral health has been reported as an important component of overall health, wellbeing, and quality of life of institutionalised elders[7]. It appears that the oral hygiene of institutionalised elderly people is poor[8-11]. Not only the oral hygiene status of the remaining teeth scored low[8,12] but also most denture-wearing patients living in nursing homes do not keep their prostheses clean[12,13]. The number of natural teeth[3,14], workload of personnel[15], the degree of functional dependency16, uncooperativeness of residents[17,18] and the lack of knowledge of the personnel employed in nursing homes are barriers to the practice of good oral care[5,6,18-20]. On the other hand the willingness of staff to provide care stimulates initiatives to promote oral care[19,21].

Some authors promote the need for successful oral health programmes[17,22-24], dental management[9], assessments, strategies and standards[19,25], procedures and facilities and protocols of care for this population[26-30]. Little research has been done on factors which contribute to the variations in oral hygiene protocols and the impact which these protocols have on the level of oral hygiene achieved.

The aim of this study was to identify the extent of the services and procedures used in long-term care facilities to assist the elderly residents with their oral hygiene, and to identify factors which contribute to any variations found in these parameters. Possible factors considered were, level of knowledge of the caregivers, work-climate, management, size of the institution and mean age and degree of dependency of residents.

MATERIAL AND METHODS

Data were collected from 225 health care workers in 16 nursing homes in the region of Ghent in Flanders-Belgium. These nursing homes were selected from a total of 36 by a technique of stratified random sampling using nine different strata. Strata were obtained by combining three categories defining the size of the institution (<50; between 50 and 100; >100 residents) and three categories depending on the funding of the institution (private non profit making institution, with an ecclesiastic background; social service institution; commercial institution).

A 43-item questionnaire, to be completed by nurses and home care aides, was designed. The first part in the questionnaire aimed to assess the extent of services, facilities and practices used in the institutions to support and assist the elderly residents with their oral hygiene, in future referred to as 'common procedure' (questions 1 to 15). The second part of the questionnaire was used to assess the organisational climate and the awareness and knowledge of the personnel, in order to explain the level of 'common procedure'.

To preserve the privacy of the personnel and their independence, the questionnaire was completed individually by the subjects within a short time span and the investigators themselves collected the questionnaires.

The study was approved by the Ethical Committee of Ghent University and consent was obtained from all nursing homes prior to the start of the study.

To define the outcome 'common procedure' in the analysis, a 15-item inventory in the questionnaire generated four components, which were combined to produce one global measure, and was expressed as a percentage. The four components were the existence of written reports of the oral status of the residents and the common use of a structured oral hygiene protocol (five items), internal communication between caregivers and residents' on oral hygiene (four items), reported oral hygiene activities (four items) and two items

concerning possible professional support of a dentist. Each item was measured using a four-point Likert scale (1=never occurs to 4=very frequently occurs).

The first component assessed the existence of a written protocol in which oral assessment was used to identify oral status and individual oral hygiene needs of residents. An example of the type of question used for this purpose was: "Is there a standard procedure to report in writing the 'status praesens' of the oral health of new residents on admission?".

On the other hand, because of the lack of a written protocol, more informal communication by caregivers concerning oral hygiene needs of individual residents may exist or care givers may provide assistance of their own accord. Evidence of these actions was assessed by the following two questions: "Are nurses or caregivers informed about the oral health status of the residents?" or "Is there any help provided to perform oral hygiene in physically or mentally handicapped and dependent residents?"

Five independent variables were used in the analyses: the stratification variables 'size of the institution' and 'managerial group of the institution', 'the distribution of the degree of dependency of the residents', and two variables collected from the questionnaire: 'the work-climate' in the institution and 'the knowledge of the personnel'. For 'the work-climate', a 20-item inventory in the questionnaire generated four component scores. As for the outcome measure, each item was measured with a four-point Likert scale (1=never occurs to 4=very frequently occurs). Two component scales were related to managerial behaviours (supportive and directive), and two were related to personnel behaviours (committed and independent). The 'personnel knowledge' scale employed eight items, each measured with a four-point Likert scale and generated one component scale. It measured the general level of educational and vocational training, the possibilities and willingness for continuing education and the existing knowledge of the individual.

The measurements used in the present study are examples of measurements for which there is neither a gold standard nor any established criteria. To answer relevant questions such as, 'does the questionnaire ask the relevant questions?' or 'are the questions clear and unambiguous?' face validity was assessed. To understand if the questionnaire covered all the essential components it was designed to measure, content validity was also assessed. During a pre-test, performed in seven comparable institutions (matched to the

study group by the stratification variables), both content validity and face validity were assessed. Evaluation by an expert panel, composed of managers of comparable institutions and two experts in the field, was performed. This process resulted in some questions being deleted, and others modified.

The reliability of the questionnaire was assessed during a test-retest procedure in a random sample of 30 caregivers at a two-week interval. Intraclass correlation coefficients (normal distribution) and the Wilcoxon signed rank test (skewed distribution) were calculated for the different component scores. One component of personnel behaviour (commitment) indicated a poor degree of reliability. After excluding one item from this component its reliability was acceptable. The reliability results for the global measures were 0.75 for 'common procedure used in the institutions to perform oral hygiene for their residents', 0.64 for the 'work-climate' and 0.77 for 'personnel knowledge'.

Bivariate statistical analysis of the data was done by Pearson or Spearman's rho correlation analyses for continuous variables (depending on the normality of the distribution of the variables) and chi-square for discrete or categorical variables. In order to explore the predictive ability of the different explanatory variables, multiple linear regression analyses were performed using forward selection procedures. Variables that turned out to be significantly correlated to the outcome were included in this model. Analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 11.0 for Windows®. Probability of 5% was defined to indicate statistical significance of the associations examined in this study.

RESULTS

The mean age of the residents was 84.87 years (SD 2.40). Of the residents, 69% exhibited a high and 29% a moderate degree of dependency.

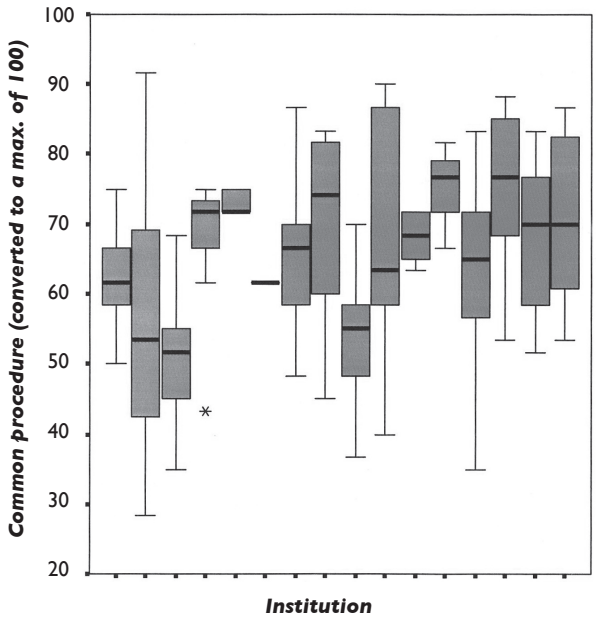
The overall response rate to the questionnaire was 75% with 225 health care workers and staff members participating in the study. Part of the non-respondents was nurses or caregivers working night shifts, who were excluded from this study. The remaining non-respondents were equally distributed among the institutions and no differences were observed between respondents and non-respondents concerning the stratification variables.

The results of the answers (converted to a maximum score of 100) concerning the 'common procedure' used in the institutions to perform oral hygiene, the global measure and the four component scores are shown in table 1. All examined institutions reported that a structured oral hygiene protocol is rarely used and there is little or no support by a dentist. Nevertheless caregivers reported the existence of internal communication about oral hygiene procedures and an active practice of daily oral hygiene by their residents, with or without the assistance of the caregivers. If given, basic oral hygiene is often carried out, without reference to patients' needs.

Table 2 shows the values of the independent variables, gathered by the questionnaire. It seems that the oral health care needs of institutionalised elders could probably be hampered by a lack of knowledge of the personnel, including staff, nurses and home care workers and by the general lack of monitoring and control over all care activities by the managers of such institutions. Concern, commitment and focus on professional activities resulted in moderately high scores, ranging from 67.67% to 69.24%.

An important variation between the institutions was observed for the outcome variable as shown in figure 1 ($p<0.001$).

Figure 1. Distribution of scores on 'common procedure' (= extent of services, facilities and practices used to support and assist residents with oral health) for the different institutions (n=16) (median, range and interquartile range)



With the exception of the 'committed behaviour of caregivers' (p=0.6) this variation was also observed for all other variables gathered by the questionnaire (p<0.001). An exploration of the differences between nurses and home care aides, concerning the knowledge, commitment and independent practice of their work resulted in only a non significant (p=0.14) minor difference in knowledge in favour of the nurses.

The results of the bivariate correlation analysis between the 'common procedure' used in the institutions to perform oral hygiene with their residents (global measure) and the different explanatory variables are shown in table 3. A significant positive correlation was found for 'knowledge of personnel' (p<0.001), supportive and directive behaviour of the management (p<0.001). A negative correlation was found for the mean age of the residents (p<0.001), the number of residents in the institution (p<0.001) and the degree of dependency of the residents (p<0.001). Institutions with more residents, older residents and residents with a higher degree of dependency tend to have a lower score on the global measure of 'common procedure'. There was also a significant difference in the global measure of 'common procedure' between institutions depending on their management and funding system (p<0.001). The statistical analysis showed no correlation between the value for committed and independent behaviour of the personnel and the institutions with different global measure scores for the 'common procedure', although there was a trend for a weak positive correlation between the commitment of the personnel and the value of this global score.

In the multiple regression analysis model (table 4) different variables met the entry requirement and were included in the equation to avoid possible confounding. These variables were the knowledge of caregivers, the two components of managerial behaviour and the mean age of residents. The R-square value indicates that 30% of the variance in global measure of the 'common procedure' is explained by the variables included in the analysis. The standardised β values show that the strongest unique contribution, explaining the dependent variable, is found in the variable 'knowledge of the care-givers' (β=0.30), followed by 'mean age' (β=-0.20) and then 'directive behaviour of the management' (β =0.19). This model resulted in a Durbin-Watson value of 1.63 and a Variance Inflation Factor ranging form 1.1 to 1.3. The Durbin-Watson test statistic detects first-order autocorrelation. The distribution of the Durbin-Watson test is symmetric about 2.00 and

ranges from 0 to 4. Positive serial correlation results in a Durbin-Watson near 0, negative serial correlation results in a Durbin-Watson near 4. Thus, as the Durbin-Watson statistic approaches 2 (as the case in the present analysis), it is more likely that the residuals are independent of each other.

DISCUSSION

This study evaluates the common practices used in long term care facilities for elders, to support and assist them with their oral hygiene, and whether or not factors could be defined which affect these practices. The results show statistically significant association between the performed oral hygiene practices and the knowledge of the personnel, mean age of the residents and supportive and directive behaviour of the management, after controlling for numerous potential confounders. As far as we know this is the first report on this subject. Previous reports only considered some of the factors considered in this study.

All examined institutions rarely used a written report of the oral status of the residents, nor a structured oral hygiene protocol. This is in agreement with Nitschke and Hopfenmüller who concluded that regular dental control and assistance with oral hygiene were often thought to be unnecessary by the management31. Kambhu and Levy reported that the oral hygiene assessment procedures, used in some retirement homes, appear to be deficient[28]. A lack of assessment and documentation was highlighted[19] and it was mentioned that caregivers have little experience of systematic oral care[6].

The study of Hardy et al. revealed that nursing aides generally provided daily oral hygiene services to nursing home residents[17.] This is similar in the present study, where the lack of a structured oral hygiene protocol notwithstanding, caregivers reported a high active practice of daily oral hygiene for their residents carried out as a routine task. However, inaccurate and overestimated responses to the questionnaire are unavoidable. Despite the validation and reliability tests of the questionnaire this could have resulted in some recall bias leading to an overestimation of the global measure for oral hygiene practices. A similar conclusion was made by Hardy et al.[17]. Because it is to be expected that this overestimation is independent of the level of other variables, the misclassification will be non-differential and tends to introduce a bias towards the null hypothesis.

In the unadjusted analyses institutions with more residents, with residents with a higher degree of dependency and with older residents tend to have a lower score for the global measure of common oral hygiene practices. Kambhu and Levy reported that small facilities have better levels of hands-on care than do the medium and large facilities. He expressed doubts whether this association was due in part to a response bias or that it may reflect a true difference resulting from the inherent characteristics of small facilities[28].

The reason why institutions with more dependent elderly tend to have a lower score can be the result of financial arrangements. Institutions with a higher degree of dependency need more personnel and financial restrictions may prevent this. It is possible that lack of time may prohibit the use of a structured oral hygiene protocol. Weeks and Fiske revealed, in a qualitative study with in depth interviews carried out in one institution that time constraints associated with workload was an inhibiting factor for oral care in people with disabilities[15].

It is noteworthy that of the preceding variables only 'mean age of the residents' remained significant in the multivariate model. Common procedures to assist the elderly residents with their oral hygiene were less pronounced in institutions where the mean age of the residents were higher. Further investigation with in depth interviews (qualitative approach) is needed to explore this correlation. This could be attributed for example to the caregivers spending more time on general health care with consequently less time for oral health care. Another explanation could be the fact that a high proportion of the older age groups were edentulous (75%). In this case carers think that edentate people have a lesser need for oral hygiene.

Only in the unadjusted model a significant difference in 'common procedure' was found between the institutions depending on their management and funding system indicating that private non profit making institutions scored the lowest and commercial institutions the highest. It could be that the socio-economic status of residents acts as a confounding factor since this variable can be associated with both the exposure and the outcome.

The statistical analysis showed no correlations for committed and independent behaviour of the personnel between the institutions with different global measure scores for 'common procedure', although there was a trend for a weak low positive correlation for the commitment of the personnel and the value of the global score for the outcome. An

exploration of differences between nurses and home care aides resulted only in a minor non-significant difference in knowledge in favour of the nurses. This is in contrary with the study of Wardh et al. who found differences in willingness and attitude18. A possible explanation could be differences in tasks between Swedish and Belgian nurses and home care aides. In Belgium, directors of nursing homes emphasize more and more living and caring rather than curing.

Directors who are more directive and who are more supportive seem to have a positive effect on the oral hygiene procedures in an institution, suggesting that it is important to involve the management from the beginning in any oral hygiene strategy. This is in agreement with Nitschke and Hopfenmüller who interviewed managements of 85 institutions in West Berlin and concluded that information and motivation of the management and nursing staff is the first step towards improving the dental care of home residents[31]. The same conclusion was reported by de Baat et al. who interviewed the staff of 300 nursing homes[22]. It is important to reference the study findings of Johnson and Lange, that directors indicated a preference for nursing staff to have oral health in-service training by dental professionals rather than other educational and/or programme proposals[24].

The regression analysis revealed knowledge of the personnel as the most important predictor for the global measure of 'common procedure'. Many publications already mention a lack of knowledge as one of the most important inhibiting factors in achieving an acceptable level of oral hygiene for institutionalised elders resulting in inadequate oral care[19]. In particular, caregivers are poor at recognizing oral disorders and assisting with oral hygiene[20].

It is difficult to compare the obtained level of knowledge with those from other studies because standard questionnaires to measure knowledge of personnel in the institutions are lacking.

Seventy % of the variance of global measure for oral health practices in the institutions remains unexplained indicating the existence of other predictors. Financial policies, socio-economic status of residents, dental status and dental awareness of elders and other factors inherent in the institutions could be further possible explanatory variables. Further investigation is necessary to explore possible influences in order to optimize oral health programs for institutionalised elders.

A structured oral health protocol that provides dental status information of residents on admission[27] and the subsequent development of an individual oral hygiene protocol together with regular dental examination[23] has been suggested as an important part of an intervention programme to obtain acceptable levels of oral care of institutionalised elderly[9,17,19,26,31]. Adequate training of personnel to handle this protocol must be the first step together with the development of information programs which involve the management of institutions. A further longitudinal investigation is planned dealing with the impact of a similar oral hygiene protocol on the level of oral hygiene.

In conclusion, the results of this study broaden our understanding of environmental factors that may have influenced the poor oral hygiene in elderly people as described in the literature. The results also suggest that increasing the knowledge of the caregivers and persuading the management of the institutions of the importance of oral hygiene may contribute to the improvement in the quality of life and the oral health of these people at risk.

REFERENCES

1 Lebrun, L.: National Institute of Statistics.
2 Heeren, J. and Thewys, T. (1999) Seniorenvoorzieningen: voor en na 2000, Kluwer Editorial.
3 Mattson, U., Heyden, G. And Landahl, S. (1990): Comparison of oral and general health development among institutionalized elderly people. Community Dentistry and Oral Epidemiology 18, 219-222.
4 Shay, K. (1994): Dental management considerations for institutionalized geriatric patients. Journal of Prostethic Dentistry 72, 510-516.
5 Holmes, S. (1998): Promoting oral health in institutionalised older adults: a nursing perspective. Journal of Royal Social Health 118, 167-72.
6 Sumi, Y., Nakamura, S., Nagaosa, S., Michiwaki, Y. and Nagaya, M. (2001): Attitudes to oral care among caregivers in Japanese nursing homes. Gerodontology 18, 2-6.
7 Coleman, P. (2002): Improving oral health care for the frail elderly: a review of widespread problems and best practices. Geriatric Nursing 23, 189-99.
8 Jokstad, A., Ambjornsen, E. and Eide, K.E. (1996): Oral health in institutionalized elderly people in 1993 compared with in 1980. Acta Odontologica Scandinavica 54, 303-308.
9 Knabe, C. and Kram, P. (1997): Dental care for institutionalized geriatric patients in Germany. Journal of Oral Rehabilitation 24, 909-912.
10 MacEntee, M.I., Weiss, R.T., Waxler-Morrison, N.E. and Morrison, B.J. (1987): Factors influencing oral health in long term care facilities. Community Dentistry and Oral Epidemiology 15, 314-316.
11 Vigild, M., Brinck, J.J. and Christensen, J. (1993): Oral health and treatment needs among patients in psychiatric institutions for the elderly. Community Dentistry and Oral Epidemiology 21,169-171.
12 Frenkel, H.F., Harvey, I. and Newcombe, R.G. (2000): Oral health care among nursing home residents in Avon. Gerodontology 17, 33-38.
13 Pietrokovski, J., Azuelos, J., Tau, S. and Mostavoy, R.(1995): Oral findings in elderly nursing home residents in selected countries: oral hygiene conditions and plaque accumulation on denture surfaces. Journal of Prostethic Dentistry 73,136-141.
14 Lester, V., Ashley, F.P. and Gibbons, D.E. (1998): The relationship between socio-dental indices of handicap, felt need for dental treatment and dental state in a group of frail and functionally dependent older adults. Community Dentistry and Oral Epidemiology 26, 155-159.
15 Weeks, J.C. and Fiske, J. (1994): Oral care of people with disability: a qualitative exploration of the views of nursing staff. Gerodontology 11, 3-17.
16 Berkey, D.B., Berg, R.B., Ettinger, R.L. and Meskin, H.L. (1991): Research review of oral health status and service use among institutionalized older adults in the U.S. and Canada. Special Care in Dentistry 11, 131-136.
17 Hardy, D.L., Brangan P.P., Darby, M.L., Leinbach, R.M. and Welliver, M.R. (1995): Self-report of oral health services provided by nurses' aides in nursing homes. Journal of Dental Hygiene 69, 75-82.
18 Wardh, I., Anderson, L. and Sörensen, S. (1997): Staff attitudes to oral health care. A comparative study of registered nurses, nursing assistants and home care aides. Gerodontology 14, 28-32.
19 Adams, R. (1996): Qualified nurses lack adequate knowledge related to oral health, resulting in inadequate oral care of patients on medical wards. Journal of Advanced Nursing 24, 552-560.
20 MacEntee, M.I., Thorne, S. and Kazanjian, A. (1999): Conflicting priorities: oral health in long-term care. Special Care in Dentistry 19, 164-172.
21 Frenkel, H.F. (1999): Behind the screens: care staff observations on delivery of oral health care in nursing homes. Gerodontology 16, 75-80.
22 De Baat, C., Bruins, H.H., van Rossum, G.M. and Kalk, W. (1993): Oral health care for nursing home residents in The Netherlands - a national survey. Community Dentistry and Oral Epidemiology 21, 240-242.
23 Ettinger, R.J. (1992): Oral care for the homebound and institutionalized. Clinics in geriatric medicine 8, 659-672.
24 Johnson, T.E. and Lange, B.M. (1999): Preferences for and influences on oral health prevention: perceptions of directors of nursing. Special Care in Dentistry 19, 173-180.
25 Call, R.L., Berkey, D. and Gordon, G. (1986): The activities of the advisory dentist in the long term care facility. Gerodontics 2, 35-38.
26 Berkey, D.B. (1996): Current state of oral health care in institutionalized older adults. Special Care in Dentistry 16, 143-146.
27 Hoad-Reddick, G. (1991): A study to determine oral health needs of institutionalised elderly patients by non dental health care workers. Community Dentistry and Oral Epidemiology 19, 233-236.

28 Kambhu, P.P. and Levy, S.M. (1993): Oral hygiëne care levels in Iowa intermediate care facilities. Special Care in Dentistry 13, 209-214.
29 Logan, H., Ettinger, R., McLeran, H. and Casko, R. (1991): Common misconceptions about oral health in the older adult: nursing practices. Special Care in Dentistry 11, 243-247.
30 Strayer, M. and Henry, R. (1996): Developing practice guidelines for institutionalized older dental patients. Special Care in Dentistry 16, 165-169.
31 Nitschke, I. and Hopfenmüller, W. (1991): Zahnmedizinische Betreuung in Seniorenheimen. Deutsche Stomatologie 41, 432-435.

Table 1. 'Common procedure' to perform oral hygiene: global measure and 4 component scores (converted to a maximum of 100)

	Mean	***SD***
Global measure	**64.9**	**13.20**
Common use of a structured protocol	33.56	19.88
Mutual and internal communication	74.28	19.79
Oral hygiene activity	88.67	14.92
Dental support	37.11	25.37

Table 2. Work-climate and knowledge of personnel (converted to a maximum of 100)

	Mean	***SD***
Work-climate		
Supportive behaviour of director	69.24	17.59
Directive behaviour of director	49.42	16.64
Commited behaviour of caregivers	67.67	8.65
Independent behaviour of caregivers	68.03	14.66
Knowledge of personnel	**53.77**	**8.44**

Table 3. Correlation coefficients and probabilities of relationships between outcome ('common procedure') and predisposing factors

N=225	***Common procedure***	
	Correlation coefficient	Level of significance
Supportive behaviour of director	**0.36**	<0.001
Directive behaviour of director	**0.35**	<0.001
Commited behaviour Personnel	0.13	0.06
Independent behaviour Personnel	-0.01	0.86
Knowledgde of personnel	**0.41**	<0.001
Mean age residents	**-0.31**	<0.001
Management	**0.25**	<0.001
Degree of dependency residents	**-0.29**	<0.001
Number of residents	**-0.26**	<0.001

Table 4. Results of the linear regression model (stepwise) by common procedure

					Collinearity Statictics	***Durbin-Watson***
	ß	***B (SE)***	***95% CI***	***p***	***VIF***	
Constant		72.635 (17.630)	37.842-107.427	<0.001		
Knowledge	0.299	0.510 (0.114)	0.286-0.735	<0.001	1.129	
Mean age	-0.201	-0.605 (0.198)	-0.996-0.213	0.003	1.102	
Directive behaviour management	0.186	0.443 (0.163)	0.122-0.764	0.007	1.191	
Supportive behaviour management	0.144	0.325 (0.161)	0.008-0.642	0.045	1.297	1.631

CHAPTER 3

ORAL HYGIENE OF ELDERLY PEOPLE IN LONG-TERM CARE INSTITUTIONS – A CROSS-SECTIONAL STUDY

This chapter has been published as:
Oral hygiene of elderly people in long-term care institutions – A cross-sectional study

Luc M. De Visschere, Lieve Grooten, Guy Theuniers, Jacques N. Vanobbergen
Gerodontology (2006) 23: 195-204

ABSTRACT

Objective: The aim of this cross-sectional study was to assess the level of oral hygiene in elderly people living in long-term care institutions and to investigate the relationship between institutional and individual characteristics, and the observed oral cleanliness.

Materials and methods: Clinical outcome variables, denture plaque and dental plaque were gathered from 359 older people (14%) living in 19 nursing homes. Additional data were collected by a questionnaire filled out by all health care workers employed in the nursing homes.

Results: Only 128 (36%) residents had remaining teeth in one or both dental arches. About half of the residents (47%) wore complete dentures. The mean dental plaque score was 2.17 (maximum possible score = 3) and the mean denture plaque score was 2.13 (maximum possible score = 4). Significantly more plaque was observed on the mucosal surface of the denture with a mean plaque score of 2.33 versus 1.93 on the buccal surface ($p<0.001$). In the multiple analyses only the degree of dependency on an individual level was found to be significantly correlated with the outcome dental plaque (Odds Ratio: 3.09) and only the management of the institution with denture plaque (Odds Ratio: 0.43).

Conclusion: Oral hygiene was poor, both for dentures and remaining teeth in residents in long-term care institutions and only the degree of dependency of the residents and the management of the institutions was associated with the presence of dental plaque and denture plaque respectively.

INTRODUCTION

In Belgium, as in all industrialized countries, the population is aging rapidly because of a prolonged life expectancy. By 2020 more than 20% of the Belgian population will be 65 years or older and 5.7% will be over 80 years, with the expectation for 2050 to be 27% and 10.6% respectively[1]. Ageing can be described as a progressive, degenerating, lessening function of organs and tissues. The 'disposable soma' theory summarises ageing as an accumulation of non-repaired damage. A number of degenerative conditions such as diabetes, osteoporosis, cancer and Alzheimer's play an important role in the process of ageing and extending morbidity. As a result of this extended morbidity, older people need help in daily living activities from family, friends or professional caregivers, if necessary, in a long-term care institution[2]. In Flanders, the Dutch part of Belgium, about 62.000 persons older than 75 (15%) live in retirement homes or long-term care institutions.

During one's lifetime, good daily oral hygiene is indispensable to maintain good oral health and quality of life. This is even more important for people of an advanced age. Previous international studies have shown poor oral hygiene and oral health among housebound[3-5] and institutionalised older people[6-11]. Not only the oral hygiene of the remaining teeth scored low[9,12] but also most denture-wearing residents living in nursing homes do not keep their prostheses clean[12,13]. Poor oral hygiene in institutionalized older people could be explained by reasons relating to the organisation of the institutions such as workload[14] and lack of knowledge of the personnel[15-19] and on factors characteristic for the residents, in particular the number of natural teeth[20,21], the degree of functional dependency[22] and low level of co-operation of residents[23,24].

Dental and denture plaque scores are high and give rise to many oral complaints such as caries (specially root caries), periodontitis, oral candidiasis[25,26], denture stomatitis[26,27] and complaints such as halitosis[28]. A high plaque score is a significant predictor for the number of teeth lost in the institutionalised older population[29]. Moreover neglected oral hygiene may increase morbidity and mortality in frail older people. Dental and denture plaque may function as a reservoir of potential respiratory pathogens to facilitate the oropharynx[30] and the aspiration of oropharyngeal (including periodontal) pathogens is a significant cause of nursing home-acquired pneumonia[29,31-37].

Studies about oral health in institutionalised older people tend to be descriptive studies and to our knowledge, little research has been carried out to explore possible relationships between levels of oral hygiene and influencing factors in this at-risk population. The present study was set up to gather cross-sectional baseline data in order to start a 5-year follow-up intervention study, promoting oral hygiene in long-term care institutions.

The aim of this cross-sectional study was to assess the level of oral hygiene and to improve understanding of factors that affect oral hygiene of older people (75 years +) in long-term care institutions. Selected variables on an individual and institutional level were included.

METHODS

Population and sample

All institutionalised older people, aged 75 years or more, living in long-term care facilities in the region of Ghent in Flanders, Belgium formed the study population (n=2585). Data were collected from 359 residents (14%) living in 19 nursing homes. These nursing homes were selected from a total of 36 by a technique of stratified random sampling with proportional allocation using 9 different strata. Strata were obtained by combining three categories defining the capacity of the institution (<50; between 50 and 100; >100 residents) and three categories depending on the management group of the institution (private non-profit making institution, all from Catholic signature; social service institution; commercial institution).

Within the nursing homes, the residents, who were to be subjects of an oral clinical examination, were selected by a technique of stratified random sampling with proportional allocation using 4 different strata based on their degree of dependency O, A, B and C (table 1)[38]. Deeply demented subjects were excluded. In the analysis O and A were defined as a low degree of dependency and B and C were considered high.

At least 10% of all residents in each nursing home were selected, but when a subject refused to participate, a replacement strategy was considered. To this end each subject was selected within a cluster belonging to the same stratum. Within this sampling procedure, the probability of selection for an individual depended on the probability of sampling in a dependency group j belonging to one of the 9 strata k. In this way, probabilities were

checked to evaluate possible oversampling/undersampling. An oversampling was only found for the stratum private non-profit/ >50 < 100. Giving the minimal oversampling, the use of weighting factors was not considered.

Table 1. Categories of degree of dependency based on Katz index

Category O	Physical independent and not demented
Category A	Physical dependent for bathing and/or dressing Mental independent but disoriented in time and space
Category B	Physical dependent for bathing, dressing, transferring and/or toileting Mental dependent, disoriented in time and space and dependent for bathing and/or dressing
Category C	Physical dependent for bathing, dressing, transferring and/or toileting and/or feeding and incontinent. Mental dependent, disoriented in time and space and dependent for bathing, dressing, transferring, and/or toileting and/or feeding and incontinent

Instrumentation

The outcome variables for the subjects' oral hygiene were denture and dental plaque assessed by clinical examination. Explanatory variables on an individual and institutional level were gathered by a questionnaire.

Denture plaque was scored independently by two investigators using methylene blue disclosing solution according to Augsburger and Elahi[39] (score range = 0-4). Dental plaque was scored by one investigator using the plaque index described by Silness and Löe[40] (score range = 0-3). In the multiple logistic regression analyses, the outcome variables were dichotomised using the median as the cut-off point. Fourteen third-year undergraduate dental students who had been specifically trained and calibrated in the use of defined diagnostic criteria carried out the clinical examinations. Prior to the study, a random sample of 16 subjects (113 scores) was examined to determine inter-examiners' reliability in scoring denture plaque. The intra-class correlation coefficient was 0.96 (95%CI: 0.92-0.99 / p<0.001) for total mean score per denture. Detailed information on reliability was evaluated comparing each examiners' score for each segment (n=113) with the scores of a golden standard (JV). The results showed a fair reliability with a weighted kappa ranging from 0.50 to 0.67.

Explanatory variables

During the clinical examination, additional parameters at an individual level were recorded on the examination sheet: gender, age (continuous), presence (yes or no) and condition (almost none or minimal vs. moderate or strong wear) of oral hygiene tools in residents' room.

Data on institutional level, measuring directive and supportive behaviour of the director, committed behaviour, independent behaviour and knowledge of the personnel were collected by a self-administered validated questionnaire with 28 items filled out by all health care workers and nursing staff employed in the institutions (n=225). These variables are described in detail in a previous study to explain the variation in oral hygiene practices and facilities in long-term care institutions for the elderly[19]. The first column of Table 5 shows the annotation of all explanatory variables used and their different levels.

Overall consent to participate was given by the director from all nursing homes prior to the start of the study. Informed consent was obtained for all residents involved in the study. The study was approved by the Ethics Committee of the Ghent University Hospital (OG017).

Statistical analyses

Statistical Package for the Social Sciences (SPSS)) version 11.0 for Windows® was used to analyse the data. Probability of 5% ($p \leq 0.05$) was defined as significant for all statistical tests in this study. Means and standard deviations were calculated and differences between groups were tested by cross-tabulation, analysis of variance, chi-squared test, and *t*-test, depending on the nature of the variable. Because of the large number of significance tests involved, the reported *p*-values in the univariate analysis were only of explanatory nature. Multiple logistic regression analyses enabled a quantitative comparison of the separate effects of putative risk factors with their joint effect on the oral hygiene response. Finally after testing for all possible interactions between independent variables, the best fitted logistic regression model with adjustment for gender, stratification variables and proportion of degree of dependency was used to determine explanatory factors for the variability in oral hygiene.

RESULTS

The mean age of the residents was 84.87 years (SD 2.4), half of them (49.2%) with a high degree of dependency, with three-quarters (77.7%) being women. Most of the institutions were private non-profit making institutions (62.4%) followed by nearly one-quarter (24.2%) social service institutions and 13.4% commercial institutions. The proportions of different management categories in the population were 55.6%, 27.8% and 16.7%, respectively. Of all institutions, 37.6% care for <50 residents, 15.3% for more than 50 but less than 100 and 47.1% for more than 100 residents. The proportion of different sizes of nursing homes of the population is 38.9%, 30.6% and 30.6%, respectively.

About two-thirds of the residents (230, 64%) were edentulous (table 2). Nearly half of the residents (171, 47%) wore complete dentures, including one overdenture on implants. Some edentulous residents wore only a maxillary denture (41) or a mandibular denture (two) and 16 had no dentures at all. Only 128 (36%) residents had some natural teeth in one or both dental arches, with one wearing a complete overdenture on two natural teeth.

A denture brush was available in their room for only 19.3% of the residents, wearing full or partial dentures (table 3). No interdental hygiene products were found for residents who had natural teeth and mouth rinse products were available for only about 10% of all residents.

The mean dental plaque index and denture plaque index per subject was 2.17 and 2.13, respectively (Table 4). Only 4% of the subjects with natural teeth had a plaque index <1 and about 30% had extremely poor oral hygiene (maximum score 3). Of all the denture wearers 46.5% had a denture plaque index >2 indicating poor denture hygiene (>50% surface plaque coverage). Figure 1 shows examples of dentures with plaque scores. Only 15 residents (5%) scored 1 or <1 and plaque levels were significantly higher on the mucosal site of the dentures than on the oral site, with improved denture cleanliness for upper dentures rather than for lower dentures (table 4). No statistical differences between institutions were found. Compared with the mean denture plaque, the variability in mean dental plaque between institutions was more pronounced (p=0.86 and 0.09, respectively).

On an individual level (table 5), there was a statistically significant relationship between degree of dependency of the resident and dental plaque (p=0.01), with the mean dental plaque being higher in residents with a high degree of dependency. The same tendency, although without statistical significance, was found for denture plaque (p=0.09). On an institutional level (table 6), a statistical significance was found between poor denture plaque and management of the institution (p=0.05) and supportive behaviour of the direction (p=0.05). Commercial management and supportive behaviour of the director had a favourable effect on denture cleanliness. With regard to denture cleanliness, only a tendency (p=0.07) towards cleaner prostheses was found to correspond with a high level of knowledge of the personnel.

Dental plaque was only significantly related to the management of the institution (p=0.04) and social service management had an unfavourable effect on dental cleanliness.

These findings were confirmed by the multiple logistic regression analyses (table 7) showing the degree of dependency to be the only significant determinant for the presence of dental plaque (OR: 3.09 – 95% C.I.: 1.28-7.47) and improved denture cleanliness for residents in commercial institutions (Table 8) (OR: 0.43 – 95% C.I.: 0.20-0.93).

DISCUSSION

This study reports cross-sectional baseline data on dental status and oral cleanliness of elderly people living in nursing homes. These data gave rise to a 5-year following-up study evaluating the changes in oral hygiene of older people after the implementation of a structured intervention in the institutions.

Of the baseline study population, 64% were edentulous and this finding is in agreement with studies performed in the 1980s and the 1990s[6,9,10,23] and a recent study reported in Australia[41]. On the other hand, the fact that the number of dentate older people in industrialised countries is rapidly increasing, as reported in recent Scandinavian studies[40,42,43], is not yet reflected in the current data. This increased percentage of dentate older people is explained by improvements in the standard of living, the increased use of fluoridated toothpaste and dental services, and a raised attention for preventive oral health care and positive attitude towards oral health.

Because of the lack of longitudinal data in Flanders, changes over time can not be estimat-

ed at the moment. According to the reports of the National Health Interview Surveys[44], organised in Belgium in 1997 and 2001, the percentage of edentate in the age group of 75 years and older increased slightly from 52% in 1997 to 54% in 2001. Both surveys did not include institutionalised subjects.

In contrast with Finland, where 18% of the subjects were edentulous with no dentures, the present study found that only 4% of the residents were edentulous with no dentures. This can be partly explained by the insurance system in Flanders which still pays more attention to cure rather than to care, with a lot of efforts provided for edentate people.

Oral cleanliness was generally poor, which is in line with reported results of comparable studies all over Europe. One could state that the oral hygiene levels of dentate and edentate older people in the present study are of the lowest reported in recent literature. Oral hygiene of the remaining teeth scored extremely low (PI = 2,17; SD 0,75) and contrasts sharply with the situation in Canada[11] (PI = 1,3; SD 0,9) but is in agreement with results obtained from a study performed in England[12] (PI = 2,3; SD 0,7), both using the plaque index of Silness & Loë. A detailed comparison with other studies is not always relevant because of differences in diagnostic criteria in plaque assessment and differences in characteristics of the sample. The main differences in sample characteristics are mean age, socio-economic status, degree of dependency, physical and mental status and place of residence.

Dental plaque scores were worse than denture plaque scores. This finding gives rise to a possible hypothesis that nurses and caregivers provide some assistance for denture cleaning but virtually no assistance for brushing remaining teeth of dentate older people, who are dependent. This hypothesis will be part of further investigation.

Denture plaque scores, recorded on the mucosal surfaces, were significantly higher than those on the oral surfaces. This finding is in agreement with two different studies performed by McCabe et al.[45], and Keng and Lim[46] and is useful for the implementation into oral hygiene protocols. Residents and caregivers should be told to pay more attention to the inner sites of the dentures, if manual cleaning is advised.

Explanations for the neglect of daily oral hygiene of long-term residents in the present study are the management of the institution, the degree of dependency of the resident for both dental and denture plaque and supportive behaviour of the management, but only

for denture plaque. As mentioned previously, poor oral hygiene in institutionalised older people could be explained by a lack of knowledge of the personnel. It is noteworthy that in this study, only a tendency (p=0.07) towards cleaner prostheses was found to correlate with a higher level of knowledge. No correlation was found between knowledge and dental cleanliness, strengthening the above-suggested absence of assistance for brushing the remaining teeth of dentate dependent residents.

Initially, a series of explanatory logistic-regression analyses were performed to test for the possible interactions between independent variables. None of them was significant. Based on this exploration and that of the univariable analyses, initially logistic regression models were performed including only the stratification variables: the degree of dependency on an individual level, and the management and capacity of the institution on institutional level. The usefulness of including a wider range of variables was considered, in particular the "proportion of high dependent residents" as a variable on institutional level. In fact, the chance of having less plaque for a resident in a commercial institution could be confounded by the fact that commercial institutions are mostly (66%) small capacity institutions with less high dependent residents. So, adjusting for both these variables seems sensible. Analyses performed with this wider range of variables yielded a more pronounced effect of 'management'. Staffing was not used as a possible explanatory variable in the multiple logistic regression analysis because of the fact that staffing of nursing homes in Flanders is set by decree taking into account the capacity of the institution and residents' degree of dependency. This makes the level of staffing comparable for the different institutions.

The multiple logistic regression analysis showed that the degree of dependency of the residents was associated with the presence of dental plaque and the management of the institution with denture plaque. Commercial institutions are smaller and have in general less high-dependent residents, but, as these factors are included in the multiple analysis, they could not act as confounders disturbing the correlation between management and denture plaque.

The presence of oral hygiene products in residents' room was not correlated with the level of oral hygiene and the presence of a mouth rinse and a denture brush was low and non-existent for interdental hygiene tools. Denture cleaning tablets were present in 44.9% of

the cases suggesting the strong belief of residents and caregivers that the use of cleaning tablets results in clean dentures. The lack of variability in the presence of oral hygiene products and the general low level of oral hygiene could hamper proving any correlation between both in the present study. Hardy et al.[23] reported the usefulness of oral hygiene tools and demonstrated that nurses' aides in Virginia (US), although not properly prepared and trained, provided mouth rinses for 95% and flossing for 34% of dentate residents. Oral hygiene protocols in the future will have to take into account shortcomings such as availability, attention to condition and knowledge about appropriate use of oral hygiene tools.

A weakness typical of this kind of study is the difficulty to complete a clinical examination in circumstances where the survey subject is not in the ideal supine position and where the examiner does not have access to the aids of modern dental examination room. To outweigh this disadvantage, both scoring dental plaque and denture plaque, were carried out independently by two investigators, with the final result as a mean of the two scores. This procedure, together with the training and calibration of the examiners, was done meticulously to optimise the reliability and reproducibility of the measurements. Denture plaque assessment, according to the method of Augsburger, is undeniably very reliable. It makes all plaque visible thanks to the high contrast with the blue and white colour of different parts of the dentures. Examiner reliability was assessed for the clinical variable 'denture plaque'. First, a strict approach was attempted using the categorical scores of each segment of the denture and this yielded a kappa score ranging from 0.50 to 0.67. According to Landis and Koch[47], this score stands for a moderate to substantial agreement. A more realistic approach compared the mean plaque score made by the examiners for a denture or a denture surface. To measure possible differences, correlation between these scores was computed using the intra-class correlation coefficient. This approach yielded a high fulfilment rate for buccal and mucosal surfaces of 0.96 and 0.95, respectively.

As the assessment of dental plaque, using the S&L index, involves the removal of plaque with the examination probe, examiner reliability was not performed for dental plaque.

Another possible weakness of the present study could be the refusal of some residents to cooperate with the survey. About 5% of the residents refused to participate in the study

and were replaced by the following subject in the cluster. Even taking into account this replacement strategy and based on the degree of dependency of the residents, the residents who refused to co-operate could be those with the most negative approach to dental care and the least favourable oral health condition. This may bias basic prevalence figures and even the existence, strengths and direction of associations. It seems reasonable to assume that, on average, this selection bias tends to result in more favourable estimates of the oral health and oral hygiene conditions of our target population. This supposition is becoming more important taking into account the fact that residents with high dementia are excluded in this study.

CONCLUSION

The hypothesis assumed in the present survey was supported such that the oral hygiene of the institutionalised older people was poor. Environmental factors and factors characteristic of the individual were associated with their oral hygiene. Oral cleanliness is the basis of primary prevention in oral diseases and in long-term care institutions, needs a structured approach in order to obtain an acceptable level of oral hygiene for residents. Therefore, the implementation of interventional projects providing daily help in oral hygiene procedures for institutionalised older people is recommended. The type of management of the institution and the degree of dependency will be helpful in identifying those residents at the most risk. Education and involvement of the personnel and the directors will increase the knowledge and supportive behaviour of those with the primary responsibility for dental care, in particular oral hygiene, of long-term institutionalised older people.

An oral hygiene protocol, based on the results of the present study and other previous studies will be developed and investigated during a 5-year longitudinal survey with an intervention and a control group. The ultimate goal of this project is to increase quality of life of residents by guaranteeing them adequate oral hygiene and other oral health services.

ACKNOWLEDGEMENTS

This project was supported by GABA Belgium/International.

REFERENCES

1 Statistics Belgium 1998/2004. A division of the Federal Public Service Economy, SMEs, Self employed and Energy. http://statbel.fgov.be/figures/d23_nl.asp.
2 Strandberg T. (2004): Aging as a phenomenon. Congres Helsinki September 2-4, 2004. Oral Function of the Elderly. A challenge for the oral health care.
3 Paunovich E. Assessment of the oral health status of the medically compromised homebound geriatric patient: a descriptive pilot study. Special Care in Dentistry 1994; 14: 80-82.
4 Strayer MS. Perceived barriers to oral health care among the homebound. Special Care in Dentistry 1995; 15: 113-118.
5 Morishita M, Takaesu Y, Miyatake K et al. Oral health care status of homebound elderly in Japan. Journal of Oral Rehabilitation 2001; 28: 717-720.
6 MacEntee MI, Weiss RT, Waxler-Morrison NE and Morrison BJ. Factors influencing oral health in long term care facilities. Community Dentistry and Oral Epidemiology 1987; 15: 314-316.
7 Miyazaki H, Shirahama R, Ohtani I et al. Oral health conditions and denture treatment needs in institutionalized elderly people in Japan. Community Dentistry and Oral Epidemiology 1992; 20: 297-301.
8 Vigild M, Brinck JJ and Christensen J. Oral health and treatment needs among patients in psychiatric institutions for the elderly. Community Dentistry and Oral Epidemiology 1993; 21: 169-171.
9 Jokstad A, Ambjornsen E and Eide KE. Oral health in institutionalized elderly people in 1993 compared with in 1980. Acta Odontologica Scandinavica 1996; 54: 303-308.
10 Knabe C and Kram P. Dental care for institutionalised geriatric patients in Germany. Journal of Oral Rehabilitation 1997; 24: 909-912.
11 Kuc IM and Samaranayake LP. Oral health and microflora in an institutionalised elderly population in Canada. International Dental Journal 1999; 49: 33-40.
12 Frenkel HF, Harvey I and Newcombe RG. Oral health care among nursing home residents in Avon. Gerodontology 2000; 17: 33-38.
13 Pietrokovski J, Azuelos J, Tau S et al. Oral findings in elderly nursing home residents in selected countries: oral hygiene conditions and plaque accumulation on denture surfaces. Journal of Prosthetic Dentistry 1995; 73: 136-141.
14 Weeks JC and Fiske J. Oral care of people with disability: a qualitative exploration of the views of nursing staff. Gerodontology 1994; 11: 3-17.
15 Adams R. Qualified nurses lack adequate knowledge related to oral health, resulting in inadequate oral care of patients on medical wards. Journal of Advanced Nursing 1996; 24: 552-560.
16 Holmes S. Promoting oral health in institutionalised older adults: a nursing perspective. Journal of Research in Society and Health 1998; 118: 167-72.
17 MacEntee MI, Thorne S, and Kazanjian A. Conflicting priorities: oral health in long-term care. Special Care in Dentistry 1999; 19: 164-172.
18 Sumi Y, Nakamura S, Nagaosa S et al. Attitudes to oral care among caregivers in Japanese nursing homes. Gerodontology 2001; 18: 2-6.
19 Vanobbergen J and De Visschere L. Oral hygiene procedures and facilities and their predisposing factors in long-term care institutions for elderly. Community Dental Health 2005; 22: 260-265.
20 Mattson U, Heyden G and Landahl S. Comparison of oral and general health development among institutionalized elderly people. Community Dental and Oral Epidemiology 1990; 18: 219-222.
21 Lester V, Ashley FP and Gibbons DE. The relationship between socio-dental indices of handicap, felt need for dental treatment and dental state in a group of frail and functionally dependent older adults. Community Dentistry and Oral Epidemiology 1998; 26: 155-159.
22 Berkey DB, Berg RB, Ettinger RL et al. Research review of oral health status and service use among institutionalized older adults in the U.S. and Canada. Special Care in Dentistry 1991; 11: 131-136.
23 Hardy DL, Brangan PP, Darby ML et al. Self-report of oral health services provided by nurses' aides in nursing homes. The Journal of Dental Hygiene 1995; 69: 75-82.
24 Wardh I, Anderson L and Sörensen S. Staff attitudes to oral health care. A comparative study of registered nurses, nursing assistants and home care aides. Gerodontology 1997; 14: 28-32.
25 Darwazeh AM, Al-Refai S and Al-Mojaiwel S. Isolation of Candida species from the oral cavity and fingertips of complete denture wearers. Journal of Prosthetic Dentistry 2001; 86: 420-423.
26 Pires FR, Santos EB, Bonan PR et al. Denture stomatitis and salivary Candida in Brazilian edentulous patients. Journal of Oral Rehabilitation 2002; 29: 1115-1119.
27 Khasawneh S and Al-Wahadni A. Control of denture plaque and mucosal inflammation in denture wearers. Journal of the Irish Dental Association 2002; 48: 132-138.
28 Honda E. Oral microbial flora and oral malodour of the institutionalised elderly in Japan. Gerodontology 2001; 18: 65-72.

29 Shimazaki Y, Soh I, Koga T et al. Risk factors for tooth loss in the institutionalised elderly; a six-year cohort study. Community Dental Health 2003; 20: 123-127.
30 Sumi Y, Miura H, Sunakawa M et al. Colonization of denture plaque by respiratory pathogens in dependent elderly. Gerodontology 2002; 19: 25-29.
31 Limeback H. Implications of oral infections on systemic diseases in the institutionalized elderly with a special focus on pneumonia. Annals of Periodontology 1998; 3: 262-275.
32 Russell SL, Boylan RJ, Kaslick RS et al. Respiratory pathogen colonization of the dental plaque of institutionalized older people. Special Care in Dentistry 1999; 19: 128-134.
33 Terpenning MS, Taylor GW, Lopatin DE et al. Aspiration pneumonia: dental and oral risk factors in an older veteran population. Journal of American Geriatrics Society 2001; 49: 557-563.
34 Yoshida M, Yoneyama T and Akagawa Y. Oral care reduces pneumonia of elderly patients in nursing homes, irrespective of dentate or edentate status. Nippon Ronen Igakkai Zasshi 2001; 38: 481-483.
35 Imsand M, Janssens JP, Auckenthaler R et al. Bronchopneumonia and oral health in hospitalized older patients. A pilot study. Gerodontology 2002; 19: 66-72.
36 Shay K. Infectious complications of dental and periodontal diseases in the elderly population. Clinical Infectious Diseases 2002; 34: 1215-1223.
37 Sumi Y, Kagami H, Ohtsuka Y et al. High correlation between the bacterial species in denture plaque and pharyngeal microflora. Gerodontology 2003; 20: 84-87.
38 Shelkey M, and Wallace M. Katz Index of Independence in Activities of Daily Living (ADL). Best Practices in Nursing Care to Older Adults 1998; 2: www.hartfordign.org/publications/trythis/issue02.pdf.
39 Augsburger RH and Elahi JM. Evaluation of seven proprietary denture cleansers. Journal of Prosthetic Dentistry 1982; 47: 356-359.
40 Silness J and Löe H. Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. Acta Odontologica Scandinavica 1964; 22: 121-135.
41 Chalmers JM, Hodge C, Fuss JM et al. The prevalence and experience of oral diseases in Adelaide nursing home residents. Australian Dental Journal 2002; 47: 123-130.
42 Osterberg T, Carlsson GE and Sundh V. Trends and prognoses of dental status in the Swedish population: analysis based on interviews in 1975 to 1997 by Statistics Sweden. Acta Odontologica Scandinavica 2000; 58: 177-182.
43 Peltola P, Vehkalathi M and Wuolijoki-Saaristo K. Oral health and treatment needs of the long-term hospitalised elderly. Gerodontology 2004; 21: 93-99.
44 Scientific Institute Of Public Health (2004) Epidemiology Unit. www.iph.fgov.be/epidemio/epien/index4.htm.
45 McCabe JF, Murray ID, Laurie J et al. A method for scoring denture plaque. European Journal of Prosthodontic Restorative Dentistry 1996; 4: 59-64.
46 Keng SB and Lim M. Denture plaque distribution and the effectiveness of a perborate-containing denture cleanser. Quintessence International 1996; 27: 341-345.
47 Landis JR and Koch GG. The measurements of observer agreement for categorical data. Biometrics 1977; 33: 159-174.

Table 2. Oral status of residents (N=359)

Oral status of residents	***n***	**%**
Edentulous	230	64%
Complete dentures	171	47%
Only upper denture	41	11%
Only lower denture	2	0.5%
Edentulous with no dentures	16	4%
Remaining natural teeth	128	36%
Overdenture on natural teeth	1	0.2%
Combination of full denture and natural teeth in the opposite jaw	41	11%
Only natural teeth	52	14%
Partial dentures	34	9%

Table 3. Presence of oral hygiene tools in residents' room

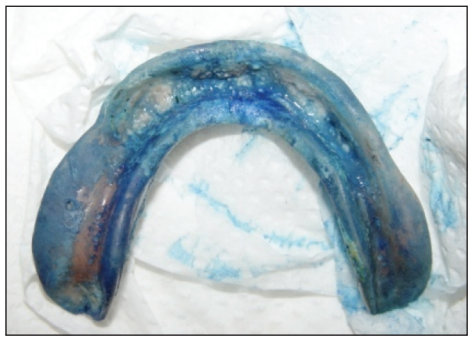
Presence of oral hygiene tools	***N=120***	***N=285***
	Residents with natural teeth	Residents with dentures
Toothbrush	85 %	81.4%
Toothpaste	69.9 %	70.9%
Interdental hygiene tools	0 %	
Denture brush		19.3%
Denture cleaning tablets		44.9%
Mouthrinse	9.8 %	
Condition of toothbrush	***Almost none or mineral water***	***Moderate or strong wear***
N=245	48.6%	51.4%

Table 4. Mean, median and percentiles for dental (n = 104) and denture (n = 288) plaque

	Mean		***SD***	***Median***	***IQ range***
Dental plaque	2.17		0.75	2.00	1.13
Total denture plaque	2.13		0.88	1.91	1.34
Denture plaque upper jaw	2.08	}*	0.92	1.81	1.44
Denture plaque lower jaw	2.11		0.90	2	1.37
Denture plaque oral side	1.93	}*	0.92	1.63	1.31
Denture plaque mucosal side	2.33		0.97	2.25	1.63

* $p<0.001$ (t-test)

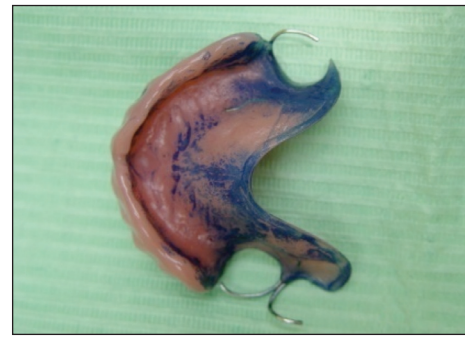
Figure 1. Examples of dentures with mean scores for dental plaque



Mean score (4 quadrants mucosal): 4

Mean score (2 quadrants buccal left): 3

Mean score (2 quadrants buccal right): 1.5



Mean score (4 quadrants mucosal): 2

Table 5. Relationship of denture or dental plaque and different possible explanatory variables at an individual level

		Denture plaque N=288			***Dental plaque N=104***		
		Mean	SD	p-value	Mean	SD	*p*-value
Sex	men women	2.16 2.12	0.98 0.85	0.80	2.10 2.19	0.71 0.77	0.62
Degree of dependency	low high	2.05 2.22	0.86 0.89	0.09	1.99 2.36	0.75 0.72	**0.01**
Toothbrush	absent present	2.14 2.12	0.86 0.88	0.91	2.4 2.07	0.55 0.76	0.13
Toothpaste	absent present	2.14 2.12	0.80 0.91	0.89	2.27 2.08	0.65 0.76	0.34
Denture brush	absent present	2.12 2.14	0.87 0.90	0.89	2.13		
Denture cleaning tablets	absent present	2.15 2.10	0.86 0.90	0.68	2.13		
Mouthrinse	absent present	2.14 2.01	0.88 0.88	0.59	2.14 2.04	0.74 0.86	0.72
Condition toothbrush	no or mineral wear moderate or strong wear	1.92 2.14	0.79 0.80	0.09	2.10 2.06	0.75 0.80	0.79

Table 6. Relationship between denture or dental plaque and different possible explanatory variables at institutional level

		Denture plaque			***Dental plaque***		
ANOVA		Mean	SD	p-value	Mean	SD	*p*-value
Capacity	< 50 ≥ 50 ≤ 100 >100	2.11 2.16 2.14	0.91 0.88 0.88	0.95	2.07 2.29 2.23	0.80 0.64 0.75	0.52
Management	private non-profit social service commercial	2.2 2.12 1.85	0.91 0.81 0.78	***0.05***[a]	2.07 2.48 1.95	0.79 0.54 0.81	***0.04***[b]
Proportion of residents with low degree of dependency	only residents with low degree of dependency at least 40% residents with low degree of dependency <40% residents with low degree of dependency	2.06 2.14 2.13	0.88 0.90 0.86	0.95	1.58 2.24 2.11	0.97 0.74 0.74	0.15
Supportive behaviour director	low high	2.19 1.97	0.86 083	***0.05***	2.18 2.10	0.80 0.65	0. 66
Directive behaviour director	low high	2.08 2.04	0.86 0.83	0.74	2.19 1.85	0.72 0.75	0. 15
Committed behaviour personnel	low high	2.05 2.09	0.84 0.87	0. 68	2.22 2.08	0.63 0.80	0. 40
Independent behaviour personnel	low high	2.02 2.11	0.81 0.88	0. 44	2.17 2.13	0.71 0.75	0. 80
Knowledge of personnel	low high	2.15 1.94	0.90 0.76	0. 07	2.17 2.08	0.76 0.66	0. 65

a: first group differs from third group, b: first group differs from second group (p ≤ 0.05)

Table 7. Stepwise multiple logistic regression analysis with dental plaque as dependent variablele

Independent variabless	***B***	***SE***	***OR (95% CI)***	***p-value***
Sex	0. 675	0. 515	1.96 (0.72-5.4)	0. 19
Degree of dependency on an individual level	1.131	0. 449	3.09 (1.28-7.47)	**0. 01**
Capacity (Ref.: < 50 residents)				0. 24
≥ 50 ≤ 100 residents	-0. 940	0. 950	0.39 (0.61-2.51)	0. 32
>100 residents	0. 343	0. 595	1.41 (0.44-4.52)	0. 56
Proportion residents with high degree of dependency (Ref.: 0% high dependent)				0. 71
1- 60% high dependent	-0. 373	1.014	0.69 (0.94-5.02)	0. 71
> 60% high dependent	-0. 743	1.115	0.48 (0.5-4.2)	0. 51
Management of the institution (Ref.: private non-profit)				0. 56
Management social service	0. 571	0. 660	1.77 (0.49-6.5)	0. 39
Management commercial	-0. 441	0. 808	0.64 (0.13-3.14)	0. 59
Constant	-2.040	1.208	0. 13	0. 09

Table 8. Stepwise multiple logistic regression analysis with denture plaque as dependent variable

Independent variabless	*B*	*SE*	*OR (95% CI)*	*p-value*
Sex	-0. 212	0. 309	0.81 (0.44-1.48)	0. 49
Degree of dependency on an individual level	0. 279	0. 263	1.32 (0.79-2.21)	0. 29
Capacity (Ref.: < 50 residents)				0. 84
≥ 50 ≤ 100 residents	-0. 19	0. 472	0.98 (0.39-2.48)	0. 97
>100 residents	-0. 174	0. 320	0.84 (0.45-1.57)	0. 59
Proportion residents with high degree of dependency (Ref.: 0% high dependent)				0. 30
1- 60% high dependent	-0. 782	0. 558	0.46 (0.15-1.37)	0. 16
> 60% high dependent	-0. 977	0. 629	0.38 (0.11-1.29	0. 12
Management of the institution (Ref.: private non-profit)				0. 10
Management social service	-0. 81	0. 377	0.92 (0.44-1.93)	0. 83
Management commercial	-0. 841	0. 391	0.43 (0.20-0.93)	**0. 03**
Constant	0. 860	0. 671	2.36	0. 20

PART I: EXPLORING THE FIELD
I.B. PROFESSIONAL CARE

CHAPTER 4

ORAL HEALTH CARE FOR FRAIL ELDERLY PEOPLE: ACTUAL STATE AND OPINIONS OF DENTISTS TOWARDS A WELL-ORGANISED COMMUNITY APPROACH

This chapter has been published as:
Oral health care for frail elderly people: actual state and opinions of dentists towards a well-organised community approach

Luc M. De Visschere , Jacques N. Vanobbergen
Gerodontology 2006 23: 170-176

ABSTRACT

Objective: This study was undertaken to provide an analysis of the actual oral heath care for frail elderly people living in different settings and to explore opinions of dentists towards new concepts in developing a community approach.

Method: Data were collected from a sample of 101 dentists (15%) in the county of Antwerp using a self-administered 32-item questionnaire including questions about age, gender, education, organisational aspects of dental office, questions concerning dentists' own contribution to oral healthcare services for frail elderly people and statements concerning opinions and attitude toward the organisation of oral health care for frail elderly people. At the same time, qualitative data were collected from focus group sessions with all participating dentists. Non-parametric analysis was used to explore possible relationships between opinion and possible explanatory variables.

Results: Half of the dentists offered dental services in residential or nursing homes (mean number of treatments a year: 5.4) and at home (mean number of treatments a year: 2.4). Prosthetic treatments such as relieving denture pressure points, repairing, rebasing and making new dentures were carried out in 77.4% and 76.7% of the cases in residential or nursing homes and at home respectively. Extractions were carried out in 16% and 18.6% of the cases in both living situations respectively. The mean reasons for dentists refusing domiciliary oral health care were the absence of dental equipment (63%), lack of time (19%) and 11% convincing the patients to be treated in their dental surgery. Analysis showed different opinions of dentists depending on age, gender and university of education; however, statistically significant differences were only found by age.

Conclusion: The older the dentist, the greater the tendency to refuse oral healthcare services. The younger dentists were reluctant to cooperate in the provision of oral health care in a structured community approach.

INTRODUCTION

The proportion of people aged 65 and over in Flanders, the Dutch speaking part of Belgium, in year 2000, was lower than the proportion of persons under 19 years of age (9.8% versus 13.3%). Due to demographic, social and medical factors these proportions will tend to change in the future. In 2020, the estimated amount of 65+ will exceed the amount of young people (12.4 versus 11.5%) and this evolution will be even more pronounced in 2050 (15.6 versus 10.8%)[1]. Today, more attention is paid to pediatric as opposed to geriatric oral health care. Prevention and health care reforms should aim to achieve a better balance between both age groups, ensuring the actual levels reached in children.

Better access to health care and healthier life styles in younger people will result in postponing the period of chronic disease and dependence in advanced old age. Consequently, the period of disability will be compressed. In fact, in Flanders, one third of people aged over seventy five years are moderately, markedly or totally dependent for support in daily living. About 65.000 persons older than 75 (15%) live in nursing homes or long-term care institutions and 80.000 (20%) reside at home and need domiciliary care[2]. Undeniably, adequate oral care is essential for this frail elderly group to maintain good oral health. Moreover, good oral health has been reported as an important component of overall health, wellbeing and quality of life[3].

In Flanders, no data exist on the oral health of frail elderly people living in nursing homes or at home, but taking into account the international literature[4-12] one can surmise that oral health is poor and apparently neglected. Moreover, the demand for preventive and curative oral health care among elderly people is very low[13-15] and caregivers in nursing homes and domiciliary care fail to support and to motivate frail elderly in this matter due to the absence of structured oral health protocols[16], lack of knowledge[17-21], lack of training and lack of time[22].

Data from the Health Interview Survey in Belgium, gathered by the Scientific Institute of Public Health in 2001, revealed a strong decrease in mean number of contacts with a dentist in the oldest age groups compared to the younger groups. Furthermore, this survey demonstrated that preventive dentistry hardly existed in 75+ old people[23].

Furthermore, it is highly likely that oral health care available to either residents or home-dwelling elders is inadequate. A high need exists for more coordinated, seamless con-

tinuing domiciliary oral health care service, tailored to the actual needs of the elderly individuals, both at home or in institutions[24]. Dentists are not well disposed and consequently not well organized to offer domiciliary dental services. In general, these services are limited to prosthetic treatment and extractions and rarely to adequate restorative dentistry[25,26].

Stereotypical views and misconceptions about the aged, ignorance of gerontology and geriatrics[27], not being interested and ill-prepared, not attracted to work in nursing homes, to busy in practice, interference with leisure and limited possibilities to treatment[28], seemed to be important barriers. In Flanders there is no complementary reimbursement by National Health Service for treatments provided by dentists outside the dental surgery. The foregoing problems must be tackled developing a well-organised oral health care delivery system based on a 'community approach' which refers to nursing homes, domiciliary care organisations, communities and government working together to improve the outcome for frail elderly people and their families. In addition, it requires access to a range of facilities and services provided by salaried dentists to ensure continuity of care in the best interests of the patients. The focus has to be on the provision of oral health care rather than on specific dental procedures[29]. This approach sharply contrasts with an 'individual' approach where individual dentists provide — only on demand — (technical) oral health care, mostly in emergency situations and on a fee for service basis.

As people in Flanders grow older, the dental population also does. In 2003, nearly one fifth (18.4%) of all dentists was younger than 35 years of age, one third was between 36 and 45 years of age and nearly half of them (48.5%) was older than 45. Furthermore, in the past decade more girls have enrolled in dental school; this results in a gradual feminisation of the dental profession. In 2003, 43.4% of all Flemish dentists were women. Almost 75% of dentists between 40 and 50 years of age were men whereas sixty eight percent in the age group younger than 40 were women. In a quantitative assessment of male and female career patterns in dentistry, Decaluwe revealed that female dentists scored lower than male dentists in each career phase. Female dentists reported other goals and other ways of working and they paid more attention to preventive dentistry[30].

The number of dentists in Flanders is controlled by the National Government by limiting the number of dentists admitted to the dental profession per year during the period

2002-2010. The number has been fixed at 84 dentists per year. A compulsory entrance examination reduces the yearly income of dental students to less than sixty five[31]. About half (49.11%) of Flemish dentists graduated at the Leuven university (KULeuven), one third (32.4%) at the university of Ghent (UGent) and 17.55% at the Vrije Universiteit Brussel (VUB).

The aim of this study is to provide a descriptive report on the actual oral health care supply for frail elderly people and to explore the opinions of dentists towards the organisation of oral health care for frail elderly people and their willingness to cooperate in a community approach.

MATERIAL AND METHODS

Data were collected from a sample of 101 dentists participating to peer review sessions focusing on 'oral health for elderly people' in the county of Antwerp. The sample represents 15% of all dentists residing in the county of Antwerp. Quantitative data were gathered by means of a questionnaire and qualitative data by focus group discussions. Before the start of the sessions, a self-administered 32-item questionnaire was filled out by all dentists. The first part of the questionnaire focused on general questions (n=10) about age, gender, education and organisational aspects of their dental surgery. A second part included questions (n=13) concerning dentists' own contributions to oral health care services for frail elderly people, reasons for refusal and conditional willingness to provide oral health care once a structured community approach is installed. The last part (9 statements) was designed to measure opinions of dentists towards the organisation of oral health care for frail elderly people. Statements dealt with information about availability of dental equipment, oral health care by selected providers, and assistance of auxiliaries and use of rigorous oral health protocols. Possible answers on statements were: 'I agree', 'I do not agree' and 'No opinion'. Missing answers (<1.6%) were treated as equivalent to no opinion. To assure anonymity, validation with test and retest has not been performed. Hence, all questions were validated during the peer review sessions and appeared clear, well-defined and not ambiguous.

For use in the analysis the outcome variable (opinion towards the organisation of oral health care for frail elderly people) was dichotomised positive versus negative. One de-

cided the optimal cut off for a positive attitude to be at least 66%. This means that at least 6 of 9 answers on the statements were positive. Qualitative data was collected by means of focus group discussions during peer review sessions with 25 dentists participating in each group (n=4). With the participants' permission, the discussions were transcribed in a written account by trained reporters. Initially, the transcripts were coded and the issues raised were mapped. Data were organised independently by the authors and themes were induced using content analysis.

SPSS (version 12.0 for Windows, SPSS, Chicago, IL, USA) was used to analyse the data. Frequencies and cross-tabs analyses were performed using descriptive statistics. Due to the small number of cases non-parametric tests were preferred in the analytical tests. Kruskal-Wallis tests were used to compare overall differences in the occurrence of willingness to provide domiciliary oral health care and occurrence of positive opinions. Mutual differences between groups were tested with the Mann-Whitney U test.

Binary logistic regression was used to explain the variability of the outcome variables (willingness and opinions) and to explore relationships between putative explanatory variables.

Qualitative data were summarised and interpreted independently by the authors.

RESULTS

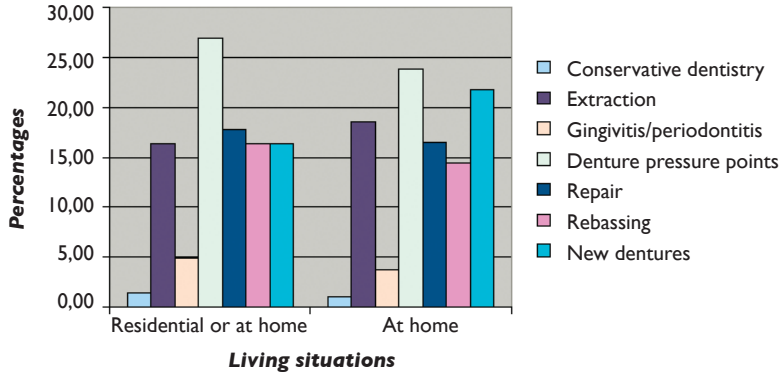
The response rate for both the quantitative and qualitative survey was 100%.

Quantitative data

The sample (15% of all dentists in the county of Antwerp) consisted of 39.6% female and 60.4% male dentists. The mean age of participating dentists was 41.7 years (SD 7.5; range 25–64). Within the sample, 65.3% of all dentists were between 36 and 45 years of age (table 1). Nearly 42% graduated at Leuven University (KUL), 32.7% at Brussels University (VUB) and 24.5% at Ghent University (UG). Three quarters of responders treated patients in solo practices.

Only one dentist offered oral health care in association with an organisation providing domiciliary care and 6 colleagues in association with a nursing home. Half of the dentists occasionally offered dental services in residential or nursing homes (mean number of treatments a year: 5.4) and at home (mean number of treatments a year: 2.4) (figure 1).

Figure 1. Percentages of different treatments in different living situations
Mean treatments a year: sheltered or nursing home 5.4; domiciliary care 2.4



Dentists were unwilling to offer oral health care in nursing homes or at home in 63% cases because of the absence of a dental unit, 19% because of lack of time, with eleven 11% convincing the patients to be treated their dental surgery (table 2). Prosthetic treatments such as relieving denture pressure points, repairing, rebasing and making new dentures and extractions were the most common treatments.

Non-parametric analyses (table 3) showed differences in opinions towards a structured community approach and in the willingness of dentists to provide oral health care (once a structured approach is installed) by gender, age and university of education. A statistically non-significant higher proportion of female dentists (39.5% versus 27.6%) expressed positive opinions towards a structured approach (p=0.29). Dentists 46 of age and over expressed more positive opinions towards a structured approach, especially compared to the youngest age group (p<0.05). On the other hand, the oldest age group presented less willingness to provide oral care, but the latter was not significant. Dentists who had graduated from the university of Brussels had the least positive opinions towards a structured approach, but expressed the greatest willingness to provide oral health care.

Binary logistic regression confirmed age category as a putative explanatory variable for positive opinions towards a structured approach (table 4). Dentists older than 46 were more likely to have a positive opinion than younger dentists, expressed by an odds ratio of 7.01 (95% CI 1.17-42.11).

Qualitative data

All groups clearly agreed that more attention, personnel and money should be given to this risk population. They strongly criticized the absence of reimbursement by the National Health Insurance System and the lack of regulated wages for providing oral health care outside the dental surgery. Two reports emphasized the importance of free choice of residents for treatment and fully agreed with the urgent need of assistance by auxiliaries. One report incited that universities should offer education in geriatric dentistry and provide guidelines to manage oral health for the elderly with dementia.

DISCUSSION

Peer reviews are good opportunities to perform questionnaires mostly resulting in excellent response rates. Focus talks contiguous to anonymous questionnaires give opportunities to validate questions and gain additional information. Due to practical reasons, in the present study, the county of Antwerp was selected to organise the peer review sessions. As dentists participate mostly in peer reviews organised in the neighbourhood of their dental surgeries, the majority of participating dentists were from the county of Antwerp. The men/women proportion in the sample (60% / 40%) was approximately the same as that found in the whole dentist population of the county of Antwerp and was comparable to the men/women proportion of the dentist population in Flanders. Dentists of middle-aged group (65.3%) and graduated from the VUB (32.7%) were over represented in this study. These deficiencies are potential sources of selection bias and the conclusions of this paper are valid only for the region of Antwerp and cannot be generalised for the whole of Flanders. Nevertheless, the over-sampling of the middle-aged group will probably not tend to accentuate predicted differences between age groups. Most significant differences were found between the oldest and youngest age group.

More than 54% of participating dentists were interested in providing oral health care to frail elderly people, but only one of three responders agreed with a structured community approach. It seems that dentists still prefer an individual rather than a community-based approach. This is mainly true for the youngest age groups. Depending on gender and age remarkable differences in opinions were observed and gave rise to some unanswered questions. In the younger age groups, a higher willingness to provide oral health care to

frail elderly patients was reported at the one hand, while, on the other, a less positive attitude towards a structured community approach in the organisation of oral health care for frail elderly people was expressed. Female dentists tend to express a more positive attitude towards this community approach.

Are older dentists less motivated to provide outreach oral health care due to workload, lack of knowledge, financial or other aspects as mentioned in the focus talks? Are younger dentists the most reluctant to work within a structured community approach due to restricted freedom or due to deprivation of income? Is the less positive attitude of younger dentists towards a structured approach related to their low knowledge or insight to the complexity of the problem? Are female dentists more positive towards a structured approach due to differences in career pattern or more preventive orientation? Do they prefer working in a salaried position with a guaranteed, but fixed, monthly salary or a wage per hour job? At present, the actual data do not allow validation of these hypotheses. More research has to be carried out to explore these differences to gain valuable information for policy makers to help them make the right decisions.

Fortunately, the fact that younger dentists are more interested to provide domiciliary oral health care looks as if it could be promising in the future. Nevertheless, this enthusiasm is partly diluted by a low number of graduating dental students, age and feminisation of dentists' population and emigration of recently graduated dentists.

Little domiciliary oral health care is offered by dentists in Antwerp. Concerning nursing home oral health care, this is in agreement with findings for nursing homes in Ghent[16]. Dental treatments are scarce and often only occur in emergency situations, a finding viewed as consistent with the study by Burke who reported that in general, domiciliary care was limited to extractions and prosthetic treatments[26].

Oral health interventions are mostly performed individually rather than community based. Prevention or oral health promotion projects hardly exist. Consistent with Hally et al., the study highlights the need for a coordinated, seamless continuing dental care service, tailored to the actual needs of the elderly individuals and groups it is designed to serve[24].

The high discrepancy between out and inflow rates of dentists strengthens the idea of legalising and educating dental hygienists or other auxiliaries. During focus talks partici-

pating dentists clearly agreed that more attention, personnel and money should be paid to frail elderly people.

Compared with earlier studies indicating more promising results[25,26], the results of this investigation could promote some serious actions concerning the delivery of oral health care for this people at risk. Recently, the VVT (Flemish Dental Association) published a Strategic Plan regarding the organisation of dentistry between 2006 and 2010. One of the proposed initiatives is the organisation of an experimental study to measure the dental need of institutionalised elderly and to explore possibilities of fulfilling this need[32]. This will probably be a first step in the right direction.

CONCLUSION

The older the dentist, the more they are reluctant to offer domiciliary oral health services. The younger dentists are more reluctant to deal with the idea of providing domiciliary oral health care based on a 'community approach'. In view of the development of new strategies aimed at reorganising oral health care for frail elderly people, further research is needed to explore differences in opinions of dentists.

ACKNOWLEDGMENTS

This project was supported by GABA Belgium/International.

REFERENCES

1 FOD Economie, KMO, Middenstand en Energie. http://statbel.fgov.be/figures/d23_nl.asp
2 Heeren J, Thewijs T. Seniorenvoorzieningen: voor en na 2000. Wittouck, Diegem 1999.
3 Coleman P. Improving oral health care for the frail elderly: a review of widespread problems and best practices. Geriatr Nurs 2002, 23: 189-99.
4 Paunovich E. Assessment of the oral health status of the medically compromised homebound geriatric patient: a descriptive pilot study. Spec Care Dentist 1994, 14: 80-2.(5)
5 Strayer MS. Perceived barriers to oral health care among the homebound. Spec Care Dentist 1995, 15: 113-8.
6 Morishita M, Takaesu Y, Miyatake K et al. Oral health care status of homebound elderly in Japan. J Oral Rehabil 2001, 28: 717-20.
7 MacEntee MI, Weiss R, Waxler-Morrison NE et al. Factors influencing oral health in long term care facilities. Community Dent Oral Epidemiol 1987, 15: 314-6.
8 Miyazaki H, Shirahama R, Ohtani I et al. Oral health conditions and denture treatment needs in institutionalized elderly people in Japan. Community Dent Oral Epidemiol 1992, 20: 297-301.
9 Vigild M, Brinck JJ, Christensen J. Oral health and treatment needs among patients in psychiatric institutions for the elderly. Community Dent Oral Epidemiol 1993, 21: 169-71.
10 Jokstad A, Ambjornsen E, Eide KE. Oral health in institutionalized elderly people in 1993 compared with in 1980. Acta Odontol Scand 1996, 54: 303-8.
11 Knabe C, Kram P. Dental care for institutionalized geriatric patients in Germany. J Oral Rehabil 1997, 24: 909-12.
12 Kuc IM, Samaranayake LP, van Heyst EN. Oral health and microflora in an institutionalised elderly population in Canada. Int Dent J 1999, 49: 33-40.
13 Karkazis HC, Kossioni AE. Oral health status, treatment needs and demands of an elderly institutionalised population in Athens. Eur J Prosthodont Restor Dent 1993, 1: 157-63.
14 Mojon P, MacEntee MI. Estimates of time and propensity for dental treatment among institutionalised elders. Gerodontology 1994, 11: 99-107.
15 Vigild M. Benefit related assessment of treatment need among institutionalised elderly people. Gerodontology 1993, 10: 10-5.
16 Vanobbergen JN, De Visschere LM. Oral hygiene procedures and facilities and their predisposing factors in long-term-care institutions for elderly. Community Dental Health 2005; 22: 260-265.
17 Adams R. Qualified nurses lack adequate knowledge related to oral health, resulting in inadequate oral care of patients on medical wards. J Adv Nurs 1996, 24: 552-60.
18 Holmes S. Promoting oral health in institutionalised older adults: a nursing perspective. J R Soc Health 1998, 118: 167-72.
19 MacEntee MI, Thorne S, Kazanjian A. Conflicting priorities: oral health in long-term care. Spec Care Dentist 1999, 19: 164-72.
20 Sumi Y, Nakamura Y, Nagaosa S et al. Attitudes to oral care among caregivers in Japanese nursing homes. Gerodontology 2001, 18: 2-6.
21 Wardh I, Andersson L, Sorensen S. Staff attitudes to oral health care. A comparative study of registered nurses, nursing assistants and home care aides. Gerodontology 1997, 14: 28-32.
22 Weeks JC, Fiske J. Oral care of people with disability: a qualitative exploration of the views of nursing staff. Gerodontology 1994, 11: 13-7.
23 Institute Epidemiology Unit Activities. Health Interview Survey, Scientific Institute of Public Health. Update: 11/04/2005. www.iph.fgov.be/epidemio/epien/index4.htm.
24 Hally J, Clarkson JE, Newton JP. Continuing dental care for Highlands elderly: current practice and attitudes of dental practitioners and home supervisors. Gerodontology 2003, 20: 88-94.
25 Longhurst RH. Availability of domiciliary dental care for the elderly. Prim Dent Care 2002, 9: 147-50.
26 Burke FJ, McCord JF, Hoad-Reddick, G et al. Provision of domiciliary care in a UK urban area: results of a survey. Prim Dent Care 1995, 2: 47-50.
27 Kiyak HA, Milgrom P, Ratener P, et al. Dentists' attitudes toward and knowledge of the elderly. J Dent Educ 1982, 46: 266-73.
28 MacEntee MI, Weiss RT, Waxler-Morrison NE et al. Opinions of dentists on the treatment of elderly patients in long-term care facilities. J Public Health Dent 1992, 52: 239-44.
29 The Joint Advisory Committee for Special Care Dentistry. Training in Special Care Dentistry. 2003. www.bsdh.org.uk/misc/TrainingInSpecialCareDentistry.pdf.
30 Decaluwe F, De Boever JA. Woman and career: an unhappy marriage? A study model: dentistry. Rev Belge Med Dent 2002, 57: 293-313.
31 Widström E. and Eaton KA. Oral Healthcare Systems in the Extended European Union. Oral Health & Preventive Dentistry 2004, 2: 155-194
32 Strategisch plan 2006-2015. Verbond der Vlaamse Tandartsen. VVT, Brussel, 2005.

Table 1. General characteristics of participating dentists

Gender	***Female*** 39.6%		***Male*** 60.4%	
Mean age	41.73 (SD 7.5 – range 25-64)			
Age categories	***25–35*** 16.8%	***36–45*** 65.3%		***>45*** 17.8%
University of graduation	***KUL*** 41.8%	***UG*** 24.5%	***VUB*** 32.7%	***UCL*** 1%
Organisation of Dental Office	***Solo*** 77%	***Group*** 13%		***Combination*** 10%
SES of patients	***Low*** 5%	***Moderate*** 87%	***High*** 1%	***Combination*** 7%
Computer/OPG	***Computer*** 72%	***OPG*** 64%	***OPG-Digital*** 2%	***Röntgen-Dig.*** 33%
Dental disciplines				
All disciplines	7%			
All disciplines - orthodontics	45%			
Restorative + orthodontics	9%			
Restorative + periodontology	3%			
Only restorative dentistry	34%			
Exclusive orthodontics	1%			
Exclusive periodontology	1%			

KUL, Katholieke Universiteit Leuven; VUB, Vrije Universiteit Brussel; UG, Universiteit Gent; UCL, Université catholique Louvain; OPG, Orthopantomogram; SES, Socio-Economic-Status

Table 2. Dentists' own contribution to oral healthcare services for frail elderly people

Do you work in association with	***Yes***	***No***			***No answer***
Domiciliary care organisation	1	93			7
Nursing home	6	92			3
Do you provide oral health care in	***Nursing homes*** 42	***Sheltered homes*** 4	***Both*** 8	***No*** 37	***No answer*** 8
Who contacted you*	***Elder*** 14.6%	***Physician*** 2.4%	***Family*** 41.5%	***Nursing home*** 37,8%	
Do you provide domiciliary oral health care*	***Yes*** 61.4%	***I convince patient to come to dental office*** 27.2%		***I refer patient to dental clinic*** 11.4%	
Who contacted you*	***Elder*** 36%	***Physician*** 9.3%	***Family*** 52.3%	***Home care nurse*** 2.3%	
Most important reasons to refuse domiciliary or nursing home care**					
Lack of time	19%				
Lack of dental or portable unit	63%				
Lack of motivation	1%				
Lack of knowledge	1%				
Insufficient salary	5%				
I believe it's better to treat in dental office or dental clinic	11%				

* More than one answer possible ** One or two answers possible

Table 3. Differences in opinions towards a structured community approach and willingness to cooperate in the provision of oral healthcare

		Overall difference (Kruskal-Wallis)	*Mutual differences (Mann-Whitney U)*
Positive opinions towards a structured community approach n=101	Gender Men 27.6% Women 39.5%	p = 0.29	
	Age category 25-35 (a) 17.6% 36-46 (b) 30.3% >46 (c) 50%	p = 0.13	a-b p = 0.33 a-c ***p* < 0.05** b-c p = 0.13
	University of graduation KUL (a) 41.5% VUB (b) 15.6% UG (c) 33.3%	p = 0.06	a-b ***p* < 0.05** a-c p = 0.52 b-c p = 0.13
Willingness to cooperate in the provision of oral health care in a community approach n=101	Gender Men 55.2% Women 52.6%	p = 0.81	
	Age category 25-35 (a) 58.8% 36-46 (b) 57.6% >46 (c) 38.9%	p = 0.35	a-b p = 0.93 a-c p = 0.25 b-c p = 0.16
	University of graduation KUL (a) 51.2% VUB (b) 68.8% UG (c) 45.8%	p = 0.18	a-b p = 0.42 a-c p = 0.14 b-c p = 0.09

Table 4. Stepwise multiple logistic regression analysis with opinions towards the organisation of oral health care for elderly people (positive 1 versus negative 0) as dependent variable (n=96)

Independent variabless		*B*	*SE*	*OR (95% CI)*	*p-value*
Age category	(Ref) 25-35	1			0.10
	36-46	1.134	0.741	3.11 (0.73-13.28)	0.13
	>46	1.947	0.915	7.01 (1.17-42.11)	**0.03**
Gender	(Ref) men	0.745	0.571	2.11 (0.69-6.45)	0.19
University of graduation	(Ref) KUL	1			0.17
	UG	-0.153	0.619	0.86 (0.25-2.89)	0.81
	VUB	-1.144	0.633	0.32 (0.09-1.10)	0.07
Constant		-1.836	0.851	16	0.03

CHAPTER 5

THE IMPACT OF UNDERGRADUATE GERIATRIC DENTAL EDUCATION ON THE ATTITUDES OF RECENTLY GRADUATED DENTISTS TOWARDS INSTITUTIONALISED ELDERLY PEOPLE

This chapter has been published as:
The impact of undergraduate geriatric dental education on the attitudes of recently graduated dentists towards institutionalised elderly people

L De Visschere, G.-J. van der Putten, C. de Baat, J. Schols, J. Vanobbergen
Eur J Dent Educ (2009) 13: 154 - 161

ABSTRACT

Objective: The aim of the study was to assess the impact of undergraduate geriatric dentistry education on knowledge of ageing and on attitudes towards institutionalised elderly people, as perceived by recently graduated dentists.

Material and methods: A validated questionnaire was sent by mail to all dentists of the study group (n=357). The questionnaire collected socio-demographic data, motives for pursuing a dental career, knowledge of ageing, attitude towards institutionalised elderly people using the Aging Semantic Differential (ASD), and aspects of geriatric dentistry education.

Results: A great variability between the six dental schools involved was observed in respect of the undergraduate education received in geriatric dentistry. Dentists' knowledge of ageing was also low. The mean value of ASD-total indicated that in this study there was a negative attitude towards the institutionalised elderly. The covariate 'financial motive for pursuing a dental career' was the only item that seemed to have any significant influence on the ASD. Age was the only significant variable for knowledge. All other covariates were found not to have any influence.

Conclusion: From this study it appears that the attitude of recently graduated dentists in Belgian towards institutionalised elderly is rather negative and their knowledge of ageing is poor. The actual level of geriatric dentistry education in the undergraduate curriculum did not appear to influence this attitude, but Belgian dental schools are challenged to re-orientate their provision of geriatric dentistry education to include activities that help to develop positive perceptions towards elderly, with an empathic positive and caring attitude.

INTRODUCTION

In 2006, the proportion of the Belgian population of 65 years or older and 80 years or older was 17.2% and 4.4%, respectively. Due to demographic, social, and medical changes, in 2050 the estimated proportion of 65 years or older and 80 years or older will be 26.5% and 10.4%, respectively[1]. In Belgium, about 140,000 people over the age of 75 years (16%) live at home but need domiciliary care, whereas 122,000 people over 75 years of age (14%) live in long term care facilities[2].

National oral health data of homebound and institutionalized elderly people are lacking. A study performed in long-term care facilities in the Ghent region (the Northern part of Belgium, Flanders), reported poor oral hygiene of the residents and absence of a structured oral health care standard[3,4]. A study performed in long-term care facilities in Liège (the Southern part of Belgium, Wallonia) reported poor oral status (edentulous without dentures or with only one complete denture) with increased difficulties eating hard foods, increased mashed food consumption, and decreased eating with pleasure and at higher risk of under-nutrition[5].

Data from the Health Interview Survey (2001) in Belgium revealed a decreasing number of visits to the dentist by age and hardly any preventive oral health care in people of 75 years or older, when compared to younger age groups[6]. To maintain good oral and general health, adequate oral health care for elderly people is essential, especially if frail. Integrated oral healthcare delivery, tailored to the actual needs of elderly individuals, is needed both for homebound and institutionalized elderly people[7].

The international literature is showing that today's dentists are not well disposed and consequently not well organised for the delivery of domiciliary and institutional oral health care. Ageism, ignorance of gerontology and geriatrics[8,9], no interest, not well prepared, or no affinity for working in long-term care facilities, being too busy in (private) practice, interference with leisure activities, and limitations of treatment in residential and home premises[10], seem to be important barriers, as perceived.

Several authors have mentioned the need for the renewal of the dental curriculum concerning the theory and practice of geriatric dentistry[11-16]. Community partnership programmes, integrated in the undergraduate curriculum, have been considered of additional value for both the community and the students[17].

The current status of geriatric dentistry education in dental schools of 34 European countries has been surveyed by Preshaw and Mohammad[12]. Within the limits of the 42% response rate, it was concluded that geriatric dentistry education was integrated in the curricula of European dental schools. Although the education format varied considerably, the range of topics was broad.

The new medical and dental curriculum of the University of Ghent is characterized by attention for the needs of the local community, a high degree of community integration, much attention to dentist-patient communication, encouraging self-study and attention to healthcare cost and health economics. Students are brought into contact with patients at an early stage of their education. Undergraduate dental students of the University of Ghent are participating actively in a special vocational oral health promotion and education program, performed in long-term care facilities, during the second cycle of their program. This vocational program includes dentist-patient communication, oral health promotion and oral hygiene screening.

In the past, authors reported that geriatric dentistry education failed to change the attitudes towards elderly people of students significantly[9]. According to Beck et al.[18], there was even evidence that exposure of dental students to elderly people with poor oral health status initially resulted in a more negative attitude towards elderly people than before the exposure. The same research group reported that students who had treated patients of all ages had a more positive attitude towards elderly people, when compared to students who had treated only patients of 65 years and older[19]. In more recent literature, Fabiano et al.[20] put a focus on practical geriatric dentistry education, providing students with positive experiences in handling the bio-psychosocial concerns of elderly patients. The results of their study suggested that positive interactions with elderly people may depend more on positive attitudes towards elderly people than on increased knowledge of ageing. Comparable research projects in medical students reported that bringing students in contact with elderly people at an early stage of education had a positive effect on their attitude towards elderly people. The positive effect may be synergetic with elderly people contact occurring later in the educational process. The positive effect was more pronounced in students who were brought into contact with elderly people living in the community than in students who encountered elderly people living in long-term care facilities[21]. Stewart

et al.[22] found rather neutral stereotype baseline attitudes towards elderly people in cohorts of medical students. In this study, four cohorts of medical students completed the measures described at several points in their undergraduate careers. The classes of 2002 and 2003 received portions input in relation to geriatrics as it was installed. The classes of 2004 and 2005 participated fully in the final curriculum and, from an evaluation standpoint, can be seen as "curriculum treatment groups", whereas the two earlier classes can be viewed as quasi-controls. The attitudes towards elderly people of the curriculum treatment groups were more positively influenced by the curriculum when compared to the two other cohorts.

The aim of the present study was to assess the impact of undergraduate geriatric dentistry education on knowledge of ageing and on the attitude of recent graduates of the six Belgian dental schools towards institutionalised elderly people, adjusted for age, gender and motives for pursuing a dental career.

The aim of the study was translated into two research questions:

1. Is there a statistical correlation between undergraduate geriatric dentistry education, knowledge on ageing and the attitude of graduated dentists towards institutionalised elderly people.
2. Is there any statistically significant difference between undergraduate geriatric dentistry education, knowledge of ageing and attitude towards institutionalised elderly people of recently graduated dentists from different dental schools and in different graduation years?

The hypothesis to be tested was that dentists from dental schools with more geriatric dentistry education would have better knowledge of ageing and a more positive attitude towards institutionalised elderly people.

MATERIAL AND METHODS

Belgium has six dental schools, three in the French speaking part (UCL-Université Catholique de Louvain, ULB-Université de Bruxelles, ULG-Université de Liège) and three in the Dutch speaking part (KUL-Katholieke Universiteit Leuven, UG-Universiteit Gent, VUB-Vrije Universiteit Brussel) of the country. All dentists (n=357), graduated in 2004, 2005 or 2006 at one of the six dental schools, constituted the study population.

During three consecutive years (2004-2005-2006) a validated questionnaire in Dutch or French, depending on the dental school's first language, was sent by mail to the recently graduated dentists. An accompanying letter explained the aim of the study and indicated the time needed to complete the questionnaire. The dentists were encouraged to participate and the anonymous approach of the analysis procedure was emphasised. Informed consent for using the data for scientific publications was requested. The original Dutch version of the questionnaire was translated into French according the principle of 'translation and back-translation'.

The first part of the questionnaire collected socio-demographic data and motives for pursuing a dental career of the dentists. The question concerning motives for pursuing a dental career consisted of 8 predefined motives and an elective personal open motive. The dentists were requested to order the eight or nine motives according to their personal importance (one 'most important' to nine 'less important').

The second part of the questionnaire assessed the dentists' knowledge of ageing. Eighteen questions applicable to this study were derived from the 'Facts on Aging Quiz'[23] and some were adapted to the socio-demographic environment of Belgian elderly people. A correction for guessing was applied to define individual scores. The correction for guessing consisted of awarding -1 for an incorrect answer, zero for a question not answered, and +1 for a correct answer. These points were added and the sum divided by the number of questions (n=18).

A third part of the questionnaire consisted of the Rosencranz and McNevins' Aging Semantic Differential (ASD) Scale[24]. The ASD is an instrument assessing a respondent's attitude towards elderly people. The instrument contains 32 items of bipolar adjectives. A respondent has to indicate his perception of all adjectives by a 7-point semantic differential scale between positive and negative adjectives, one being the positive anchor, four the mid-point or undecided response, and seven the negative anchor. In the present study, the ASD was used to assess the dentists' attitude towards 'institutionalised' elderly people (ASD-total, including 32 items). In addition to the ASD-total, three dimensions or internal scales were used. These dimensions are known as Rosencranz Instrumental-Ineffective (I-I, nine items), which refers to qualities such as pursuing goals and adapting to changes, Rosencranz Autonomous-Dependent (A-D, nine items), comprising qualities

such as independence, security and organisation, and Rosencranz Personal Acceptability-Unacceptability (PA-U, 14 items), assessing friendliness, happiness and cooperativeness.

The last part of the questionnaire dealt with the content of the geriatric dentistry education received by the recently graduated dentist during their education. Twenty one aspects of geriatric dentistry education were listed and dentists had to cross for each aspect one of the following answers; "taught during a geriatric dentistry programme", "taught during another programme", "taught superficially", or "not taught at all". These four possibilities got the score three, two, one, and zero respectively. The mean score of the 21 items was standardised to 10. The more items of geriatric dentistry education had been taught during a geriatric dentistry programme, the higher was the score 'curriculum'. Additionally, the dentists were requested to respond by 'yes' or 'no' to a question regarding education in vocational training and oral health promotion in long-term care institutions for elderly people. The choice to gather information on educational programmes by questioning recently graduated dentists was based on the knowledge that written study programmes in a course catalogue can be interpreted in many ways. Sometimes it is very difficult to sort out different aspects of a specific course such as geriatric dentistry from a series of general courses. Content validity of the questionnaire was developed from searches of the literature. Face validity and discriminant validity was checked in a pre-test.

The reliability of the questionnaire was assessed during a test-retest procedure in a random sample of 13 dentists (graduated before 2004) at a 2-week interval. Intra-class correlation coefficients were 0.84, 0.7, 0.7, and 0.62 for motives pursuing a dental career, knowledge of ageing, ASD-score, and 'curriculum', respectively.

The study was approved by the Ethical Committee of the University of Ghent (EC UZG 2006/076).

On the basis of quartiles of the observed values, four different groups of dentists were compared with regard to the geriatric dentistry education received at their respective dental schools. As dental schools change the curriculum gradually the cohorts of 2004, 2005 and 2006 were compared to evaluate the changes over time.

Inferential analysis was used to determine whether outcome scores improved over time or by curriculum groups. Improvement of the two outcome variables, knowledge of ageing and attitude towards elderly people, was interpreted as moving from more-negative

scores towards more-positive scores. For knowledge of ageing, mean scores could range from -1 to +1. Mean scores for attitude were also used for ASD-dimensions and ASD-total. Low scores represented more positive attitudes and high scores more negative attitudes. The analysis was accomplished by ANOVA. To further explore the influence of 'curriculum' on attitude towards elderly people, multiple logistic regression analysis was performed with attitude towards elderly people as dependent variable, dichotomised around the neutral point of 4 (<4 vs. ≥4). Knowledge of ageing was included as covariate and the model was adjusted for age, gender and motives for pursuing a dental career. A non-response analysis was performed using a chi-square test. The level of significance was chosen as 0.05. Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS, Inc., Chicago, II,USA) version 15.0 for Windows®.

RESULTS

Descriptive

Three hundred and fifty-seven questionnaires were sent and 132 were returned. Taking into account eight undelivered and returned postal articles due to unknown address the overall response rate was 37%. The response rate of the cohorts 2004, 2005 and 2006 were 44.6%, 40.1% and 28.9% respectively. The response rate of the cohorts KUL, UG, VUB, UCL, ULB, ULG were 36.4%, 59.7 %, 38.5%, 32.1% 15.3% and 38.2% respectively.

A non-response analysis to compare respondents with non-respondents was performed using data on gender, year of graduation and university of graduation. The variable that appeared to differ significantly between the response and non-response group was 'year of graduation' with more UG-participants and less ULB-participants in the response group.

The mean age of all responders was 25.48; 91.9% was younger than 30 years of age. Nearly 60.5% was female. Nine percent of the responders was working in a solo private practice, 30% in a hospital or university clinic, 44% in a group practice and 16% combined working in a private dental practice with working in a hospital or university clinic. Only 10 responders (8%) perpetuated a professional collaboration with a nursing home. No significant differences in attitude to institutionalised elderly were found between dentists with experience from collaboration with a nursing home compared to dentists without this experience.

'Social contacts with patients' was indicated by recently graduated dentists as the most important motive for pursuing a dental career, followed in decreasing order, by the 'technical' and 'independent' aspect of the profession and 'scientific interest'. 'Treatment need of elderly people' and 'treatment need of persons with disabilities' were the less important motives. Not a single dentist ranked the 'financial aspect' and 'treatment need of elderly people' as most important motive.

Table 1 shows the mean, standard deviation and median for curriculum and all outcome variables for the total sample. Dentists' knowledge of ageing was low. Of all questions 50% were answered correctly, 28.8% incorrectly and 20.3% with 'I do not know'. Inspection of the means of different dimensions of the Rosencranz indicated that the mean value of the PA-U dimension was nearly four, indicating a neutral attitude. The mean values of I-I and A-D dimensions and the ASD-total were clustered above 4 what can be interpreted as a negative attitude towards institutionalised elderly.

Concerning the geriatric dentistry education 15.8% of aspects of geriatric dentistry was taught during a geriatric dentistry programme, 27.7% during another programme, 24.7% was taught superficially and 31.8% was not taught at all. Oral manifestations of systemic diseases (85.4%), dental treatments (all disciplines) (83.8%) and acute and chronic diseases of elderly (80.7%) were indicated to be most frequently taught during a geriatric dentistry programme or during another programme. Dental treatments for the elderly at home (94.3%), dental treatments for the elderly in long term care facilities (83.7%), and management of oral health for the vulnerable elderly (82.8%) were mostly indicated as taught superficially or as not taught.

Only dentists who graduated at the University of Ghent (n=30) participated in an oral health promotional vocational training in long-term care facilities during their undergraduate curriculum but without any influence on their attitude towards institutionalised elderly or knowledge of ageing.

Analytical

Great variability amongst the six dental schools (figure 1 and table 2) was observed for geriatric dentistry education received. Each distribution of scores for geriatric dentistry education is represented by a box and protruding lines (whiskers). The length of the box

is the variable's inter-quartile range and comprises the middle 50% of the cases. The line inside the box represents the median and the protruding lines represent the range without the outliers.

Figure 1. Distribution of scores on geriatric dentistry education for the dental schools (n=6) (median, interquartile range and range)

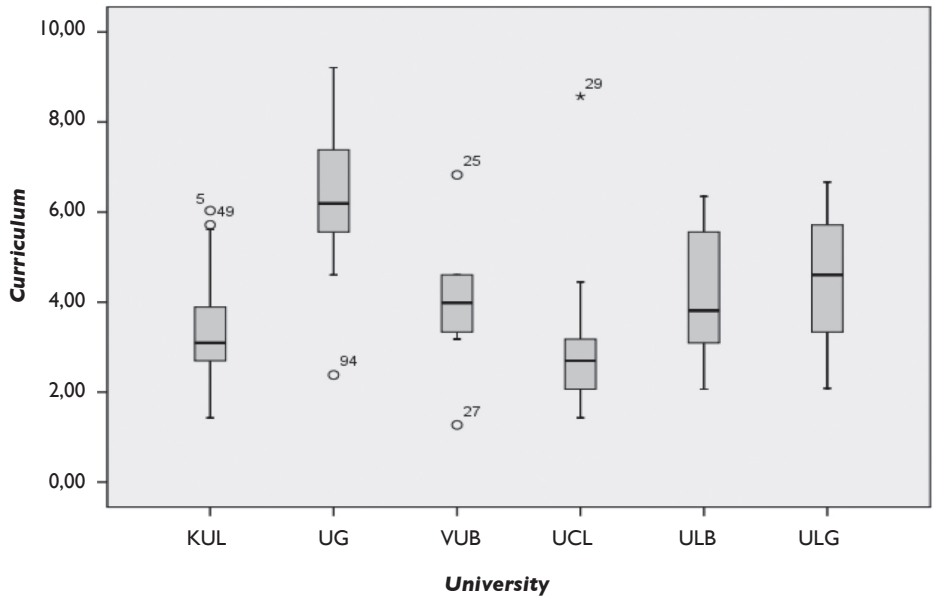


Table 2 shows that geriatric dentistry education significantly differs between dental schools of different universities (p=0.000), although a slightly growing importance for geriatric dentistry education in the time (p=0.27) can be observed.

Intra-class correlation coefficients indicate acceptable internal consistency in the answers within the different groups of dental schools compared to the between group difference.

Table 3 shows comparison (ANOVA) by different covariates of the mean of the three dimensions of the ASD, the total ASD scale and knowledge. The covariate 'financial motive for pursuing a dental career' is the only item that seems to have any significant influence on all dimensions of the ASD. Age is the only significant variable for knowledge. All other covariates were not found to have any influence on the expressed attitude towards institutionalised elderly people or knowledge about aging. Concerning financial motives for pursuing a dental career, those who reported financial aspects as an important motive had higher mean values on the ASD full measure and sub-scales. This could be inter-

preted as a more negative stereotypical attitude than those who reported financial aspects as less important.

The younger dentists (22-26 years) scored better (p=0.03) for knowledge than their older counterparts (27-40 years).

The multiple logistic regression models did not identify any significant predictors. This can be related to subject to item ratio and the number of subjects in the sample.

DISCUSSION

In Belgium, a significant increase of disability rate of elderly people is expected till 2050 as reported by the Organisation for Economic Cooperation and Development[25]. As in many other European countries, the Belgian government takes initiatives to promote domiciliary care for elderly people living at home. Nevertheless, the need for institutionalisation will remain. Due to demographic changes and an increasing disability rate the amount of institutionalised elderly will further grow in the future. It is clear that institutionalised elderly people are at the greatest risk and need adequate oral health.

The semantic differential method is well established as a reliable and generally applicable way to measure individuals' attitudes, preferences and perceptions. The original three-factor model of the aging semantic differential was used for the analysis rather than the four-factor model[26]. In this study, responders were asked to express attitudes towards 'specific old persons', namely institutionalised elderly people and Intrieri et al.[27] mentioned in a confirmatory factor analysis that the three-factor solution proposed by Rosencranz and McNevin may provide a better fit to data that used ASD judgments of a specific social subject. Consequently, it is argued that the results of this study, obtained by the three-factor analysis, can be compared with the results of earlier studies using the ASD. Compared to studies exploring dental and medical students' attitude by the ASD[19,28-32], the mean score of ASD-total (140.16, mean per item 4.38) observed in this sample is, to our knowledge, the highest score so far reported in the literature. This finding is partly explained by the fact that the present study measured attitude specifically towards institutionalised elderly.

Low mean values of geriatric dentistry education (curriculum) and significant differences amongst Belgian dental schools indicate the lack of a single format of teaching geriatric

dentistry in Belgium. A slightly growing importance for geriatric dentistry in the time gives some promises for the future as already suggested by Preshaw and Mohammad[12]. It could be valuable to start inter-university consultations in order to develop a convergent and harmonised format of teaching of geriatric dentistry in Belgium according to the Bologna Declaration[33] and the Profile and Competences for the European Dentist[34]. Attention should be paid to skills in order to obtain a general, medical, oral and psychosocial history of the elderly patient and to assess patients' comprehension and competence. Other important topics to be covered include age-related changes in oral structures, quality of life, delivery of oral health care in elderly patients' homes and nursing homes using appropriate dental equipment, strategies to overcome barriers to oral care for elderly patients and training of auxiliaries and care providers in basic oral hygiene and in the perception of pain and oral impairment for dental referral.

Why recent graduates showed limited knowledge about aging remains unclear, but is not exceptional as compared to the study on dental students' knowledge performed by Wood and Mulligan[32]. A possible explanation could be the lack of a special course in geriatric dentistry at most dental schools in Belgium. Nevertheless, this explanation is hampered by the fact that no correlation was found between knowledge and curriculum. Possibly, the curriculum and expected knowledge were both too low to be of importance. Age was the only significant variable for knowledge resulting in more knowledge on ageing for the youngest groups. Dental schools are challenged to upgrade geriatric dentistry education with attention to new learning methodologies and experiences to better prepare future dental practitioners. Within 5 or 10 years, future research should be undertaken to assess possible long-term effects of these new curricula on the attitude of undergraduate dental students.

Notwithstanding the great variability of geriatric dentistry education between different dental schools in Belgium, this study revealed no impact of a dental undergraduate curriculum on knowledge on ageing, neither on attitude towards institutionalised elderly people as perceived by recently graduated dentists. Based partially on the premise that knowledge of ageing and contacts with elderly people would result in more positive attitudes of health students towards the elderly, a special vocational oral health promotion and training programme was implemented in the geriatric dentistry education at the

dental school of Ghent. Interactions between institutionalised elderly people and dental students during this programme seemed to have no influence on the attitude of recently graduated dentists towards institutionalised elderly. This finding is in agreement with a study performed in 1988 by Mann et al.[28] and in 1992 by Eyison et al.[31]. The first study concluded that attitudes of dental professionals towards the elderly may have little to do with whether or not their dental education included formal curricula elements in geriatric dentistry. Eyison and co-workers found that social contact and experiences in treating the elderly did not change students' attitudes and desire to work with these patients in the future. However, other studies showed positive[19,21,32,35,36] and negative[8,31] influences of practice experiences on the attitude of health students towards the elderly.

A contradiction was found exploring the different motives for pursuing a dental career. On the one hand, having 'social contacts with patients' was reported as the most important motive but on the other hand 'treatment need of different risk groups' seemed not to be an attractive pole. Possibly, the real problem of treatment need of risk groups is not recognised by adolescents and young adults. The financial aspect was not reported as an important motive and none of the responders suggested 'work certainty' as a possible additional motive. This may suggest that recently graduated dentists prefer the 'social aspect' of the job rather than the commercial aspect. Nevertheless, the covariate 'financial motive for pursuing a dental career' was the only item that seems to have any significant influence on all dimensions of the ASD. Recently graduated dentists, showing low importance for the financial aspect indicated a more positive attitude towards the institutionalised elderly. Supposing that graduated dentists did not respond in a socially desirable way, this is an interesting finding that needs further research. University hospitals have to think about the creation of special geriatric dental departments for frail elderly patients and recruit real interested and motivated dental professionals during their education.

A limitation of this study is the small sample size (n=124) and a limited power of 25% to detect an attitude (ASD-Total) difference of 0.15 when comparing four different curriculum groups. In Belgium, during the last five years, the number of graduating dentists per year is low, resulting in a small number of recently graduated dentists. With that, a decreasing response rate was observed over time. This could be explained by an increasing unco-operativeness due to an expanding number of research projects using ques-

tionnaires. The response rate was the highest for dentists graduated at the University of Ghent (UG). Possibly, the willingness of students to co-operate with a study performed by their University of graduation is higher. The response rate of students graduated at the Université Libre de Bruxelles (ULB) was low and from a scientific point of view this is a shortcoming of this study. The lack of effect in multiple regression models may be due to this small sample size.

Nevertheless, this study revealed some interesting findings concerning the attitude of recently graduated dentists towards institutionalised elderly people.

CONCLUSION

The attitudes of recently graduated dentists in Belgium towards institutionalised elderly are rather negative and knowledge of ageing is poor. Recently graduated dentists, who reported the financial aspect as a less important motive for pursuing a dental career showed a more positive attitude towards institutionalised elderly.

Geriatric dentistry education in the undergraduate curriculum, even participation in a special vocational oral health promotion and training programme in long term care facilities did not influence the attitude of recently graduated dentists towards institutionalised elderly people.

Belgian dental schools are challenged to re-orientate their geriatric dentistry education. We argue that they should include activities that develop positive perceptions towards elderly and an empathic positive caring attitude. Taking into account the demographic changes in our society, a better balance between theory and practice of geriatric dentistry education has to be considered to prepare future dental professionals.

ACKNOWLEDGEMENTS

Data collection was supported by GABA International.

REFERENCES

1 FOD Economie, KMO, Middenstand en Energie. http://statbel.fgov.be/figures/d23_nl.asp
2 Rijksinstituut voor Ziekte en Invaliditeitsverzekering. www.riziv.fgov.be/homenl.htm
3 De Visschere LM, Theuniers G, Grooten L, Vanobbergen JN. Oral hygiene of elders in long-term care institutions - A cross-sectional study. Gerodontology 2006; 23(4):195-204.
4 Vanobbergen JN, De Visschere LM. Factors contributing to the variation in oral hygiene practices and facilities in long-term care institutions for the elderly. Community Dental Health 2005; 22(4):260-265.
5 Lamy M, Mojon P, Kalykakis G, Legrand R, Butz-Jorgensen E. Oral status and nutrition in the institutionalized elderly. J Dent 1999; 27(6):443-448.
6 Institute Epidemiology Unit Activities, Health Interview Survey, Scientific Institute of Public Health. Update: 11/04/2005. www.iph.fgov.be/epidemio/epien/index4.htm.
7 Hally J, Clarkson JE, Newton JP. Continuing dental care for Highlands elderly: current practice and attitudes of dental practitioners and home supervisors. Gerodontology 2003; 20(2):88-94.
8 Kiyak HA, Milgrom P, Ratener P, Conrad D. Dentists' attitudes toward and knowledge of the elderly. J Dent Educ 1982; 46(5):266-273.
9 Claus LM. Dental student attitudes towards the elderly and training in geriatric dentistry. Int Dent J 1982; 32(4):371-378.
10 MacEntee MI, Weiss RT, Waxler-Morrison NE, Morrison BJ. Opinions of dentists on the treatment of elderly patients in long-term care facilities. J Public Health Dent 1992; 52(4):239-244.
11 Plasschaert AJM, Holbrook WP, Delap E, Martinez C, Walmsley AD. Profile and Competences for the European Dentist. 1-24. 2004. ADEE.
12 Preshaw PM, Mohammad AR. Geriatric dentistry education in European dental schools. Eur J Dent Educ 2005; 9(2):73-77.
13 Nitschke I, Muller F, Ilgner A, Reiber T. Undergraduate teaching in gerodontology in Austria, Switzerland and Germany. Gerodontology 2004; 21(3):123-129.
14 Matear D. Why do we need education in geriatric dentistry? J Can Dent Assoc 1998; 64(10):736-738.
15 van Waas MAJ. De geriatrische tandheelkunde in het tandheelkundig onderwijs. Ned Tijdschr Tandheelkd 105, 362-364. 1998.
16 Mersel A, Mann J, Malve D, Anaise J. Israeli dental students' attitudes toward elderly patients. Spec Care Dentist 1984; 4(6):261-263.
17 Beaulieu E, Dufour LA, Beaudet R. Better oral health for infants and toddlers: a community based program. J Dent Hyg 2000; 74(2):131-134.
18 Beck JD, Ettinger RL, Glenn RE, Paule CL, Holtzman JM. Oral health status: impact on dental student attitudes toward the aged. Gerontologist 1979; 19(6):580-584.
19 Ettinger RL, Beck JD, Kerber P, Scandrett FR. Dental students' confidence in prosthodontics and attitudes toward the elderly. J Dent Educ 1982; 46(9):541-547.
20 Fabiano JA, Waldrop DP, Nochajski TH, Davis EL, Goldberg LJ. Understanding dental students' knowledge and perceptions of older people: toward a new model of geriatric dental education. J Dent Educ 2005; 69(4):419-433.
21 Wilkinson TJ, Gower S, Sainsbury R. The earlier, the better: the effect of early community contact on the attitudes of medical students to older people. Med Educ 2002; 36(6):540-542.
22 Stewart TJ, Eleazer GP, Boland R, Wieland GD. The middle of the road: results from the aging semantic differential with four cohorts of medical students. J Am Geriatr Soc 2007; 55(8):1275-1280.
23 Erdman Palmore's landmark "Facts on Aging Quiz" http://cas.umkc.edu/cas/AgingFactsQuiz.htm
24 Rosencranz HA, McNevin TE. A factor analysis of attitudes toward the aged. Gerontologist 1969; 9(1):55-59.
25 Lafortune G, Balestat G and the Disability Study Expert Group Members. Trends in Severe Disability Among Elderly People: Assessing the Evidence in 12 OECD Countries and the Future Implications. OECD Health Working Papers, 2007. www.google.com/search?hl=en&q=OECD+HEALTH+WORKING+PAPERS+2007+disability+&btnG=Search.
26 Rupp DE, Vodanovich SJ, Crede M. The multidimensional nature of ageism: construct validity and group differences. J Soc Psychol 2005; 145(3):335-362.
27 Intrieri RC, von Eye A, Kelly JA. The aging semantic differential: a confirmatory factor analysis. Gerontologist 1995; 35(5):616-621.
28 Mann J, Bomberg TJ, Holtzman JM, Berkey DB. The effect of dental geriatric curricula on attitudes toward the elderly. J Dent Educ 1988; 52(9):516-518.
29 Sainsbury R, Wilkinson TJ, Smith CW. Attitudes of medical students to old people: a cross-national comparative study. Med Educ 1992; 26(4):285-289.

30 Edwards MJ, Aldous IR. Attitudes to and knowledge about elderly people: a comparative analysis of students of medicine, English and Computer Science and their teachers. Med Educ 1996; 30(3):221-225.
31 Eyison J, Mann J, Holtzman JM, Mersel A. A comparative study of the attitude of dental students towards the elderly. Eur J Prosthodont Restor Dent 1992; 1(2):87-90.
32 Wood GJ, Mulligan R. Cross-sectional comparison of dental students' knowledge and attitudes before geriatric training: 1984-1999. J Dent Educ 2000; 64(11):763-771.
33 Confederation of EU Rectors' Conferences and the Association of European Universities (CRE). The Bologna Declaration on the European space for higher education: an explanation, 2000. www.google.com/search?hl=en&q=bologna+declaration&btnG=Search
34 Cowpe J, Plasschaert A, Harzer W, Vinkka-Puhakka H, Walmsley AD. Profile and Competences for the European Dentist - update 2008. www.adee.org/cms/
35 Steele LP. Dental students' attitudes and knowledge about elderly people. Gerodontics 1987; 3(2):61-64.
36 Devlin H, Mellor AC, Worthington HV. Attitudes of dental students towards elderly people. J Dent 1994; 22(1):45-48.

Table 1. Mean, SD and Median for dependent and independent variables

N=124	*Mean*	*SD*	*Median*
Geriatric dentistry education (curriculum)	4.25[1]	1.88	3.89
Knowledge of ageing	0.22[2]	0.16	0.22
Instrumental – Ineffective (I-I)	4.91[3]	0.55	4.89
Autonomous – Dependent (A-D)	4.47[3]	0.59	4.44
Personal Acceptability – Unacceptability (PA-U)	3.99[3]	0.59	3.96
Aging Semantic Differential (ASD-total)	4.38[3]	0.49	4.38

1 The more aspects of geriatric dentistry education were taught during a geriatric dentistry programme the higher the value of the variable
2 +1 all answers correct (very good knowledge; -1 all answers incorrect (very low knowledge)
3 < 4 positive attitude; > 4 negative attitude

Table 2. Curriculum for different universities and years of graduation

Curriculum (Geriatric dentistry education)				
University of graduation (n=124)	[1]	***Mean*[2]**	***SD***	***Median***
(n=32) KUL	0.87	3.35	1.23	3.10
(n=31) UG	0.79	6.31	1.42	6.19
(n=10) VUB	0.92	3.99	1.40	3.98
(n=27) UCL	0.92	2.89	1.39	2.70
(n=11) ULB	0.87	4.21	1.45	3.81
(n=13) ULG	0.71	4.59	1.52	4.60
p-value		**<0.001**		
Year of graduation (n=124)				
(n=45) 2004		3.97	1.82	3.65
(n=40) 2005		4.19	1.85	3.73
(n=39) 2006		4.62	1.95	4.00
p-value		0.27		

1 Intra-university class correlation coefficient
2 The more aspects of geriatric dentistry education were taught as chapters of a particular course Geriatric Dentistry the higher the value of the variable

Table 3. ANOVA for outcome variables (ASD and knowledge) by the independent variable 'curriculum' and different covariates

N=124	*I-I*[1]	*A-D*[1]	*PA-U*[1]	*ASD-total*[1]	*KNOWLEDGE*[2]
Curriculum*[3] *(n=124)* *Geriatric Dentistry Education	Mean (SD)				
(n=30) Q1	5.05 (.63)	4.49 (.65)	4.09 (.64)	4.48 (.58)	0.20 (.19)
(n=32) Q2	4.80 (.49)	4.36 (.48)	3.96 (.44)	4.31 (.33)	0.22 (.16)
(n=32) Q3	4.78 (.57)	4.48 (.59)	3.90 (.66)	4.31 (.52)	0.25 (.14)
(n=40) Q4	5.04 (.46)	4.55 (.63)	4.01 (.63)	4.45 (.52)	0.21 (.15)
p	0.08	0.64	0.64	0.39	0.53
University of graduation (n=124)					
(n=32) KUL	4.91 (.59)	4.52 (.52)	3.96 (.58)	4.39 (.46)	0.23 (.15)
(n=31) UG	4.93 (.48)	4.49 (.66)	4.02 (.60)	4.41 (.52)	0.22 (.14)
(n=10) VUB	4.84 (.65)	4.47 (.63)	3.98 (.77)	4.36 (.65)	0.18 (.17)
(n=27) UCL	4.90 (.64)	4.31 (.59)	4.03 (.55)	4.35 (.51)	0.24 (.16)
(n=11) ULB	4.87 (.39)	4.54 (.52)	5.05 (.36)	4.42 (.30)	0.18 (.20)
(n=13) ULG	5.00 (.54)	4.56 (.62)	3.99 (.59)	4.37 (.55)	0.21 (.19)
p	0.99	0.75	0.96	0.99	0.81
Year of graduation (n=124)					
(n=45) 2004	4.96 (.54)	4.42 (.56)	3.93 (.69)	4.36 (.53)	0.21 (.14)
(n=40) 2005	4.86 (.63)	4.49 (.63)	3.92 (.61)	4.34 (.54)	0.20 (.17)
(n=39) 2006	4.91 (.48)	4.50 (.58)	4.12 (.42)	4.45 (.38)	0.26 (.17)
p	0.66	0.76	0.22	0.56	0.23
Gender (n=124)					
(n=75) female	4.84 (.56)	4.41 (.59)	3.95 (.58)	4.33 (.48)	0.23 (.16)
(n=49) male	5.03 (.52)	4.56 (.57)	4.05 (.63)	4.47 (.51)	0.21 (.17)
p	.060	0.17	0.35	0.13	0.57
Age (n=124)					
(n=103) 22 – 26	4.91 (.54)	4.46 (.59)	3.97 (.58)	4.37 (.48)	0.24 (.15)
(n=14) 27 – 31	4.83 (.60)	4.56 (.62)	4.06 (.73)	4.42 (.63)	0.13 (.19)
(n=7) 32 – 40	5.17 (.54)	4.46 (.53)	4.09 (.55)	4.50 (.45)	0.14 (.21)
p	0.39	0.82	0.78	0.77	**0.03**
Motives persuing a dental career					
Financial aspect (n=120)					
(n=20) very important	5.13 (.57)	4.63 (.54)	4.23 (.65)	4.60 (.52)	0.21 (.17)
(n=69) important	4.94 (.51)	4.53 (.61)	4.00 (.60)	4.42 (.49)	0.23 (.15)
(n=31) less important	4.72 (.60)	4.24 (.52)	3.81 (.52)	4.19 (.45)	0.19 (.18)
p	**0.03**	**0.03**	**0.05**	**0.01**	0.39
Treatment need of elderly people (n=120)					
(n=8) very important	5.24 (.47)	4.60 (.39)	4.32 (.30)	4.66 (.26)	0.18 (.16)
(n=45) important	4.84 (.59)	4.35 (.58)	3.88 (.52)	4.28 (.48)	0.20 (.18)
(n=67) less important	4.92 (.54)	4.54 (.61)	4.03 (.66)	4.43 (.52)	0.23 (15)
p	0.19	0.19	0.11	0.09	0.47
Vocational training & oral health promotion in long term care facilities (n=124)					
(n=30) Yes	4.92 (.58)	4.47 (.57)	3.98 (.60)	4.38 (.49)	0.22 (.17)
(n=94) No	4.91 (.48)	4.46 (.66)	3.00 (.60)	4.38 (.51)	0.22 (.14)
p	0.94	0.95	0.93	0.99	0.94

1 < 4 positive attitude; > 4 negative attitude
2 +1 all answers correct (very good knowledge)t; -1 all answers incorrect (very low knowledge)
3 Q1: more aspects were taught superficially or were not taught at all; Q4: more aspects of geriatric dentistry were taught

PART II: AMOR-ABRIM PROJECT
II.A QUANTITATIVE APPROACH

CHAPTER 6

EVALUATION OF THE IMPLEMENTATION OF AN 'ORAL HYGIENE PROTOCOL' IN NURSING HOMES: A 5-YEAR LONGITUDINAL STUDY

This chapter has been published as:
Evaluation of the implementation of an 'oral hygiene protocol' in nursing homes: a 5-year longitudinal study

De Visschere L, De Baat C, Schols JMGA, Deschepper E, Vanobbergen J
Community Dent Oral Epidemiol. September 2010 accepted for publication

ABSTRACT

Introduction: To explore the long-term effects of the implementation of an oral hygiene protocol in nursing homes.

Material and Methods: Out of 14 nursing homes (Flanders) 7 nursing homes were randomly allocated to the intervention group and confirmed to implement an 'oral hygiene protocol'. The remaining nursing homes (the control group) continued to perform oral hygiene as usual. Oral hygiene levels were scored and factors related to plaque levels were recorded. Mixed model analysis with random institution effect, were performed to explore differences in oral hygiene levels owing to the intervention, and the predictive value of explanatory variables.

Results: At baseline, no significant differences were found between plaque levels in both study groups. In an unadjusted analysis, different effects were observed on denture and dental plaque. The lowest denture plaque levels were found 2 years after the start of the study, while the lowest dental plaque levels were found at the end of the study. The effect of the intervention could not be confirmed in an adjusted mixed model, where significant indicators for dental plaque were resident's dependency ($p<0.01$) and presence of mouth rinse ($p<0.01$). Capacity of the nursing home ($p<0.05$) and the presence of toothpaste ($p<0.01$) were dominant influencing factors for denture plaque.

Conclusion: After 5 year of implementation obtained plaque levels were unsatisfactory. A lot of uncertainties remained on the impact of characteristics of individual nursing homes. Obtaining adequate oral hygiene levels in nursing homes remain an important ongoing challenge and needs further research.

INTRODUCTION

Ageing of the population is a worldwide concern, owing to the growing number of elderly people with disabilities due to comorbidity. During the last years of their lives, many elders suffer from physical, psychological and cognitive complaints (compression of morbidity). In Flanders (Belgium), about 65,000 persons (15%) older than 75 reside in long-term care institutions and 80,000 (20%) receive home supportive domiciliary care. Based on data reported in 1999, 40% of these residents have a low or moderate scale of functional dependency, with 60% nearly totally or totally dependent[1].

It is well known that elderly people, especially those residing in long-term care facilities, have a high risk of oral disease, which directly influences their quality of life and lifestyle. The negative impact of poor oral health on general health and quality of life in older adults is an important public health issue[2]. However, international literature shows an insufficient level of oral care among institutionalised elderly people[3]. One of the most important aspects of oral health care is oral hygiene, although several recent studies have documented poor oral hygiene among institutionalised elderly people[4-6].

Institutional barriers to the practice of oral health care have been reported on many different levels. At the residents' level, important factors include the number of natural teeth[7,8], the extent of functional dependency[9], level of co-operativity[10,11], and a general low demand for oral health care of frail elderly people unless they experience pain[12]. Among nurses, nursing assistants and nurse' aides, the main barriers to providing adequate oral care include unawareness of the importance of oral health, lack of appropriate knowledge and skills to perform oral health care, and low priority given to oral health care[11,13-17]. Finally, prevalent organisational barriers include high work load owing to insufficient manpower, the increasing proportion of highly dependent residents[18-20], lack of time[17,18,21,22], and absence of a structured oral health care policy[17,19,23,24].

In 2002, poor oral hygiene was demonstrated in residents of long-term care institutions in Ghent (Flanders). It was concluded that increasing caregivers' knowledge and educating the management of the institutions on the importance of performing adequate oral hygiene may help to improve oral health and oral health-related quality of life in these residents[19]. Several authors have advocated implementing oral health care programmes that include standardised procedures, oral health-related facilities and protocols of care, in or-

der to achieve acceptable oral hygiene levels in institutionalised elderly people[10,13,15,19,25-34]. Looking at the literature published before mid-2009, only few recent studies reported about the direct effect of the implementation of an oral hygiene protocol on oral health of institutionalised elderly people. They produced inconsistent results, with some showing beneficial effects[17,35], while others showing no improvement[36-39]. The intervention period didn't exceed 18 months. In Belgium no intervention studies had been undertaken aiming an improvement of the oral health of elderly people in nursing homes.

This study was designed to evaluate the effects of implementing an oral hygiene protocol in long-term care facilities, over a five-year study period. The study tested the null hypothesis that the oral hygiene protocol would not result in any change in residents' oral hygiene levels. This was assessed in two main ways: longitudinal exploration of dental and denture plaque levels, assessed by standardised measurements; and exploration of determinants which affect variability in oral hygiene levels.

MATERIALS AND METHODS

Study design

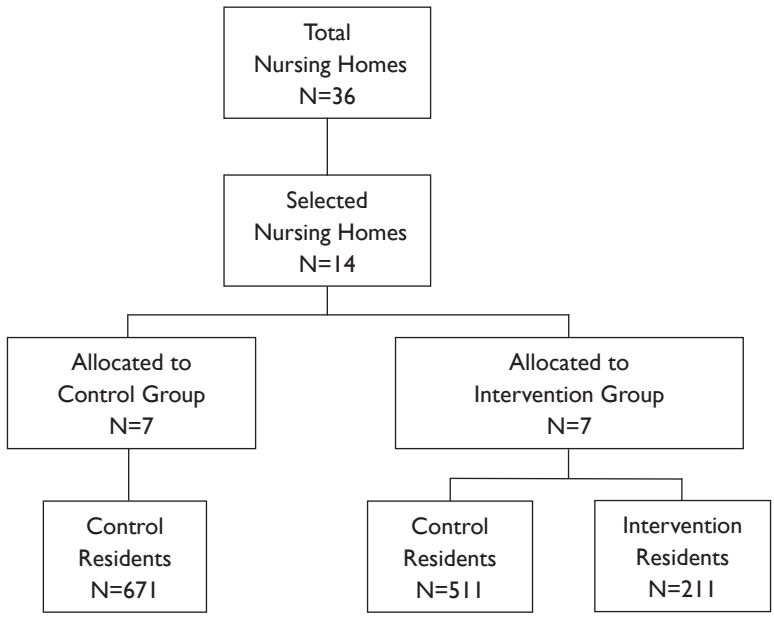
The present study was a 5-year longitudinal group randomized controlled trial, conducted between 2003 and 2008 with the nursing home as the primary sampling unit.

Population and sample

Institutionalised older people living in 36 nursing homes in the region of Ghent in Flanders-Belgium formed the target study population (n=2585). A two-stage sampling procedure was used. In the first stage, a sample of 14 nursing homes was selected using stratified cluster sampling. For this, the target group was divided into 9 different strata, obtained by combining three categories defining the capacity of the institution (<50; between 50 and 100; >100 residents) and three categories depending on the managerial umbrella of the institution (private non-profit making institution, all Catholic; social service institution; commercial institution). In the second stage residents were randomly selected within nursing homes using stratified cluster sampling. Since in the intervention nursing homes not all residents were involved in the intervention (see below) eight different strata were used by combining 2 categories based on whether or not they are involved in the intervention and 4 categories defining the residents' degree of dependency (O, A,

B, C ranging from less dependent to very dependent – Katz-scale[40]). In the control nursing homes 4 strata were used obtained by combining the 4 categories of dependency. The second sampling stage was repeated each year.

Figure 1. Different study groups



At study start, out of the 14 nursing homes, 7 were randomly allocated (figure 1) to the intervention group and 7 to the control group. In the intervention group the standardized oral hygiene protocol was gradually applied when new residents arrived. In this way, we managed the workload of the staff not having to apply the protocol to all residents straight-away. This resulted in a increasing group of intervention residents. Given a mean length of stay for residents in nursing homes of 3.5 years, one can expect a majority of residents to be involved in the intervention after a period of 5 years. Consequently, 3 study groups were considered: control residents in control nursing homes (CrCh), control residents in intervention homes not involved in the implementation (CrIh) and intervention residents in intervention homes involved in the implementation (IrIh).

Overall consent to participate in the study was given by the director of each nursing home

prior to study start. Individual verbal consent was obtained for all residents participating in the study. When verbal consent was impossible due to lack of communication with the residents or their proxies, residents were excluded and replaced. The study was approved by the Ethics Committee of the Ghent University Hospital (OG017).

Outcome variables

The outcome variables for residents' oral hygiene were denture plaque and dental plaque, assessed by a clinical examination. Denture plaque was scored independently by two examiners according to Augsburger and Elahi (score range = 0–4)[41]. Loose debris was rinsed off the denture, which was then immersed in a methylene disclosing solution. Excess dye was rinsed off in gently running water. Plaque was scored on each of four buccal and four mucosal surface segments, using a 0 to 4 scale. Each scale point represented a further 25% increment in surface plaque coverage. Dental plaque was scored by one examiner using the plaque index described by Silness and Löe (score range = 0–3)[42]. A mean score per resident was computed as a continuous variable representing the oral hygiene of the resident separately for denture(s) and natural dentition, if applicable.

Each year, a group of about 14 dental examiners carried out the clinical examinations, all of whom were trained and calibrated in the use of the defined diagnostic criteria. Prior to the study and at the beginning of each year, a random sample of 20 upper or lower dentures was examined to determine inter-examiners' reliability in scoring denture plaque. Detailed information on reliability was evaluated, comparing each examiners' mean denture scores (n=20) with the mean denture scores of a gold standard (JV). For the consecutive examination years, the Chronbach alpha intra class correlation coefficients varied from 0.97 to 0.86. The diagnostic criteria for scoring dental plaque was practised during training sessions but, due to the procedure where plaque scores were assessed by using a probe on the tooth surface, calibration could not be carried out. In order to avoid information bias, care givers and residents of nursing homes were not informed of the exact examination dates, and examiners were blind as to which residents were included in the intervention or not.

Independent variables

The intervention protocol was the main independent variable in this study. The intervention consisted of an oral hygiene protocol which aimed to integrate oral hygiene into the

daily care of the residents. The intervention included:

- an introduction session (1 h) with the director of the institution explaining the rationale and the procedure of the intervention,
- appointment of registered nurses as oral health coordinators, responsible for the implementation procedure on their ward. At least one nurse was appointed per ward (30 to 50 residents),
- a half-day theoretical and practical training session for all appointed oral health coordinators,, which in turn had to educate the other nurses, nursing assistants or nurse' aides (train the trainer principle),
- an oral assessment of all new arrivals, to be performed by the trained oral health coordinators using newly designed assessment forms,
- an 'individualised oral hygiene plan', to be prepared by the trained oral health coordinators, taking into account residents' oral needs as reported on the oral assessment, and residents' degree of dependency. The oral hygiene protocol described clearly the instructions for the cleaning of teeth, soft tissues and dentures,
- integration of the 'individualised oral hygiene plan' into daily care, to be performed by all care givers involved in daily care.

Additional independent variables on residents' level were recorded on each resident's examination sheet, including gender, age, degree of dependency, presence of toothbrush, denture brush, mouth rinse, toothpaste and cleaning tablets (yes or no) and condition of (almost none or minimal versus moderate or strong wear) of oral hygiene tools (toothbrush and denture brush) in resident's room. Degree of dependency was determined based on the Katz-scale resulting in 4 categories (Table 1). On an institutional level the following data were registered: the stratification variables (capacity and management of the institution) and the number of years involved in the study were registered.

Statistical analyses

SPSS (Statistical Package for the Social Sciences) version 15.0 for Windows® was used to analyse the data. To avoid various misleading artefacts and to respect real life conditions an intention to treat analysis[43] was performed. Every nursing home who initially was allocated to the intervention or control group was analysed in this group, whether or not the protocol was implemented for the whole period. Four out of the fourteen nursing

homes had more or less serious organisational problems implementing the protocol and started 1 year later or tended to drop out for 1 year in the course of the study. Means and standard deviations were calculated, assumptions were checked and differences between groups were tested by t-tests and analysis of variance. Cross-tabulation and χ^2 test were used for categorical variables. A linear mixed model was used to explore differences in oral hygiene levels due to the intervention and predictive value of explanatory variables, taking into account the random nursing home effect. Probability of 5% ($p \leq 0.05$) was defined as significant for all statistical tests.

RESULTS

Explorative data analysis

The total sample over the 5-year longitudinal study period included 1,393 residents, including 671 in the CrCh-group, 511 residents in the CrIh-group and 211 residents in the IrIh-group (Figure 1). The sample was characterized by a mean age of 84.79 years (SD: 7.87) and a high proportion of female residents (75.9%). Fifty percent of the residents were highly functional dependent (scale B and C). Seventy seven percent wore dentures, of which 58% were complete denture. More than 30% of residents had some natural dentition (Table 1). The mean number of remaining teeth was 12 (SD: 7.64), 9.8 (SD: 7.0) and 10.3 (SD: 7.26) for the CrCh-group, CrIh-group and IrIh-group, respectively.

Due to the stratification and randomisation no statistically significant differences were found between the 3 study groups related to age, gender, proportion of edentulousness and degree of dependency.

Only relevant data were reported in table 2: at baseline, in the middle of the study and at the end. At baseline, there were no significant differences in denture and dental plaque levels between resident groups (p=0.35) (Table 2). In a non-adjusted analysis comparing denture and dental plaque levels in the 3 study groups over time, the lowest denture plaque levels were observed 2 years after the start of the study in all resident groups (CrCh:1.90; CrLh:1.78; IrIh:1.57). However, this plaque reduction faded out towards the end of the study period, even in the IrIh-group (CrCh:2.33; CrIh:2.04; IrIh:2.05). In contrast, dental plaque levels were lower at the end of the study period than at baseline in all resident groups. The smallest difference in plaque reduction was observed within the CrIh-group. The differences between

baseline and 5-year follow up dental plaque levels were 0.39, 0.16 and 0.53 for CrCh, CrIh and IrIh, respectively. Additional analyses based on 5-year follow-up data revealed significant differences in both denture (p=0.04) and dental plaque (p<0.01) levels between residents in relation to their degree of dependency, with less favourable plaque scores found in highly dependent residents (scale B and C).

Multivariate analysis

Within the adjusted mixed model, the main explanatory variable (intervention) over the 5-years did not significantly add to the explanation of the variance in plaque levels. The mixed model regression revealed capacity of the nursing home (p=0.02) and presence of toothpaste (p=0.01) as the only variables significantly correlated to denture plaque levels (Table 3). The presence of toothpaste was associated with cleaner dentures. Dentures of residents in nursing homes with capacities ≥ 50 ≤ 100 beds were less cleaner than dentures of residents in nursing homes exceeding 100 beds.

The mixed model regression analysis for dental plaque (Table 4) indicated correlations between oral hygiene levels and the degree of resident dependency (p=0.01) and the presence of a mouth rinse (p=0.01). Residents with 'O' or 'A' degree of dependency (low dependency) had lower dental plaque levels, with estimates of -0.337 and -0.459 respectively, compared with highly dependent residents (C). Highest dental plaque levels were observed when mouth rinse was available in residents' bathrooms.

DISCUSSION

The present study is the first longitudinal intervention (with a 5-year follow-up) focusing on oral hygiene in the institutionalised elderly in Flanders. The mean length of stay of residents in nursing homes in Flanders is approximately 3.5 years, making it difficult to follow the same individuals over a longer period. Therefore, in order to conduct a 5-year longitudinal study in frail elderly population groups, an analysis at an institutional level was performed. In fact, the present study compared different cross-sectional measurements. Because the sampling procedure for residents was repeated each year, it was possible to get the same individuals repeatedly into the samples. This putative bias could not have influenced the results firstly because it was at random for all study groups and secondly because the analysis was performed at nursing home level and not at individual level. It is beyond all doubt that evidence-based oral

health care should begin with good oral hygiene, the cornerstone of preventive oral health care. This was the rationale for focusing on oral hygiene in the present study. The importance of oral hygiene has been highlighted in a recent systematic review, which revealed positive preventive effects of oral hygiene on pneumonia and respiratory tract infections in hospitalized elderly people and elderly nursing home residents. The absolute risk reduction (ARR) ranged from 6.6% to 11.7% and the number needed to treat (NNT) from 8.6 to 15.3[44].

In the present study, high denture and dental plaque levels were observed at baseline (2003). Plaque levels were in agreement with oral hygiene levels already reported in an earlier study in Flanders, and confirmed the results of previous studies[6]. One third of the study population was dentate. This proportion is also in agreement with studies performed in the 1980's and 1990's[10,33,45,46].

This study was undertaken to evaluate the effects of implementing an oral hygiene protocol (intervention) in nursing homes on residents' dental and denture plaque levels, and to explore additional determinants that may influence oral hygiene. The null-hypothesis of no improvement can be partly rejected, since the results showing a positive short-term effect of the intervention on denture plaque, and a positive long-term effect on dental plaque. The reductions in dental plaque levels were comparable to those reported in a 6-month intervention study in the UK[17] and confirmed the findings of previous studies demonstrating short-term benefits[38,39].

In the mixed model, important confounding factors were found relating to both the intervention (explanatory variable) and oral hygiene levels (outcome). These factors could impair positive long-term effects of the intervention and may explain why in the present study the influence of the intervention could not be confirmed in an adjusted mixed model resulting in a non-rejecting the null hypothesis.

Capacity of the nursing home and the presence of toothpaste were correlated to denture plaque levels, while the degree of residents' dependency and the presence of mouth rinse were related to dental plaque levels. These findings are not yet reported in previous studies.

The relationship between the resident's degree of dependency and dental plaque levels can only partly be explained. As long as the resident is able to adequately clean his or her own natural dentition, the problem of oral hygiene seems minimal. But as soon as the resident becomes more vulnerable and care-dependent, oral hygiene of natural dentition fails rapidly and has to be taken over by the care givers. The actual final dental plaque levels (>1.5) and

denture plaque levels (>2) still reflect the large proportion of frail elderly people who are unable to brush their teeth or dentures adequately and who do not receive assistance. Yet, caregivers are generally able to clean residents' dentures but do not have sufficient knowledge, skills and experience to adequately clean residents' natural dentition as anecdotally mentioned during feedback moments in the intervention homes. Why most nurses, nursing assistants and nurse' aides didn't succeed to carry out dental hygiene in residents, in particular in moderate to highly dependent elderly, needs to be further explored using a qualitative approach. This kind of qualitative data was gained more in depth by means of focus groups and face to face interviews and will be subject of separate publications..

The positive correlation between denture cleanliness and the presence of toothpaste seems logical. In all nursing homes toothpaste was used to brush dentures despite the fact that it was recommended to use liquid soap. The association of denture cleanliness and nursing home capacity remains rather difficult to explain.

The major strengths of the present study are the randomised and longitudinal design. This study, documenting oral hygiene levels among institutionalised elderly in a 5-year longitudinal study design, confirms and extends the findings of previous research[17,35-39], revealing the reality of the problem: ensuring the continuation of good practice. Two studies[17,35] reported improvements after less than 2 years. The present study showed that it is very difficult to hold this results after 5 years. Therefore implementation strategies should pay attention to this phenomenon of permanence. A further strength of the study was that the oral hygiene protocol was implemented in a real life nursing home situation, nevertheless it remains very difficult to control for all confounding factors. Even the randomisation did not allow complete control of confounders. Firstly, high staff turnover meant that caregivers moved between wards and institutions, and therefore provided care to residents in different study groups. Secondly, it was not possible to control the level of compliance to the protocol within intervention nursing homes. A third factor influencing the results is a novelty and/or Hawthorne effect where the new care protocol results in an initial benefit which fades out over time. On the other hand, within the Hawthorne effect both intervention and control groups benefit directly or indirectly by the study participation. The influence of these putative confounding factors will be explored further in qualitative studies.

It is important to notice that, after the analysis of the quantitative date of the present study, there are a lot of unresolved uncertainties. The actual rather small effect of the intervention all the more draws the attention to those uncertainties and to the multi factorial aspect of the outcome "oral hygiene" in this particular target group. Unknown factors related to the characteristics of a nursing home may have an important impact on the final outcome. This initiated the start of further research using a qualitative design aiming to explore enabling factors and barriers during the implementation of an oral hygiene protocol in nursing homes.

CONCLUSION

In conclusion, the null-hypothesis of no improvement could not be rejected. The implementation of an oral hygiene protocol in nursing homes resulted in less dental and denture plaque, but the obtained plaque levels were statistically and clinically insignificant. A lot of uncertainties remained on the impact of characteristics of individual nursing homes and are important to be explored in further qualitative research.

ACKNOWLEDGMENTS

Data collection was supported by Gaba International.

REFERENCES

1 Heeren, J. and Thewys, T. Seniorenvoorzieningen voor en na 2000, Diegem, Kluwer Editorial, 1999.
2 Kandelman D, Petersen PE, Ueda H. Oral health, general health, and quality of life in older people. Spec Care Dentist 2008;28:224-236.
3 Holm-Pedersen P, Vigild M, Nitschke I, Berkey DB. Dental care for aging populations in Denmark, Sweden, Norway, United kingdom, and Germany. J Dent Educ 2005;69:987-997.
4 Tramini P, Montal S, Valcarcel J. Tooth loss and associated factors in long-term institutionalised elderly patients. Gerodontology 2007;24:196-203.
5 Padilha DM, Hugo FN, Hilgert JB, Dal Moro RG. Hand function and oral hygiene in older institutionalized Brazilians. J Am Geriatr Soc 2007;55:1333-1338.
6 De Visschere LM, Grooten L, Theuniers G, Vanobbergen JN. Oral hygiene of elderly people in long-term care institutions--a cross-sectional study. Gerodontology 2006; 23:195-204.
7 Lester V, Ashley FP, Gibbons DE. The relationship between socio-dental indices of handicap, felt need for dental treatment and dental state in a group of frail and functionally dependent older adults. Community Dent Oral Epidemiol 1998;26:155-159.
8 Mattsson U, Heyden G, Landahl S. Comparison of oral and general health development among institutionalized elderly people. Community Dent Oral Epidemiol 1990;18:219-222.
9 Berkey DB, Berg RG, Ettinger RL, Meskin LH. Research review of oral health status and service use among institutionalized older adults in the United States and Canada. Spec Care Dentist 1991;11:131-136.
10 Hardy DL, Darby ML, Leinbach RM, Welliver MR. Self-report of oral health services provided by nurses'aides in nursing homes. J Dent Hyg 1995;69:75-82.
11 Wardh I, Andersson L, Sorensen S. Staff attitudes to oral health care. A comparative study of registered nurses, nursing assistants and home care aides. Gerodontology 1997;14:28-32.
12 Wardh I, Berggren U, Andersson L, Sorensen S. Assessments of oral health care in dependent older persons in nursing facilities. Acta Odontol Scand 2002;60:330-336.
13 Adams R. Qualified nurses lack adequate knowledge related to oral health, resulting in inadequate oral care of patients on medical wards. J Adv Nurs 1996;24:552-560.
14 Holmes S. Promoting oral health in institutionalised older adults: a nursing perspective. J R Soc Health 1998;118:167-172.
15 MacEntee MI, Thorne S, Kazanjian A. Conflicting priorities: oral health in long-term care. Spec Care Dentist 1999;19:164-172.
16 Sumi Y, Nakamura Y, Nagaosa S, Michiwaki Y, Nagaya M. Attitudes to oral care among caregivers in Japanese nursing homes. Gerodontology 2001;18:2-6.
17 Frenkel H, Harvey I, Needs K. Oral health care education and its effect on caregivers' knowledge and attitudes: a randomised controlled trial. Community Dent Oral Epidemiol 2002;30:91-100.
18 Chalmers J, Pearson A. Oral hygiene care for residents with dementia: a literature review. J Adv Nurs 2005;52:410-419.
19 Vanobbergen JN, De Visschere LM. Factors contributing to the variation in oral hygiene practices and facilities in long-term care institutions for the elderly. Community Dent Health 2005;22:260-265.
20 Wardh I, Hallberg LR, Berggren U, Andersson L, Sorensen S. Oral health education for nursing personnel; experiences among specially trained oral care aides: one-year follow-up interviews with oral care aides at a nursing facility. Scand J Caring Sci 2003;17:250-256.
21 McKelvey VA, Thomson WM, Ayers KM. A qualitative study of oral health knowledge and attitudes among staff caring for older people in Dunedin long-term care facilities. N Z Dent J 2003;99:98-103.
22 Reed R, Broder HL, Jenkins G, Spivack E, Janal MN. Oral health promotion among older persons and their care providers in a nursing home facility. Gerodontology 2006;23:73-78.
23 Brady M, Furlanetto D, Hunter RV, Lewis S, Milne V. Staff-led interventions for improving oral hygiene in patients following stroke. Cochrane Database Syst Rev 2006;CD003864.
24 Paley GA, Slack-Smith LM, O'Grady MJ. Aged care staff perspectives on oral care for residents: Western Australia. Gerodontology 2004;21:146-154.
25 de Baat C, Bruins H, van Rossum G, Kalk W. Oral health care for nursing home residents in The Netherlands--a national survey. Community Dent Oral Epidemiol 1993;21:240-242.
26 Ettinger RL. Oral care for the homebound and institutionalized. Clin Geriatr Med 1992;8:659-672.
27 Johnson TE, Lange BM. Preferences for an influences on oral health prevention: perceptions of directors of nursing. Spec Care Dentist 1999;19:173-180.
28 Berkey DB. Dr. Steven Gordon, DDS, Memorial Lecture. Current state of oral health care in institutionalized older adults. Spec Care Dentist 1996;16:143-146.

29 Hoad-Reddick G. A study to determine oral health needs of institutionalised elderly patients by non dental health care workers. Community Dent Oral Epidemiol 1991;19:233-236.
30 Kambhu PP, Levy SM. Oral hygiene care levels in Iowa intermediate care facilities. Spec Care Dentist 1993;13:209-214.
31 Logan HL, Ettinger R, McLeran H, Casko R. Common misconceptions about oral health in the older adult: nursing practices. Spec Care Dentist 1991;11:243-247.
32 Strayer M, Henry R. Developing practice guidelines for institutionalized older dental patients. Spec Care Dentist 1996;16:165-169.
33 Knabe C, Kram P. Dental care for institutionalized geriatric patients in Germany. J Oral Rehabil 1997;24:909-912.
34 Samson H, Strand GV, Haugejorden O. Change in oral health status among the institutionalized Norwegian elderly over a period of 16 years. Acta Odontol Scand 2008;66:368-373.
35 Budtz-Jorgensen E, Mojon P, Rentsch A, Deslauriers N. Effects of an oral health program on the occurrence of oral candidosis in a long-term care facility. Community Dent Oral Epidemiol 2000; 28(2):141-149.
36 Nicol R, Petrina SM, McHugh S, Bagg J. Effectiveness of health care worker training on the oral health of elderly residents of nursing homes. Community Dent Oral Epidemiol 2005;33:115-124.
37 Parks SM, Haines C, Foreman D, McKinstry E, Maxwell TL. Evaluation of an educational program for long-term care nursing assistants. J Am Med Dir Assoc 2005;6:61-65.
38 MacEntee MI, Wyatt CC, Beattie BL, Paterson B, Levy-Milne R, McCandless L et al. Provision of mouth-care in long-term care facilities: an educational trial. Community Dent Oral Epidemiol 2007; 35(1):25-34.
39 Simons D, Baker P, Jones B, Kidd EA, Beighton D. An evaluation of an oral health training programme for carers of the elderly in residential homes. Br Dent J 2000; 188(4):206-210.
40 Shelkey M, and Wallace M. Katz Index of Independence in Activities of Daily Living (ADL). Best Practices in Nursing Care to Older Adults 1998; 2: www.hartfordign.org/publications/trythis/issue02.pdf
41 Augsburger RH, Elahi JM. Evaluation of seven proprietary denture cleansers. J Prosthet Dent 1982;47:356-359.
42 Silness J, Loe H. Periodontal Disease in Pregnancy. II. Correlation Between Oral Hygiene and Periodoantal Condition. Acta Odontol Scand 1964;22:121-135.
43 Coalition for Evidence Based Policy. http://evidencebasedprograms.org/wordpress/?page_id=19
44 Sjogren P, Nilsson E, Forsell M, Johansson O, Hoogstraate J. A systematic review of the preventive effect of oral hygiene on pneumonia and respiratory tract infection in elderly people in hospitals and nursing homes: effect estimates and methodological quality of randomized controlled trials. J Am Geriatr Soc 2008;56:2124-2130.
45 MacEntee MI, Weiss R, Waxler-Morrison NE, Morrison BJ. Factors influencing oral health in long term care facilities. Community Dent Oral Epidemiol 1987;15:314-316.
46 Jokstad A, Ambjornsen E, Eide KE. Oral health in institutionalized elderly people in 1993 compared with in 1980. Acta Odontol Scand 1996;54:303-308.

Table 1. Demographics and dental status of different study groups

Residents *(N=1393)*	***Control residents Control NH*****	***Control residents Intervention NH***	***Intervention residents Intervention NH Median***
No. of subjects	671	511	211
Mean age (SD)	86.0 (7.36)	83.18 (8.63)	84.93 (6.97)
Female [%]	77.6	74.4	73.9
Dentate [%]	32.1	31.5	32.2
Dependency O* [%]	29.8	25.7	27.5
Dependency A* [%]	21.8	20.8	26.1
Dependency B* [%]	19.4	24.6	23.2
Dependency C* [%]	29.1	28.9	23.2

* O: physically independent, not demented; A: physically dependent for bathing and/or dressing, mentally independent but disoriented in time and space; B: physically dependent for bathing, dressing, transferring and/or toileting, mentally dependent, disoriented in time and space and dependent for bathing and/or dressing; C: physically dependent for bathing, dressing, transferring and/or toileting and /or feeding and incontinent, mentally dependent, disoriented in time and space and dependent for bathing and/or dressing, transferring, and/or toileting and/or feeding and incontinent

** Nursing homes

Table 2. Plaque levels and differences between study groups and study years

Study groups	***Control residents control homes (CrCh)***	***Control residents intervention homes (CrIh)***	***Intervention residents intervention homes (IrIh)***	***p value***
Denture plaque levels				
Baseline				
N	129	124		0.35
Mean (SD)	2.16[a] (0.91)	2.06[b,c] (0.85)		
95% CI	2.006 -2.322	1.909 – 2.211		
2 year follow up				
N	89	93	32	0.16
Mean (SD)	1.90[a] (0.95)	1.78[b] (0.78)	1.57[c] (0.74)	
95% CI	1.699 – 2.098	1.615 – 1.936	1.304 – 1.835	
5 year follow up				
N	56	26	66	0.26
Mean (SD)	2.33 (1.02)	2.4 (1.04)	2.05 (0.97)	
95% CI	2.053 – 2.598	1.622 – 2.459	1.807 – 2.286	
P value*	**< 0.001**	0.10	**0.02**	
Dental plaque levels				
Baseline				
N	44	46		0.16
Mean (SD)	1.97[d] (0.79)	2.21[e] (0.81)		
95% CI	1.729 – 2.210	1.971 – 2.451		
2 year follow up				
N	38	40	13	0.81
Mean (SD)	2.4 (0.92	2.14 (0.80)	1.97 (0.92)	
95% CI	1.759 – 2.366	1.886 – 2.399	1.412 – 2.528	
5 year follow up				
N	27	15	28	0.16
Mean (SD)	1.58[d] (0.75)	2.05 (0.87)	1.68[e] (0.74)	
95% CI	1.629 – 1.878	1.571 – 2.540	1.398 – 1.975	
P value**	0.20[d]	0.95	**0.03[e]**	

* significant differences were only found between baseline and 2 year follow up; [a] p=0.04;[b] p=0.01;[c] p<0.001

** significant differences were only found between baseline and 5 year follow up;[d] p=0.04;[e] p=0.01

Table 3. Mixed model analysis with denture plaque level as a dependent variable

Independent variables	***Estimate***	***SE***	***95% CI***	***p-value***
Age	-0,001	0.004	-0.01 – 0.01	0.77
Gender				
(Ref.) Female				
Male	-0,037	0.071	-0.18 – 0.10	0.61
Degree of dependency				
(Ref.) Dependency C				
Dependency B	0.070	0.087	-0.10 – 0.24	0.42
Dependency A	0.044	0.089	-0.13 – 0.22	0.62
Dependency O	-0.135	0.084	-.030 – 0.03	0.11
Management of the nursing homes				
(Ref.) Private non-profit				
Social service	-0.006	0.195	-.047 – 0.46	0.98
Commercial	-0.273	0.343	-1.08 – 0.53	0.45
Capacity of the nursing homes				
(Ref.) > 100				
≥50 ≤ 100 residents	0.397	0.152	0.08 – 0.71	**0.02**
<50 residents	0.398	0.232	-0.14 – 0.93	0.125
Study group				
(Ref.) Intervention residents intervention homes				
Control residents intervention homes	0.083	0.102	-0.12 – 0.28	0.42
Control residents control homes	0.132	0.191	-0.30 – 0.56	0.51
Study years				
(Ref.) Baseline				
1 year	0.054	0.144	-0.23 – 0.34	0.71
2 years	-0.083	0.150	-0.38 – 0.21	0.58
3 years	-0.015	0.158	-0.32 – 0.29	0.92
5 years	0.263	0.161	-0.05 – 0.58	0.10
Presence of oral health materials and products in residents' bathroom				
(Ref.) Material or product present				
Toothbrush not present	0.076	0.104	-0.13 – 0.28	0.46
Denture brush not present	0.069	0.084	-0.09 – 0.23	0.41
Mouth rinse not present	-0.166	0.101	-0.36 – 0.03	0.10
Toothpaste not present	0.214	0.079	0.06 – 0.37	**0.01**
Cleaning tablets not present	0.013	0.062	-0.11 – 0.14	0.83
Intercept	1.824	0.475	0.89 – 2.76	0.00

Table 4: Mixed model analysis with dental plaque level as a dependent variable

Independent variables	***Estimate***	***SE***	***95% CI***	***p-value***
Age	0.004	0.005	-0.01 – 0.01	0.42
Gender				
(Ref.) Female				
Male	0.196	0.100	-0.18 – 0.22	0.84
Degree of dependency				
(Ref.) Dependency C				
Dependency B	-0.050	0.121	-0.29 – 0.19	0.68
Dependency A	-0.459	0.127	-0.71 – -0.21	**<0.001**
Dependency O	-0.337	0.119	-0.57 – -0.10	**0.01**
Management of the nursing homes				
(Ref.) Private non-profit				
Social service	0.085	0.165	-0.33 – 0.49	0.63
Commercial	-0.162	0.295	-0.85 – 0.53	0.60
Capacity of the nursing homes				
(Ref.) > 100				
≥50 ≤ 100 residents	0.151	0.207	-0.37 – 0.30	0.49
<50 residents	-0.035	0.148	-0.33 – 0. 63	0.82
Study group				
(Ref.) Intervention residents intervention homes				
Control residents intervention homes	0.103	0.141	-0.18 – 0.38	0.47
Control residents control homes	-0.123	0.177	-0.51 – 0.27	0.50
Study years				
(Ref.) Baseline				
1 year	0.042	0.204	-0.36 – 0.44	0.84
2 years	0.120	0.211	-0.29 – 0.53	0.57
3 years	0.038	0.224	-0.40 – 0.48	0.87
5 years	-0.288	0.223	-0.73 – 0.15	0.20
Presence of oral health materials and products in residents' bathroom				
(Ref.) Material or product present				
Toothbrush not present	0.195	0.197	-0.19 – 0.58	0.32
Denture brush not present	0.310	0.165	-0.01 – 0.64	0.06
Mouth rinse not present	-0.406	0.146	-0.69 – 0.12	**0.01**
Toothpaste not present	0.205	0.170	-0.13 – 0. 54	0.23
Cleaning tablets not present	0.010	0.105	-0.20 – 0. 22	0.93
Intercept	1.874	0.543	0.80 – 2.94	0.00

CHAPTER 7

AN ORAL HEALTH CARE GUIDELINE FOR INSTITUTIONALISED OLDER PEOPLE

This chapter has been published as:
An oral health care guideline for institutionalised older people

Luc M.J. De Visschere, Gert-Jan van der Putten, Jacques N.O. Vanobbergen, Jos M.G.A. Schols and Cees de Baat
Gerodontology 2010; in press

An extensive Dutch version of this chapter has been published as:
The guideline oral health care for dependent residents in long term care facilities, 2007: dire necessity.

G.J. van der Putten, L. De Visschere, J. Vanobbergen, J.M.G.A. Schols, C.,de Baat.
M.G.A. Schols and Cees de Baat
Tijdschr Gerontol en Geriatr 2008; 39: 202-207

INTRODUCTION

There is no doubt that good oral health influences general health status with positive effects on quality of life, also in older people[1-3]. As a result of better oral health self-care of the younger generations and increasing quality of professional oral health care during the last decades, the number of older people with natural teeth has increased. This ongoing trend has implications for professional oral health care. In addition, the mean number of teeth present has increased together with the complexity of the dentition, whether or not combined with fixed or removable dentures[4]. Particularly institutionalized older people are prone to oral health problems and their negative impact due to frailty, disabilities, multi-morbidity, and multiple medication use. Recent surveys in several countries have demonstrated that the oral health status of institutionalized older people is poor[5-8]. Until recently, no evidence-based oral health care guideline for institutionalized older people has been available (www.agree-collaboration.org/instrument). For that reason, the Dutch Association of Nursing Home Physicians developed the Oral health care Guideline for Older people in Long-term care Institutions (OGOLI), meeting the requirements of the AGREE instrument for assessing a guideline's quality (www.agreecollaboration.org/instrument). The OGOLI aims to improve the oral health status of institutionalized older people. The recommendations included are supported by scientific evidence where available or otherwise based on experts' experiences. A compact excerpt of the OGOLI has been produced to facilitate the nursing staff who are expected to implement the OGOLI integrally in their daily nursing activities. In this article, the keynotes and the content of the OGOLI are presented and discussed.

KEYNOTE 1: INTEGRATED ORAL HEALTH CARE

According to the OGOLI, every long-term care institution for older people in The Netherlands should have an institutional oral health care protocol. Oral health care should be integrated tailor-made in the individual nursing care of every resident. In the cyclically organized institutional health care process, the outcome of the oral health care protocol should be evaluated continuously and adjusted when indicated. On admission of a new resident, an elderly care physician of the institution should describe his/her oral health status and should refer him/her to the institution's dentist for further assessment and treatment. The elderly care physician should be very alert to oral health problems which could be related

to general health and vice versa. In the guideline, a concise oral health inventory form for elderly care physicians is provided. One nurse of each ward should be educated specifically on oral health and oral health care, the so-called ward oral health care organizer (WOO). The WOO (1) has to monitor the adherence of the nursing staff to the OGOLI, (2) has to monitor the compliance of the residents' individual oral health care programmes, (3) must act as an oral health care counsellor for the ward's nursing staff, (4) should provide oral health care workshops to the ward's nursing staff, and (5) must act as intermediary between nursing staff, dentist, dental hygienist, and elderly care physician(s).

KEYNOTE 2: CONTINUOUS EDUCATION OF NURSING STAFF

It has been demonstrated that theoretical and practical oral health education of nursing staff improves the residents' oral health[9]. However, a single educational session or workshop is not sufficient to establish a long-term result. After some time, the education effect is diminishing and the residents' oral health declines[10]. The OGOLI recommends to educate WOO's and other nursing staff at least every 18 months, but preferably annualy. The education should be provided by a dentist or a dental hygienist who is practising in the institution.

KEYNOTE 3: CONTINUOUS MONITORING THE GUIDELINE IMPLEMENTATION

Monitoring the adherence to the institutional oral health care protocol and the compliance of each resident's oral health care programme is a crucial factor when implementing the OGOLI. Structure, process, and effect indicators should be used in a recurring process for monitoring the implementation of the OGOLI within the institutional health care process. Structure indicators demonstrate whether oral health care is well integrated into the institutional health care process. Process indicators are related to the residents' individual oral health care programmes. Effect indicators provide information on the outcome of the oral health care protocol, for example the amount of residents' oral plaque.

CONTENT OF THE GUIDELINE

Table 1 shows the guideline recommendations for the nursing staff. The OGOLI adresses the fact that older people in long-term care institutions are at risk of oral health problems, due to reduced self care, dependency, (co-)morbidity and the usually high number of medications

used. These residents experience more oral health problems, particularly when they become more and more dependent interms of daily living activities. Many dependent older people do not or are not able to request assistance for their normal daily care activities, especially not for oral health care. Furthermore, the OGOLI highlights that non-verbal signs, such as behaviour alterations, decreasing appetite, and loss of weight may be related to oral health problems. The OGOLI also briefly discusses some ethical considerations in case a resident refuses to undergo the (necessary) oral health care. Finally, the OGOLI pays special attention to oral health care needed by residents in a vegetative state and residents in need of palliative nursing care.

The OGOLI meets the requirements of the AGREE instrument which offers a systematic framework to judge the most important aspects of the quality of a guideline, such as the development process and the reporting. However, this instrument does not offer specific criteria for evaluating the clinical content of a guideline and it's supporting scientific evidence. It is remarkable and disappointing that none of the recommendations mentioned in the OGOLI could be based on an evidence level A1 conclusion (Table 2). Four recommendations (education, pneumonia, use of an electric toothbrush, and fluoride rinsing in case of a sudden increase of oral plaque amount) are based on evidence level A2 conclusions. The remaining recommendations are based on expert opinions. This emphasizes the need for research on oral health of institutionalized older people.

DISCUSSION

The OGOLI meets the requirements of the AGREE instrument which offers a systematic framework to judge the most important aspects of the quality of a guideline, such as the development process and the reporting. However, this instrument does not offer specific criteria for evaluating the clinical content of a guideline and it's supporting scientific evidence. It is remarkable and disappointing that none of the recommendations mentioned in the OGOLI could be based on an evidence level A1 conclusion (Table 2). Four recommendations (education, pneumonia, use of an electric toothbrush, and fluoride rinsing in case of a sudden increase of oral plaque amount) are based on evidence level A2 conclusions. The remaining recommendations are based on expert opinions. This emphasizes the need for research on oral health of institutionalized older people.

REFERENCES

1 Lee IC, Shieh TY, Yang YH, Tsai CC, Wang KH. Individuals´ perception of oral health and its impact in the health-related quality of life. J Oral Rehabil 2007; 34: 79-87.

2 Locker D, Matear D, Stephens M, Jokovic A. Oral health-related quality of life of a population of medically compromised elderly people. Community Dent Health 2002; 19: 90-97.

3 Mariño R, Schofield M, Wright C, Calache H, Minichiello V. Self-reported and clinically determined oral health status predictors for quality of life in dentate older migrant adults. Community Dent Oral Epidemiol 2008; 36: 85-94.

4 Kleinman ER, Harper PR, Gallagher JE. Trends in NHS primary dental care for older people in England: implications for the future. Gerodontology 2009; 26: 193-201.

5 Šimunković SK, Boras VV, Pandurić J, Žilić IA. Oral health among institutionalised elderly in Zagreb, Croatia. Gerodontology 2005; 22: 238-241.

6 De Visschere LM, Grooten L, Theuniers G, Vanobbergen JN. Oral hygiene of elderly people in long-term care institutions – a cross-sectional study. Gerodontology 2006; 23: 195-204.

7 Montal S, Tramini P, Triay J-A, Valcarcel J. Oral hygiene and the need for treatment of the dependent institutionalised elderly. Gerodontology 2006; 23: 67-72.

8 Isaksson R, Söderfeldt B. Oral status and treatment needs among elderly within municipal long-term care 2002-2004. Swed Dent J 2007; 31: 45-52.

9 Nicol R, Sweeney MP, McHugh S, Bagg J. Effectiveness of health care worker training on the oral health of elderly residents of nursing homes. Community Dent Oral Epidemiol 2005; 33: 115-124.

10 De Visschere L, De Baat C, Schols JMGA, Deschepper E, Vanobbergen J,. Evaluation of the implementation of an 'oral hygiene protocol' in nursing homes: a 5-year longitudinal study. Community Dent Oral Epidemiol. Sept. 2010 accepted.

Table 1. Recommendations of the OGOLI for the nursing staff

Nr.	*Recommendation*
1	Provide oral health care systematically to improve the residents' quality of life.
2	In dentate, but especially in removable denture wearing residents, try to prevent *Candida* colonisation of the oral mucosa and the dentures or treat the infection by systematic oral health care.
3	Provide oral health care at least once a day to minimize the risk of remote infections, such as pneumonia.
4	Using an electric toothbrush, may contribute to good oral health care substantially.
5	Clean a removable partial or complete denture when the resident goes to sleep and store it dry at night.
6	Arrange at least every 6 months a professional oral examination for dentate residents.
7	Arrange at least annually a professional oral examination for residents having no natural teeth and for removable denture wearing residents.
8	In case a resident shows or seems to show (non-verbal) signs of oral pain, try to examine his/her mouth and/or dentures and consult a dentist or a dental hygienist or an elderly care physician when indicated or questionable. Non-verbal manifestations of oral pain may be altered behaviour, decreased appetite, and weight loss.
9	In case a resident has bad breath frequently, consult a dentist or a dental hygienist or an elderly care physician.
10	In case a resident complains about oral dryness, consult a dentist or a dental hygienist or an elderly care physician.
11	Assess the possible oral side effects of prescribed drugs.
12	In case a resident complains about or shows (non-)denture-related oral soft tissue lesions, consult a dentist or a dental hygienist or an elderly care physician.
13	In case a resident shows a sudden caries increment, consult a dentist and request the dentist to prescribe a 0.025-0.01% fluoride rinse daily or a 0.1% fluoride rinse weekly.
14	In case of any suspect tooth lesion noticed during the provision of oral health care, consult a dentist or a dental hygienist or an elderly care physician.
15	In case daily oral health care in a dentate resident is impossible due to physical and/or behavioural problems, apply 1% chlorhexidine gel once daily or 0.5% chlorhexidine gel twice daily for prevention of periodontal disease. The chlorhexidine should be prescribed by a dentist or a dental hygienist or an elderly care physician.
16	When provision of oral health care daily is not possible (anymore), use a 0.12% chlorhexidine rinse or spray for daily use. In case rinsing or spraying is not possible (anymore), apply 1% chlorhexidine (gel), using, for example, drenched gauzes. The chlorhexidine should be prescribed by a dentist or a dental hygienist or an elderly care physician.

Table 2. Levels of scientific evidence used in the OGOLI

Level	*Study*
A1	Meta-analysis or systematic review of at least 2 independent, consistent studies of level A2
A2	Good quality, randomized double-blind controlled trial
B	Randomized double-blind controlled trial of less quality or other comparative study, such as cohort or case-control study
C	Non-comparative study
D	Expert opinion

CHAPTER 8

EFFECT EVALUATION OF A SUPERVISED VERSUS NON-SUPERVISED IMPLEMENTATION OF AN ORAL HEALTH CARE GUIDELINE IN BELGIAN NURSING HOMES: A CLUSTER RANDOMISED CONTROLLED CLINICAL TRIAL

The methodology described in this chapter has been published as:
Supervised versus non-supervised implementation of an oral health care guideline in (residential) care homes: a cluster randomised controlled clinical trial

Gert-Jan van der Putten, Luc De Visschere, Jos Schols, Cees de Baat and Jacques Vanobbergen
BMC Oral Health 2010, 10:17. www.biomedcentral.com/1472-6831/10/17

This chapter has been accepted for publication as:
Effect evaluation of a supervised versus non-supervised implementation of an oral health care guideline in nursing homes: a cluster randomised controlled clinical trial

Luc De Visschere, Jos Schols, Gert-Jan van der Putten, Cees de Baat and Jacques Vanobbergen
Gerodontology 2010; in press

ABSTRACT

Objective: The aim was to compare a supervised versus a non-supervised implementation of an oral health care guideline in Flanders (Belgium).

Background: The key factor in realising good oral health is daily oral hygiene care. In 2007, the Dutch guideline "Oral health care in care homes for elderly people" was developed to improve oral health of institutionalised elderly.

Material and Methods: A random sample of 12 nursing homes were randomly allocated to the intervention or the control group. Representative samples of 30 residents in each home were monitored during a 6-month study period. The intervention included a supervised implementation of the guideline.

Results: At the 6-month follow-up, only a small but statistically significant (p=0.002) beneficial effect (0.32) of the intervention was observed for denture plaque after adjustment for baseline value and the random effect of the institution. In the linear mixed regression models, including a random institution effect difference in denture plaque level was no longer statistically significant at the 5% level.

Conclusion: Only denture hygiene has been improved by the supervised implementation although with lower benefits than presumed. Factors on institutional level, difficult to assess quantitatively, may play an important role in the final result.

INTRODUCTION

The international literature shows an increasing proportion of older people. This demographic shift has important implications for (oral) health care services. More (frail) older people will present more morbidity and care dependency and, consequently, will need an increasing proportion of health care services[1]. Those older people, not able to function independently, are often supported by domiciliary care service or admitted to (residential) care homes[2,3].

Advances in oral health care and treatment during the last decades have resulted in a reduced number of edentulous individuals whether or not with extensive dental restorations, oral implants, and sophisticated tooth- and implant-supported restorations and prostheses. Hence, they are in need of both preventive and curative oral health care continuously. A cumulative effect of risk factors, weakened resistance, co-morbidity and medication use make them more vulnerable to oral problems than younger age groups, especially when they are cognitively impaired[4,5].

Weakened oral health due to neglect of self care, professional care and reduced oral health care utilization is already present when (cognitively impaired) older people are still community-dwelling[5-8]. At the moment of (residential) nursing home admittance, many older people in countries all over the world are in need of oral health care urgently. If residents' needs are not met, their oral health will be persistently poor and will utmost probably further deteriorate during their residency because of increasing care dependency and subsequent lack of adequate oral health care[9-14].

The key factor in realizing and maintaining good oral health is daily oral hygiene care by removing the oral bacterial plaque on teeth and dentures[15,16]. Numerous studies revealed inadequate oral hygiene levels in residents in long-term care institutions[17-23]. Many residents are not able to maintain their oral hygiene themselves being dependent on nurses and care givers[24,25]. Many quantitative and qualitative studies in long-term care facilities have reported low prioritisation, lack of oral health care awareness, lack of knowledge and skills on oral health, shortness of oral health care training and education, and repeated non-cooperativeness of residents as important inhibiting factors[26-32].

The last several years a lot of efforts were done by stakeholders involved in intramural

care to overcome these barriers in order to improve oral health care. Although, there is still a need for guidelines, effective protocols and uniform verifiable system that assures quality of oral health care performed[33-35]. A first attempt in Flanders-Belgium to develop and implement an oral health care protocol in nursing homes was made in 2003. The effect on oral hygiene was measured in a 5-year longitudinal observational study. An inconsistent and rather temporary effect was observed[36]. In 2007, the Dutch guideline "*Oral health care in (residential) care homes for elderly people*" was developed and presented to all (residential) nursing homes for older people in The Netherlands and a part of Flanders, Belgium. The Dutch guideline is satisfying the Appraisal of Guidelines Research & Evaluation Instrument (AGREE). It describes all aspects of good oral health and oral health care, presents the methods and skills needed for providing oral health care to residents, and effective oral health and oral hygiene assessment tools. The ultimate objective of the guideline is to improve the oral health of the residents[37].

A clinical study was designed to assess the clinical impact of the implementation of the Dutch guideline for improving the oral health of older people receiving care in nursing homes. The aim of the present study was to compare a supervised versus a non-supervised implementation of the Dutch guideline and to improve understanding of individual and institutional factors that affect residents' oral hygiene levels.

MATERIAL AND METHODS

Study design and sample

The study is a single-masked cluster randomized intervention trial with an institution as the unit of randomization. With regard to the design effect and drop-outs, loss to follow up, and some uncertainties in the power calculation[38], a sample size of 360 residents and 12 clusters was considered an achievable number for the 6-months study period (Figure 1). Each component of this uncertainty is represented by an estimated standard deviation of the outcome variables. Based on previous studies, a standard deviation (SD) for dental plaque and denture plaque of 0.75 and 0.88 respectively was used. Since estimates for tongue plaque are lacking in the international literature, standard deviation for tongue plaque could not be assessed. A 25% improvement of oral hygiene level was the presumed effect of the intervention.

A random sample of 12 nursing homes in Flanders (Belgium) accommodating each 120-180 somatic as well as psycho-geriatric residents were randomly allocated to an intervention or control group. This sample was obtained using stratified (geographical distribution) cluster sampling with replacement. A nursing home was considered eligible for inclusion unless any of the following exclusion criteria were applicable: no written informed consent to participate, mainly wards accommodating less than 20 residents, only somatic or psycho-geriatric wards, an oral health care guideline or protocol had already been introduced and implemented, nurses and nurse aides had received special training on oral health care during the last 24 months, and more than 5 other major care innovation projects had been implemented during the last 24 months.

A representative cohort of 30 residents of the institution was included to be monitored during a 6-months period. A stratified random sample based on residents' degree of dependency strategy[22] (O, A, B, C and Cd) was used to select the residents to be examined. For each stratum several residents belonging to the same stratum were selected and a replacement strategy was used to replace residents who refused or were unable to participate for different reasons. Inclusion criteria were a written informed consent undersigned by the resident or his legal representative, having a natural dentition and/or partial or complete dentures, physically and cognitively suitable for examination, residing in the nursing home during the entire 6-months period. Residents were excluded when in day-care, in short-term residency, in coma, in palliative care or terminally ill, expressing verbal or physical resistance not allowing the oral examination.

Intervention

The intervention consisted of supervised implementation of the guideline and the daily oral health care protocol derived from the guideline. In each institution of the intervention group an institution project supervisor was appointed. This could be the managing director him/herself or another staff member or registered nurse with managerial capacities. An oral health care team was installed consisting of an institution project supervisor, at least 2 oral health care organizers (nurses or nurse aides) per ward (WOO), a physician, and optionally an occupational or speech therapist. The supervision of the implementation of the guideline was conducted by an investigator (first author) supported by

a dental hygienist and included:

- A 1.5-hour informative oral presentation on the guideline, the daily oral health care protocol, and the supervised implementation project before the start of the study. This presentation was introduced by the investigator and addressed the managing director, the institution project supervisor and the ward heads. Important objective of the informative oral presentation was to lay a strong institutional foundation of the implementation project and the study.
- A 2-hour lecture and 1-hour of practical education for all members of the oral health care team. This education, presented by the investigator and the dental hygienist regarded the theoretical and practical essentials of the guideline. The participants were practically educated in skills facilitating them to practically educate and encourage the nurses and nurse aides of theirs wards (train the trainer concept).
- A 1.5-hour theoretical and executive education session at each ward, to be presented by the WOO, for all ward nurses and care aides. This education session was scheduled after the baseline data collection. A summary of the guideline was presented and all executive actions, such as tooth brushing, were taught and demonstrated with ward residents on site. The WOO had the additional task to encourage and assist the nurses and care aides regularly in the daily delivery of oral health care.
- Providing free of charge oral health care materials and products for each resident.
- Monitoring visits by the investigator every 6 weeks, meeting the institution project supervisor and WOO's in order to follow up the implementation process and study problems.

Data collection

Research data were gathered at baseline and at 6 months after the start of the study in the nursing homes of both the intervention and the control group.

Primary outcome variable was the oral hygiene level of the participating residents. An oral examination of the random sample of 30 residents was carried out by a team of trained external examiners. Prior to the study, they participated in a training session and were calibrated on the examination criteria. The examiners were masked, they did not know whether a nursing home was allocated to the intervention or the control group.

The oral hygiene level of natural teeth was assessed using the validated plaque index described by Silness and Löe (score range 0-3) at a subset of the so-called 'Ramfjörd teeth'[39]. In absence of one of these teeth, the corresponding distal neighbour tooth was assessed. The oral hygiene level of dentures was assessed using a Methylene Blue® denture plaque disclosing solution according to the method of Augsburger and Elahi (score range 0-4)[40]. Tongue coating was scored by the validated Winkel[41] tongue coating index (WTCI). The dorsum of the tongue was notionally divided into six areas, i.e. three at the posterior and three at the anterior part of the tongue. The tongue coating in each sextant was scored as 0 = no coating, 1 = light coating and 2 = severe coating. The tongue coating value was obtained by addition of the six distinct scores, range 0–12.

At baseline, independent variables related to the nursing home and the residents were gathered by questionnaires. On institutional level a questionnaire was completed by the managing director of each institution. Data on the capacity and the managerial umbrella of the nursing home, residents' mean length of stay, residents' mean age, number of FTE personnel, and percentage coverage (ratio of resources to health care needs) were collected. On residents' level a questionnaire on personal and medical details of every resident of the random sample was completed. This questionnaire was completed by nurses of the nursing home and recorded personal details (age, gender, ward), primary diagnosis, secondary diagnoses, Care Dependency Scale (CDS) score[42], Mini Mental State Examination (MMSE) score[43], and prescribed drugs of the examined residents. The study protocol was approved by the Ethics Committees of the Ghent University, Belgium (OG017 – approval 2008/440).

Statistical analysis

Both categorical and continuous variables were initially analyzed using exploratory data analysis, employing a variety of mostly graphical techniques and techniques for testing the necessary assumptions. The institution was the unit of randomization and the residents were the units of analysis. Cluster effects were addressed in the analysis. Group means or medians were calculated for main outcome variables for each group at each time point in the trial. Baseline differences between the intervention and the control group in both, dependent and independent variables were checked.

Given the characteristics of the oral hygiene outcome variables non parametric tests were used in the bivariate analyses. Differences in plaque levels between groups were explored using Mann-Whitney U and Kruskal Wallis tests for independent samples. Wilcoxon Signed Rank tests for paired samples were used to explore differences in plaque levels between T_0 and T_1. Correlation between relevant independent variables was tested by Spearman's rank correlation coefficient.

GLM (generalized linear model) analysis was used to estimate differences in oral hygiene levels between allocation groups from baseline to the 6 month follow-up visit. Data of all randomized subjects were analysed as allocated with respect to the intention-to-treat principle. These analyses incorporated adjustment for the corresponding baseline value and for the clustered nature of the data (nursing home). Mixed linear models were used to model a combination of fixed and random effects and to analyse these effects on the different plaque levels at six month follow-up visit. The level of significance was set at 0.05. All research data were analyzed using PASW statistics 18 (SPSS IBM cie).

RESULTS

Explorative data analysis

All the nursing homes (n = 12) invited to participate agreed to do so and agreed to participate in the randomly allocated group. In total, 1,987 residents were involved in the project, 1,003 in the intervention group and 984 in the control group.

At baseline 373 residents were selected for the effect evaluation, 187 in the intervention arm of the trial and 186 in the control group (Figure 1). The main reasons for loss to follow-up included: death (35%), administrative errors (30%), address change, move or absence (15%), hospitalization or sickness (9%) or refusals (9%). There were no differences in loss to follow-up between nursing homes (p=0.47) and between those randomized to the intervention group and to the control group (p=0.27). Baseline plaque levels were similar in both groups the loss to follow-up group and those who completed the study. No other differences were found between residents who completed the study and those who did not, which shows no evidence for a loss to follow-up effect.

The mean age of the residents within the sample was 84.8 (SD 8) years, the oldest being 102 and the youngest 52. The gender ratio was 73.2% females to 26.8% males. The mean

number of diseases for single subjects was 3 and the mean number of drugs used by single subjects was 7.6. There was a significant correlation between the number of diseases for single subjects and advancing age (Spearman ρ 0.20 / p>0.001), but no progressive increase of drug use with ageing. Cognitive impairment, tested by Mini Mental State Examination (MMSE), was present to various extents (MMSE< 26) in 86.5% of the sample. It was not influenced by age nor by the number of diseases. At the contrary, cognitive impairment was influenced by the numbers of drugs prescribed.

The mean number of natural teeth within the sample was 5.10 (SD 7.6), 54.6% were edentulous. Only 22 (6%) reached the 21-tooth-threshold, considered as a functional threshold. Within the group of dentate residents the mean number of teeth was 11.25 (SD 7.6).

Baseline comparison of residents (Table 1) showed acceptable comparability between control and intervention group for almost all variables on demographic characteristics, medical and dental history. There was a significantly different gender ratio between the intervention and the control group, with more male participants in the intervention group. Residents in the intervention group had comparable baseline values for all oral hygiene levels.

The outcome variables tongue plaque, dental plaque and denture plaque were skewly distributed both at baseline (T_0) and at 6 month follow-up (T_1). The variable measuring the difference between T_0 and T_1 appeared to follow a normal distribution.

Figure 2 shows plaque levels at both follow up and baseline for the different nursing homes involved in the study. As a whole an important variability can be observed between institutions.

In a bivariate analysis (Table 2) significant differences were observed between the intervention and control group for mean denture plaque (0.37) at 6 month follow-up visit, with a beneficial effect for the intervention group (p<0.01). A non-significant effect for the intervention group was observed for both mean tongue (0.10 — p=0.74) and dental plaque (0.19 — p=0.22) at 6 month follow up. A highly significant difference was found between the different nursing homes for mean tongue plaque (p<0.001) and mean denture plaque (p<0.001) at 6 month follow-up visit. An increasing dental plaque at 6 month follow-up visit was found by increasing dependency scale (p=0.017). An increasing dental plaque and decreasing denture plaque was observed by a decreasing cognitive func-

tion (p= 0.013 and p=0.05 respectively). Estimated differences between intervention and control group means for tongue plaque, dental plaque and denture plaque after 6 month follow-up compared to baseline values, together with 95% confidence intervals are shown in table 3. These differences have been adjusted for the corresponding baseline value of the variable as a covariate and the random effect of the institution.

For denture plaque, compared to the baseline value, a small benefit of the intervention in the order of 0.32 was observed at the 6-month follow-up examination. This improvement was statistically significant (p=0.002). Taking into account the baseline value the improvement was about 15%.

For dental and tongue plaque there were no significant differences at the 5% level between the intervention group and the control group at the 6 month follow-up visit compared to the baseline values. In both, intervention and control group, the hygienic condition related to the dental plaque remained almost unchanged and the improvement in tongue plaque was equal in both groups.

Multivariate analysis

The results of the multilevel mixed linear model analyses conducted with the different plaque levels at 6 month follow-up visit as dependent variable are reported in table 4. This model took into account the random institution effect. The main explanatory variable (the intervention) did not significantly add to the explanation of the variance in plaque levels. No other explanatory variables contributed significantly to the model (results in table 4 are restricted to the variable 'intervention').

DISCUSSION

A cluster randomized controlled trial allows for statistical analysis of the feasibility and effectiveness of an intervention on care provision. This trial provides both practical and methodological advantages for implementation studies, especially when the intervention requires policy or behavioural alterations and intends an effect at institution level[44]. Cluster randomization using institutions as the unit of randomization reduces contamination between groups of persons. It is easier to deliver an intervention at institution level (unit) than at individual level within an institution. Also, when focussing on all nurses, nurse

aides, and residents, group dynamics and peer pressure may facilitate the adoption of the intervention.

Due to the fact that all wards of the nursing homes were involved in the intervention and taking into account the randomisation of the examined subjects, self-selection bias was avoided.

On the other hand, cluster randomization may result in a random effect, which was taken into account when analyzing and interpreting the results. Another problem of cluster randomization is the hazard of selection bias at cluster level. An institution which, for one or another reason, decides to abandon the study may cause an important attrition bias. This is even of greater concern in case of differential drop outs of institutions in the intervention as well as in the control group. To prevent drop-out, all participating institutions were requested to provide a written informed consent for the entire study and study period. Dropout threats were similarly controlled in that none of the participating institutions left the study once a written consent was delivered. Nevertheless, compliance was not similar for all intervention institutions, what became clear during the focus group talks and individual interviews undertaken in the process evaluation.

Another possible bias, caused by lack of masking, was considered. Although double-masking was not possible due to the set-up of the trial, safeguards were incorporated to guarantee and maintain examiner masking. Examiners were randomly allocated to the nursing homes and were not informed about each nursing home's allocation.

Actually, a number of international studies in older institutionalised people were performed exploring the effect of oral health care education interventions. Comparing the reported results is nearly impossible due to a variety in study designs, interventions and oral health care outcomes all or not including oral hygiene measurements.[45-51] In the future, multi-centre studies with comparable design and similar outcome measurements are needed.

The present study is the first study who reports the effect of the implementation of an oral hygiene protocol on tongue plaque. However, these results should be interpreted with caution due to the uncertainties in power calculations. Power calculation[38] was only based on denture and dental plaque due to the unavailability of mean tongue plaque values in institutionalised older people. In the present study baseline dental and denture

plaque levels were lower than those observed in the cluster-randomised trial of Frenkel and Newcombe[49]. This has to be taken into account when evaluating historically the effect of health promotion programs. Low baseline levels will impede the effect of an intervention. Probably, new scoring techniques with higher sensitivity are needed.

Due to the small sample size of available nursing homes and despite the randomisation, non differential misclassification on confounding factors could still turn out to be of importance. A lot of individual factors, difficult to assess in a quantitative approach and characteristic for each institution, could have played an important role in the final results. Analysing differences between intervention and control groups leads further to the assumption that physical and environmental influences of the workplace and even psychological aspects (such as group pressure, working hours or managerial leadership) will have influenced the outcome regardless of the experimental manipulation employed. This was confirmed by significant outcome differences found between the institutions regardless of the intervention. The variable intervention accounted for almost all the variation in hygiene levels during the experimental period. In addition, the Hawthorn or Novelty effect might have had a positive impact on hygiene levels, in particular at baseline. This can be explained by the tendency to perform better when participating in an experiment, resulting in a short-lived improvement of the outcome of interest.

Dental plaque

The improvement of dental hygiene in the present study was negligible and disappointing compared to improvements reported in a previous longitudinal implementation study in Flanders-Belgium and other international study results[36]. However it has to be emphasized again that baseline data were much lower compared to these two previous studies. Changes in both control and intervention group were slight and not significant. Comparison between the different institutions shows large, but non-significant differences between individual nursing homes, with a mean dental plaque score ranging from 0.88 for the best performing institution (intervention institution) and 2.30 for the worst performing institution (control institution). The small numbers of dentate residents limit the power to detect significant differences between groups.

The actual plaque levels (>1.5) still reflect the large proportion of frail elderly people who

are unable to brush their teeth adequately and who do not receive assistance. During the supervised implementation it became clear that most nurses and nurse aides experienced barriers to carry out dental hygiene in residents, in particular in demented elderly. These qualitative findings will be subject of further research. Intensive and continuing coaching seems to be necessary to improve knowledge and skills in order to increase the confidence of care givers.

Denture plaque

Results of the analysis suggest that most beneficial results were obtained for denture plaque. The presumed effect of 25% improvement of oral hygiene level was not achieved by the supervised implementation. Individual factors related to the institutions and their compliance could have had an impact on the final results, weakening the influence of the intervention. At follow up three intervention institutions showed worse results for denture plaque resulting in less obvious improvements in the intervention group as a whole. With regard to denture cleanliness, residents and staff members received a lot of new practical instructions such as not to soak dentures overnight in water and not to use effervescent cleansing tablets, and to brush dentures with liquid soap rather than with toothpaste. Anecdotally, caregivers reported difficulties to convince residents to follow the new guidelines, and it is quite possible that they had problems to deal with this resistance to change. Denture plaque levels were higher for residents with a low degree of dependency brushing their dentures mostly themselves while the lowest plaque levels were found for residents with severe cognitive function of which dentures were mostly brushed by nurses and nurse aides.

Tongue plaque

The baseline values for tongue plaque were low with a skewed distribution to the right. Actually, tongue scraping is not commonly done by staff members, they are not used to clean their own tongue and surely not to clean residents' tongue. As part of the implementation every resident received a tongue scraper and as expressed by many staff members some residents with low degree of dependency were scraping their tongue regularly since the start of the project. At the other hand, nurses and nurse' aides were asked to perform

a lot of new oral hygiene tasks and they had to set priorities. During the monthly visits of the implementation coordinator reluctance to tongue scraping was often expressed by many staff members. Nevertheless it is obvious that daily tongue scraping is necessary in particular in the group of frail elderly to obtain adequate oral hygiene. Highest tongue plaque levels were found in residents with the highest degree of dependency, in particular elderly people suffering from dementia syndrome. Nurses should be trained and motivated to overcome their rather negative attitude towards tongue brushing or scraping.

CONCLUSION

Considering the lower baseline values for the different plaque levels, one can conclude that oral hygiene has been improved by the supervised implementation intervention although not corresponding to the presumed 25% improvement. The intervention was most satisfactory for denture plaque followed by tongue plaque and dental plaque. Besides the intervention, an increasing dental plaque was found by increasing dependency scale and an increasing dental plaque and decreasing denture plaque by a decreasing cognitive function. Highly significant differences were found between the different nursing homes for the mean tongue and denture plaque. The study results demonstrate that individual factors, difficult to assess in a quantitative approach and characteristic for each institution, will play an important role in the final result. They will be further explored in a qualitative design.

COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHOR'S CONTRIBUTIONS

All authors participated in the conception and design of the study protocol. G-JvdP and LDV drafted the manuscript. JS, CdB and JV reviewed the draft manuscript. All authors read and approved the final manuscript.

ACKNOWLEDGEMENTS

This research project is funded by GABA International.

REFERENCES

1 Branca S, Bennati E, Ferlito L, Spallina G, Cardillo E, Malaguarnera M, Motta M. The health-care in the extreme longevity. Arch Gerontol Geriatr 2009, 49:32-34.
2 Rothera I, Jones R, Harwood R, Avery A, Waite J. Health status and assessed need for a cohort of older people admitted to nursing and residential homes. Age Ageing 2003, 32:303-309.
3 Schols JMGA, Crebolder HFJM, van Weel C. Nursing home and nursing home physician: The Dutch experience. J Am Med Dir Assoc 2004, 5:207-212.
4 Ettinger RL. Oral health and the aging population. J Am Dent Assoc 2007, 138:5S-6S.
5 Wu B, Plassman BL, Crout RJ, Liang J. Cognitive function and oral health among community-dwelling older adults. J Gerontol A Biol Sci Med Sci 2008, 63:495-500.
6 Holm-Pedersen P, Vigild M, Nitschke I, Berkey DB. Dental care for aging populations in Denmark, Sweden, Norway, United Kingdom, and Germany. J Dent Educ 2005, 69:987-997.
7 Holm-Pedersen P, Russell SL, Avlund K, Viitanen M, Winblad B, Katz RV. Periodontal disease in the oldest-old living in Kungsholmen, Sweden: findings from the KEOHS project. J Clin Periodontol 2006, 33:376-384.
8 Wu B, Plassman BL, Liang J, Wei L. Cognitive function and dental care utilization among community-dwelling older adults. Am J Public Health 2007, 97:2216-2221.
9 Jokstad A, Ambjørnsen E, Eide KE. Oral health in institutionalized elderly people in 1993 compared with in 1980. Acta Odontol Scand 1996, 54:303-108.
10 Stubbs C, Riordan PJ. Dental screening of older adults living in residential care facilities in Perth. Aust Dent J 2002, 47:321-326.
11 Simunković SK, Boras VV, Pandurić J, Zilić IA. Oral health among institutionalised elderly in Zagreb, Croatia. Gerodontology 2005, 22:238-241.
12 Unlüer S, Gökalp S, Doğan BG. Oral health of the elderly in a residential home in Turkey. Gerodontology 2007, 24:22-29.
13 Arpin S, Brodeur J-M, Corbeil P. Dental caries, problems perceived and use of services among institutionalized elderly in 3 regions of Quebec, Canada. J Can Dent Assoc 2008, 74:807.
14 Samson H, Strand GV, Haugejorden O. Change in oral health status among the institutionalized Norwegian elderly over a period of 16 years. Acta Odontol Scand 2008, 66:368-373.
15 Hancock EB, Newell DH. Preventive strategies and supportive treatment. Periodontology 2000 2001, 25:59-76.
16 Attin T, Hornecker E. Tooth brushing and oral health: how frequently and when should tooth brushing be performed? Oral Health Prev Dent 2005, 3:135-140.
17 Morishita M, Takaesu Y, Miyatake K et al. Oral health care status of homebound elderly in Japan. Journal of Oral Rehabilitation 2001; 28: 717-720.
18 Jokstad A, Ambjornsen E and Eide KE. Oral health in institutionalized elderly people in 1993 compared with in 1980. Acta Odontologica Scandinavica 1996; 54: 303-308.
19 Knabe C and Kram P. Dental care for institutionalised geriatric patients in Germany. Journal of Oral Rehabilitation 1997; 24: 909-912.
20 Kuc IM and Samaranayake LP. Oral health and microflora in an institutionalised elderly population in Canada. International Dental Journal 1999; 49: 33-40.
21 Frenkel HF, Harvey I and Newcombe RG. Oral health care among nursing home residents in Avon. Gerodontology 2000; 17: 33-38.
22 De Visschere LM, Grooten L, Theuniers G, Vanobbergen JN. Oral hygiene of elderly people in long-term care institutions--a cross-sectional study. Gerodontology 2006;23:195-204.
23 Lamy M, Mojon P, Kalykakis G, Legrand R, Butz-Jorgensen E. Oral status and nutrition in the institutionalized elderly. J Dent 1999; 27(6):443-448.
24 Gil-Montoya JA, de Mello AL, Cardenas CB, Lopez IG. Oral health protocol for the dependent institutionalized elderly. Geriatr Nurs 2006, 27:95-101.
25 Stein PS, Henry RG. Poor oral hygiene in long-term care. Am J Nurs 2009, 109(6):44-50.
26 Murray PE, Ede-Nichols D, Garcia-Godoy F. Oral health in Florida nursing homes. Int J Dent Hyg 2006, 4:198-203.
27 Costello T, Coyne I. Nurses' knowledge of mouth care practices. Br J Nurs 2008, 17:264-268.
28 Young BC, Murray CA, Thomson J. Care home staff knowledge of oral care compared to best practice: a West of Scotland pilot study. Br Dent J 2008, 205:E15.
29 de Mello ALSF, Padilha DMP. Oral health care in private and small long-term care facilities: a qualitative study. Gerodontology 2009, 26:53-57.
30 Coleman P, Watson NM. Oral care provided by certified nursing assistants in nursing homes. J Am Geriatr Soc 2006, 54:138-143.
31 Chung JP, Mojon P, Budtz-Jørgensen E. Dental care of elderly in nursing homes: perceptions of managers, nurses, and physicians. Spec Care Dent 2000, 20:12-17.

32 Sweeney MP, Williams C, Kennedy C, Macpherson LM, Turner S, Bagg J. Oral health care and status of elderly care home residents in Glasgow. Community Dent Health 2007, 24:37-42.
33 O'Reilly. Oral care for the critically ill: a review of the literature and guidelines for practice. Aust Crit Care 2003, 16:101-110.
34 Vanobbergen JNO, De Visschere LM. Factors contributing to the variation in oral hygiene practices and facilities in long-term care institutions for the elderly. Community Dent Health 2005, 22:260-265.
35 McGrath C, Zhang W, Lo EC. A review of the effectiveness of oral health promotion activities among elderly people. Gerodontology 2009, 26:85-96.
36 De Visschere L, De Baat C, Schols JMGA, Deschepper E, Vanobbergen J,. Evaluation of the implementation of an 'oral hygiene protocol' in nursing homes: a 5-year longitudinal study. Community Dent Oral Epidemiol. Oct. 2009 submitted; Sept. 2010 accepted.
37 AGREE Collaboration: Development and validation of an international appraisal instrument for assessing the quality of clinical practice guidelines: the AGREE project. Qual Saf Health Care 2003, 12:18-23.
38 Gert-Jan van der Putten, Luc De Visschere, Jos Schols, Cees de Baat and Jacques Vanobbergen. Supervised versus non-supervised implementation of an oral health care guideline in (residential) care homes: a cluster randomized controlled clinical trial. BMC Oral Health 2010, 10:17. www.biomedcentral.com/1472-6831/10/17
39 Silness J, Löe H. Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. Acta Odontol Scand 1964, 22:121-135.
40 Augsburger RH, Elahi JM. Evaluation of seven proprietary denture cleansers. J Prosthet Dent 1982, 47:356-359.
41 Winkel EG, Roldan S, Van Winkelhoff AS, Herrera D, Sanz M. Clinical effects of a new mouth rinse containing chlorhexidine, etylpyridinium chloride and zinc lactate on oral halitosis. A dual-centre, double blind, mlacebo controlled study. J Clin Periodontol 2003 ,30:300-306.
42 Dijkstra A, Tiesinga LJ, Plantinga L, Veltman G, Dassen TW. Diagnostic accuracy of the care dependency scale. J Adv Nurs 2005, 50:410-416.
43 Tombaugh TN, McIntyre NJ. The mini-mental state examination: a comprehensive review. J Am Geriatr Soc 1992, 40:922-935.
44 Eccles M, Grimshaw J, Campbell M, Ramsay C. Research designs for studies evaluating the effectiveness of change and improvement strategies. Qual Saf Health Care 2003, 12:47-52.
45 MacEntee MI, Wyatt CC, Beattie BL, Paterson B, Levy-Milne R, McCandless L et al. Provision of mouth-care in long-term care facilities: an educational trial. Community Dent Oral Epidemiol 2007; 35(1):25-34.
46 Peltola P, Vehkalahti MM, Simoila R. Effects of 11-month interventions on oral cleanliness among the long-term hospitalised elderly. Gerodontology 2007; 24(1):14-21.
47 Nicol R, Petrina SM, McHugh S, Bagg J. Effectiveness of health care worker training on the oral health of elderly residents of nursing homes. Community Dent Oral Epidemiol 2005;33:115-124.
48 Wardh I, Berggren U, Andersson L, Sorensen S. Assessments of oral health care in dependent older persons in nursing facilities. Acta Odontol Scand 2002; 60(6):330-336.
49 Frenkel H, Harvey I, Newcombe RG. Improving oral health in institutionalised elderly people by educating caregivers: a randomised controlled trial. Community Dent Oral Epidemiol 2001; 29(4):289-297.
50 Simons D, Baker P, Jones B, Kidd EA, Beighton D. An evaluation of an oral health training programme for carers of the elderly in residential homes. Br Dent J 2000; 188(4):206-210.
51 Parks SM, Haines C, Foreman D, McKinstry E, Maxwell TL. Evaluation of an educational program for long-term care nursing assistants. J Am Med Dir Assoc 2005;6:61-65.

Figure 1. Flow chart of the study protocol (nursing homes = nh)

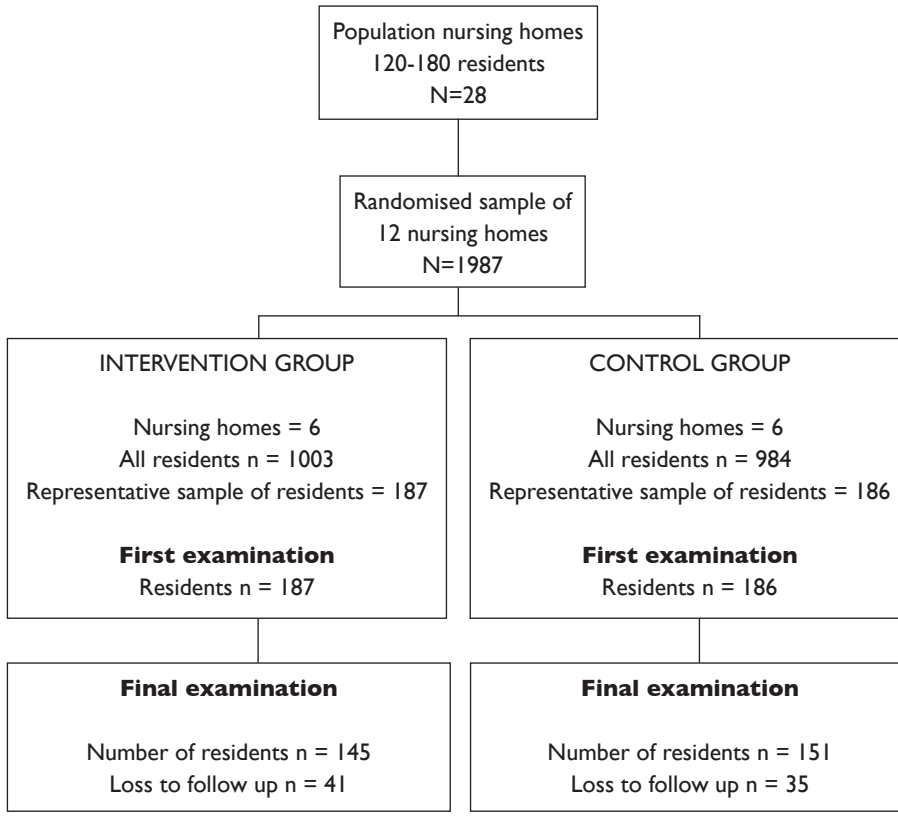


Figure 2. Box-plots for the different plaque levels by institution (x-axis)
Intervention group (green) versus control group (blue)

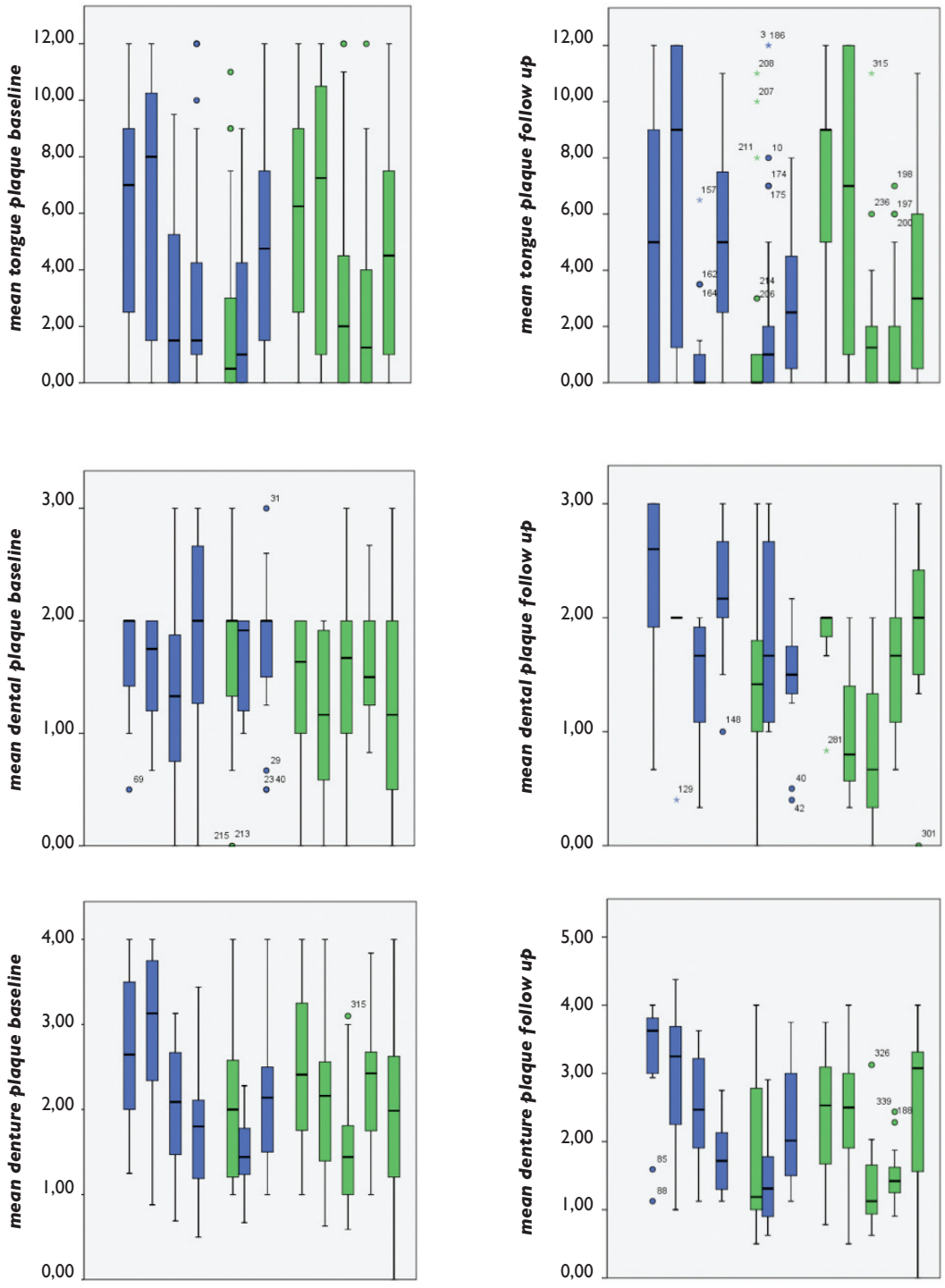


Table 1. Baseline comparison of intervention and control group

Parameter	*Intervention*	*Control*	*p-value*
Age in years			
mean (SD)	84.5 (8,5)	84,9 (7.6)	NS
Gender			
female (%)	128 (68.4%)	145 (78.0%)	**0.05**
male (%)	59 (31.6%)	41 (22.0%)	
Care Dependency			
low (O) (%)	24 (12.8%)	24 (12.9%)	
moderate – high (A-B-C) (%)	112 (59.9%)	110 (59.1%)	NS
demented (Cd) (%)	51 (27.3%)	52 (28.0%)	
MMSE (mental state)			
normal cognitive function	14 (13.0%)	16 (14.0%)	
mild cognitive function	35 (32.4%)	29 (25.4%)	NS
moderate cognitive function	40 (37.0%)	49 (43.0%)	
severe cognitive function	19 (17.6%)	20 (17.5%)	
Co-morbidity			
mean number of diseases (SD)	3,1 (1.8)	2.9 (1.3)	NS
mean number of drugs (SD)	7.8 (3.3)	7.4 (3.0)	
Dental status			
mean number of teeth (SD)	4.7 (7)	5.5 (8)	
natural teeth only	44 (24.4%)	43 (24.6%)	NS
denture(s) only	93 (51.7%)	84 (48.0%)	
natural teeth + denture(s)	37 (20.6%)	37 (21.1%)	
no natural teeth, no denture(s)	6 (3.3%)	11 (6.3%)	
Oral hygiene status			
mean tongue plaque (SD)	4.04 (3.91)	4.41 (4.03)	NS
mean dental plaque (SD)	1.47 (0.77)	1.63 (0.72)	
mean denture plaque (SD)	2.14 (0.91)	2.25 (0.94)	

Table 2. Results of the bivariate analysis for oral hygiene indicators by intervention/ control

Outcome	*n*	*mean (SD)*	*p-value**
Tongue plaque at 6 month follow-up visit			
intervention	140	3.63 (4.19)	0.74
control	141	3.73 (4.11)	
Dental plaque at 6 month follow-up visit			
intervention	41	1.58 (0.79)	0.22
control	58	1.77 (0.74)	
Denture plaque at 6 month follow-up visit			
intervention	98	1.99 (1.0)	**<0.01**
control	98	2.36 (1.0)	

* Independent sample Mann-Whitney U test

Table 3. Plaque levels and follow-up with differences between intervention and control group

Outcome	*n*	*Baseline mean (SD)*	*Follow-up mean (SD)*	*Adjusted difference* (95% CI)*	*p-value*
Tongue plaque					
Intervention	139	4.25 (4.05)	3.66 (4.19)	-0.07 (-0.91,0.77)	0.87
Control	139	4.14 (4.11)	3.66 (4.10)		
Dental plaque					
Intervention	40	1.60 (0.68)	1.57 (0.79)	-0.15 (-0.45,0.14)	0.31
Control	57	1.64 (0.66)	1.77 (0.75)		
Denture plaque					
Intervention	95	2.19 (0.93)	2.01 (1.00)	-0.32 (-0.52,-0.11)	**<0.002**
Control	97	2.24 (0.91)	2.37 (1.00)		

* adjusted for random institution effect and for corresponding baseline value as covariate; negative values indicate benefit tot the intervention group

Table 4. Estimates of the main explanatory variable 'intervention' in the linear mixed model with random effect. Dependent variables: mean tongue/dental/denture plaque at 6 month follow-up

Parameter	*Estimate*	*Standard error*	*95% Confidence Interval*		*p-value*
			Lower Bound	*Upper Bound*	
Tongue plaque					
Intercept	5.83	3.09	-0.30	11.96	0.06
Control	0.71	1.25	-2.15	3.56	0.59
Intervention	0				
Dental plaque					
Intercept	2.24	1.08	0.05	4.43	0.04
Control	0.29	0.33	-0.53	1.12	0.87
Intervention	0				
Denture plaque					
Intercept	0.65	1.00	-1.34	2.64	0.52
Control	0.55	0.29	-0.27	1.38	0.13
Intervention	0				

PART II: AMOR-ABRIM PROJECT
II.B QUALITATIVE APPROACH

CHAPTER 9

BARRIERS AND ENABLING FACTORS TO THE IMPLEMENTATION OF AN ORAL HEALTHCARE PROTOCOL IN NURSING HOMES: A QUALITATIVE STUDY

This chapter has been submitted:
Barriers and enabling factors to the implementation of an oral healthcare protocol in nursing homes: a qualitative study.

De Visschere L, de Baat C, De Meyer L, Van der Putten GJ, Soderfeldt B, Vanobbergen J
Journal of Advanced Nursing, May 2010 submitted

ABSTRACT

Aims: This paper is a report of a study exploring barriers and enabling factors to the implementation of an oral hygiene protocol in nursing homes.

Background: Oral health care in nursing homes in Flanders (Belgium) is inadequate. The implementation of an oral hygiene protocol depends on a multitude of factors.

Methods: Qualitative data were obtained from nurses employed in 13 nursing homes involved in two randomised controlled trials in Flanders-Belgium. Data were collected by focus groups and face-to-face interviews during the periods April 2005-March 2009 and October-December 2009. Transcripts were subjected to a three-step procedure using NVivo 8 for the analysis.

Results: A basic classification model documents the barriers and enabling factors. Most revealed barriers were consistent with previous findings in the literature. Newly reported barriers were respect for residents' self-determination, experience based oral health care by nurses, residents' oral health status and the noticeability of residents' oral health status. Demand driven oral health care was found to be an enabling factor.

Conclusion: Despite nurses' willingness and enthusiasm to improve oral health in nursing homes the integration of oral health care into general daily care seemed to be a major problem due to a multitude of barriers. A supervised implementation of an oral health protocol with practical advices only partly succeeded to help nurses to overcome these barriers.

INTRODUCTION

There is sufficient evidence supporting the relation between poor oral health and general health, particularly in nursing home residents. Advances in oral health care (OHC) during the last decades have resulted in an increasing number of dentate older people. International studies reported no systematic approach in arranging OHC in nursing homes and the care was mostly limited to emergency care[4]. A majority of nursing home residents lack either the functional abilities or cognitive capacity to perform oral health care independently and have to rely on their nurses[1-5]. Despite the increasing demand of OHC services in this vulnerable group, in Flanders (Northern part of Belgium) only limited numbers of geriatric-focused oral health services are available. This results in poor oral hygiene for both natural dentition and dentures[6].

Both quantitative and qualitative international research projects have reported a spectrum of barriers for OHC of nursing homes residents. The current generation is less likely to complain of oral conditions, unless suffering from pain. Other reported barriers by nurses on residents' level were the lack of cooperation, the non-compliance, the functional disability and fear of high dental treatment costs. In particular, some residents with dementia present more problems due to behavioural problems and lack of communication[1,4,7-9].

Common barriers reported at nurses' level concern their attitude towards OHC which was not given high priority. This impedes the identification of problems and the report of treatment needs. Other barriers related to OHC were forgetfulness, lack of time, lack of routines, lack of training, fear, unwillingness, reluctance and revulsion[1,3-5,10-13]. One study reported that nurses were interested in improving OHC delivery, but that the implementation was severely limited by lack of knowledge[14]. Lack of communication between nurses during working time shifts was reported, which may increase the chance of oral health problems being overlooked or forgotten[4,15]. Nurses have limited knowledge and skills regarding the provision of OHC in general, poor understanding of the process causing oral diseases, and they specifically lack knowledge of OHC to older people exhibiting care-resistant behaviour[2,3,7,9-11,13,16]. Nurses feel more comfortable with cleaning dentures than brushing some ones' natural teeth[2,4,15].

The available literature reports important barriers at the management level related to the OHC provision at nursing facilities. Limited time for delivery of OHC has been raised repeatedly in the literature, particularly in relation to an increased workload due to a larger proportion of highly functionally dependent residents and a shortage of nurses[1,5,8,11,13,16,17].

Finally, studies found barriers on OHC professionals' level such as low priority of oral health policies, including preventive strategies[4,8,10,11]. Structured dental protocols with clear guidelines are seldom apparent[8,11]. Other service barriers are unwillingness of dental professionals to visit residents within the facility, long waiting lists and lack of resources to assist residents with access to dental services[4].

The introduction of innovations in health care is widely recognized as a complex process[18]. Most experts in health care improvement emphasize the importance of acquiring a good understanding of the problem, the target group, its setting, and the obstacles to change in order to develop more effective strategies for change[19].

Keeping in mind the barriers already mentioned, and obstacles involved with implementation procedures, an oral hygiene protocol was developed and implemented in nursing homes in Flanders. Before the start of the implementation, insight into determinants that may facilitate the intervention was gained by exploring the literature and by interviewing directors of nursing homes. Two randomised controlled trials in Flanders (AMOR- and ABRIM-study) reported the impact of the implementation on clinical variables, namely, denture, dental and tongue cleanliness. In the first study the implementation was introduced at the start of the 5-year implementation period and, further on, only supported by a yearly visit on the occasion of the impact evaluation. In the second trial, the implementation was supervised monthly during the 6-months study period[20,21].

The aim of the present study was to gain insight into barriers and enabling factors that could influence the practice of oral health care in nursing homes.

MATERIAL AND METHODS

The study was based on the methodology of Grounded Theory[22] aiming to generate hypotheses, models or preliminary theories about what is revealed in a social situation, rather than aiming to verify existing theory.

Qualitative data were obtained from nurses (Registered Nurses and Certified Nurse Assistants) employed in nursing homes involved in the two randomised controlled trials in Flanders quoted above (AMOR- and ABRIM-study).

The qualitative data were collected by focus group and face-to-face interviews in 13 nursing homes during the period April 2005-March 2009 (n=7) and October-December 2009 (n=6) for the AMOR- and ABRIM-studies, respectively.

Focus group interviews

Due to the high workload, maximum 5 nurses could participate in the interviews simultaneously, without hampering the usual care delivery. Accordingly, 2-5 nurses predominantly involved in daily care of the AMOR nursing homes were selected by purposive sampling. In total, 30 nurses participated in 7 interviews conducted at the end of the 5-year study period.

The focus group interviews were structured by semi-structured and open-ended questions, sounding out the nurses on their observations and perceptions while delivering daily OHC. The questions were selected consistent with the barriers already mentioned in the introduction and on observations of an interviewer (LDM) during a teaching practice in a nursing home not belonging to the study group. The main topic focused on barriers to deliver OHC, as experienced by the participants. Interviewers were the first author of the present study (DVL) who is experienced in interviewing and the third author (LDM), an undergraduate nurse theoretically educated in qualitative interviewing and practically trained before the interviews. Each interview session took 45–60 minutes.

Face-to-face interviews

Face-to-face interview technique was used rather than focus group interviews allowing in-depth interviewing and spreading the nurses' absence on the work floor. Thirty six

nurses of the 6 intervention nursing homes (ABRIM-study) were selected at random. This strategy resulted in 100% participation. All interviews were conducted within the first month after the end of the 6-month study period. Face-to-face interviews were structured by open-ended questions and follow-up questions exploring participants' observations, experiences and perceptions of daily OHC delivery before, during and after the project. The questions were selected consistent with the results of the focus group interviews of the AMOR-project, further exploring in-depth stimulating and inhibiting factors. The first author (DVL) conducted the interviews which took 30–40 minutes.

The focus group interviews (7) and face-to-face interviews (36) were tape-recorded and transcribed verbatim after the interviews. Collection and analyses of the transcripts were carried out in parallel until saturation. The data were analyzed using thematic content analysis by subjecting the transcripts to a three-step procedure: open coding, axial coding and selective coding. NVivo 8 was used for the analyses. All transcripts were initially analyzed by the interviewers. At the end of the study period, all transcripts were scrutinized by the last author of this article (JV), maximizing the accuracy of the data interpretation.

Ethical approval and informed consent

Both studies were approved by the Ethics Committee (OG017, and OG017/2008/440). Overall informed consent was given from the directors of all nursing homes and from all participants.

RESULTS

According to the aim of the study all results were reported as a whole for all 13 nursing homes. Consequently, no single nursing home and no interviewee can be identified. The participating nurses of the AMOR- and ABRIM-study were between 23 and 55 and 22 and 64 years old, respectively. The mean seniority in practice was > 10 years.

Barriers and enabling factors are schematically visualized in a basic classification model (figure 1). The following overview only deals with new observed factors or factors requiring more explanation.

Barriers and enabling factors at residents' level as reported by nurses

Compliance. The most frequently mentioned barrier by nurses on residents' level was lack of co-operation of residents due to unwillingness, whether or not expressed through physical violence (aggression, biting, kicking, beating, shouting,...), variability of mood, disregard of new OHC instructions, and sticking to old or familiar habits.

> "It's also linked to the mood of that person. If that person is really in a bad mood, I am not going to say much…if you get snapped at, and they don't want and yes… or aggressive, if somebody for example can't say what he thinks; but he is very aggressive, then I am very reluctant. That also means that the person doesn't want that. If he can't express his feelings, and he's hitting with his arms then, euh… is it also best not to do that. It's also maybe a sign of "I don't want to", "I understand maybe, but I can't say it". It does stop me, when there is aggression."

Nurses were particularly encouraged by the "gratitude" of the elderly. One nurse told that residents "felt sorry for them" because they had to carry out OHC.

Degree of dependency. Almost all nurses, all or not predominantly involved in delivering care for older people with dementia syndrome believed that these residents are the most difficult group for delivering daily OHC.

Nurses also expressed difficulties to improve OHC in residents who are more or less self-supporting. These residents strongly believe that they can clean their mouth and/or dentures adequately, but in fact they cannot as demonstrated by disclosing tablets or solutions.

Residents' self-determination. Nearly half of the interviewees expressed that individuals, dependent on others for (oral) health care, have to be offered opportunities to participate in direct decisions affecting themselves. Residents should preserve their dignity and self-esteem.

> "If people don't want to, I don't know if you can force them to brush their teeth. Apparently they weren't brushing their teeth before either. My parents do so now, but… what I hear sometimes. It didn't used to be done, so yeah…. People didn't even wash before, so what would they do with their teeth (laugh)"

When a resident, suffering from serious oral health problems, refuses OHC, as formulated by one nurse, ethical consultations were required with the physician and the family.

Attitude towards OHC.

Nurses reported that many residents showed a "resigned attitude" to OHC and they didn't believe in the "usefulness" of daily OHC at their old age. The importance of daily OHC is not known and some residents were firmly convinced that their teeth or dentures wear out more quickly by brushing. Nevertheless, some nurses also claimed that recently admitted residents were more concerned with oral health, resulting in spontaneous requests for support. This "demand-driven OHC" was occasionally claimed as an important stimulating factor, especially by those with a low degree of dependency.

> "We do have some people who are requesting "would you brush my teeth"? Those who ask themselves, but those who can't ask anymore euh… it just wasn't done."

Barriers and enabling factors at nurses' level

For many nurses OHC was not an issue before the start of the implementation project. During the implementation, an increasing OHC' awareness was observed. OHC became "routine care", especially evoked by "clear practical guidelines". Due to a lot of remaining barriers the implementation only resulted in cleaner dentures.

Oral health mindedness. Respondents expressed, spontaneously or not, their personal interest of OHC. Still, only few could indicate clearly why. Suggestions were based on aesthetical rather than on health motives. The importance of a healthy and good appearance during social contacts was often pointed out.

Many nurses delivered OHC through positive or negative personal experience, resulting in positive or negative OHC behaviour. This phenomenon of "self-experience driven" OHC was observed in about half of the interviews. It can be defined as an approach influenced by personal and emotional experiences connected to the nurse in both historical and sociological sense.

> …" well, it's like that with me. When I've brushed my teeth, and I have washed, then I have a feeling of being clean, and I want to pass this feeling to other people, so like… they are washed, they are completely clean, but to be with not clean teeth… that is not clean, I think. So yes, it's a bit about what you do yourself. And in the end, you get positive actions from the residents. They say "it's clean, I am happy". That's what I think."

Nurses feeling easily nauseated while brushing teeth or scraping the tongue did not carry out these actions in residents.

Daily OHC was not considered as a "priority" by most nurses. Daily "body hygiene" or "wound care" were more important issues. Others were convinced that OHC should be considered as "detail care" as an equivalent of "cutting fingernails" or "foot care". OHC was given priority only in case of oral problems. On the other hand, many nurses were strongly convinced that OHC was "essential" for residents in palliative care.

> "Because it's more, that you have a cause and consequence. If you don't brush a tooth, then the effect is only shown at a later age. Apart from having a dry mouth, that gives immediate problems. Like dry lips for example, dry crusts, that's also for the family, who's sitting or attending a person, I can imagine if you see you mother of father just lying there with a completely dry mouth. So we do want to show the family, hey, it's important to us that we care for the people, so yes, in the framework of comfort care, it is important towards the family that you pay attention."

Knowledge and skills. After 5 years of implementation (AMOR-project), many nurses recalled that a lot of uncertainties concerning oral health procedures still remained unsolved. Nurses primarily engaged in palliative care had the most knowledge of OHC.

"Lack of mutual communication" about oral health advices was expressed as an important reason for this shortage in knowledge. Participants in the ABRIM-project persuasively expressed that oral health advices were clearly communicated during the training sessions, but oral hygiene procedures did not conform to these advices. Many nurses claimed being insufficiently informed about the rationale behind these new instructions.

> "Well, I was surprised by that. Everybody puts those prosthesis in… Steradent or what is it, and all of a sudden it appears to be no good. So I think : "come on, what nonsense is that? [ ]… here prosthesis for years, there are people here who for years… yes, they bring those effervescent tablets, and the people still put them in those effervescent tablets. And now all of a sudden : bad. Then I think by myself : that is not possible. We still have plaque, anti-plaque, those rinsing aids….I think : this is being promoted, this is being sold, people use it, people are happy with it, and then all of a sudden they are not allowed to use it anymore. First it's and aid, and then you're not allowed to use it anymore."

Some nurses strongly argued having sufficient skills to perform tooth brushing and tongue scraping, others claimed having too little experience. The fact not being familiar

with these new actions was merely expressed as an important barrier.

R…"(laughs) then I say "no". I think it's got to do with people… there is also no demand

I : So if the occupants would ask more, then…

R: Yes of course! It's like somebody who asks you to put lotion on his back. If they ask this, then you just do it

I: Yes, and do you think you have the right skills to do so?

R; Oh, I don't have any issues with that. And skills, it's not like you have to be an engineer to do this, is it?"

The group of older nurses recalled that theoretical and practical OHC wasn't taught during their school-time or during their traineeship. The youngest interviewees indicated that OHC was actually taught but usually directed to children only and not to older people.

"In school, we saw a piece about that once [ ] that it's important for the heart, and yes… It was less, how can I say, in my course, you had different choices, for children, or elderly people. And for elderly people, there wasn't much said about it. It was mainly for the children that we had to pay attention for the young teeth and new teeth, but otherwise, we didn't really hear much about it."

Attitude towards OHC. During the interviews, all nurses expressed their beliefs, feelings, values and dispositions to OHC. Many interviewees recalled a promising "willingness" to perform OHC and as some have said, a "good feeling" remained after delivering oral health care. Empathy was a keyword for many nurses.

Yet, a substantial proportion of nurses expressed a negative attitude. Most nurses who did not deliver OHC actually and in the past could not easily explain why. They lacked reflection on OHC matters and many of them answered "I am not thinking about that".

A major stimulating factor was the fact that, due to the supervised implementation, the whole nursing team was involved in the new OHC strategy. They argued that a collective approach, in which every nurse contributes, offered more opportunities to persist. Nurses not performing daily OHC were denounced by their colleagues as not respectful.

… "yes, like today actually. I mean, I am only a person. Yes, they don't pay attention to that. Yes, euh… without respect towards me, towards the colleagues, the occupants. Because we do all the work, we make all the efforts…. To do yes, to do that. We want the quality of care even better, then the person who gives a rat's ass. (laughs) Yeah"….

Barriers and enabling factors related to the specificity of OHC

Brushing teeth or dentures. All interviewees were talking spontaneously about brushing dentures. Nobody spontaneously started talking about tooth brushing and certainly not about tongue scraping.

At evening shift, it was common practice to brush dentures of all residents whether or not dependent. "Supporting" residents with denture hygiene is more time consuming than "taking over". Nurses believed that dentate residents with low or moderate degree of dependency, all were able to perform tooth brushing themselves. In many cases, tooth brushing of highly dependent residents was not done at all, not before and even not after the implementation.

Denture brushing was more easy to perform compared to tooth brushing because of several reasons: "better visibility", "better brushing outside the mouth", "less time consuming", "no bad odour", and one can remove the "dirt" by running water before manipulating the dentures.

Brushing dentures was easily done because it was "usual", even before the start of the project. Nurses brushed dentures as routine, like robots in a factory, as said by someone.

Many nurses argued that tooth brushing in residents is "very difficult" to perform. The most common reasons mentioned were "tongue obstruction", "gagging", "vomiting", "difficulties with rinsing and swallowing", "limited mouth opening", "difficult to see what you are doing", especially at the back of the mouth, "fear" to hurt the resident and residents' "dislike".

> … "yes, I feel like… well, you have it in your own hands. You wear gloves, and you also wear gloves when you brush real teeth, but it's always an obstacle when you go into the mouth…. Also to open the cheeks, I still think that….you take it out, and then sometimes an elastic comes along. …it's dirty I think, I find it more dirty. Most people do have a blockage to do that with prostheses. So that you still find all sorts of things… it's a bit like, hmm, because it's really personal, you go into the mouth of someone, yes, I think it's a stronger blockage than a teeth prosthesis."

The low proportion of dentate residents in nursing homes was expressed many times as a major barrier in order to gain routine in tooth brushing.

Feasibility. Nearly "total absence" of OHC delivery by dental professionals and residents refusing professional care in case of oral problems were sporadically mentioned as barriers to persist with OHC.

Many nurses claimed that tooth brushing was nearly impossible, especially in older people with dementia syndrome. One nurse indicated tongue scraping as a "torture".

Yet, a minority of motivated nurses also expressed that tooth brushing and even tongue scraping were useful and possible to be performed by nurses or even by cognitive not impaired residents themselves.

Noticeability and seriousness of consequences. Some nurses were not motivated to deliver OHC to dentate residents because they were not able to notice possible oral health problems. Moreover, the consequences of inadequate daily OHC were considered as not serious. Some nurses confirmed OHC being not so important referring to their past experiences, when OHC was not delivered daily and never resulted in serious problems.

> "When somebody indeed has dirty incontinent material, and everything is running through her legs, then of course you see it immediately. But, indeed, a mouth which is not being kept clean, after a while you get parodontitis, inflated gums, bleeding gums, , but it's like… it's only after a while, so euh… Of course, when you don't change a diaper at noon, you have trouble in the evening."

Lack of control of performed OHC actions by colleagues, family members or even the residents themselves was also mentioned several times as a barrier.

> …"Yes, because… shaving is more noticeable. If you don't shave somebody, then he's got a beard, and the family says "You didn't shave him", or "I haven't been shaved". But euh, if they only have a few teeth left, and they have not been brushed some times, and the people don't say themselves "you haven't brushed my teeth yet", if they don't bother themselves. I think it's appearance that we first… euh, washing and shaving is more part of our care task, but oral care too, but yeah"….

Barriers and enabling factors at the organisational level

Workload. The most pronounced obstructing factors at the organisational level were high workload and lack of time experienced in all participating nursing homes in both projects.

> "If one or two residents of our ward are in the hospital, than you have more time for someone hey, then you do something extra, so then you can do some more at once, such as cleaning the finger nails,

the teeth once. So yes, then, we are happy that we can do so, should we have more time we could, we would be happy with that."

Especially during the weekend, an even higher workload resulted in not delivering OHC in some nursing homes. However, within the same nursing home and even within the same ward, allegations of lack of time were weakened by some nurses. According to them, not delivering OHC was not caused by lack of time, but by lack of OHC priority or even lack of time management.

"In fact, there may be things that play a role, but that doesn't touch me. And that is the workload, but that doesn't touch me either. It's only a minute or two of work, where they talk about, that I do it euh... and if it takes a lot of work ... I do not care. I do my thing and I do so. I follow the instructions of the project and euh ... if it takes five hours or ten hours, so what? I will do it. Although I have ten people in one morning to wash, I will. No problem. I will [...], such when a person is on the toilet and in the mean time I brush the false teeth for example. Allez, I organize my thing of: the person sitting there, I'm going to do a good rub. Otherwise I sit there with my fingers crossed."

Communication. Nurses working part-time expressed lack of communication being an important reason for not being informed about the implementation process, the OHC protocol nor about practical oral healthcare recommendations.

Feedback. Some interviewees complained not receiving feedback, especially about the results obtained by the new OHC approach. Some nurses argued that 'oral health organisers' (as part of the intervention each nursing home of the intervention group had, on each ward, to appoint a nurse acting as 'ward oral health care organizer'[21]) had insufficient skills to give feedback, while others stated not to be familiar with giving or receiving feedback.

"The oral health of some residents was discussed by the oral health team together with a ward oral health care organizer I think, but really I have so far not seen any advantage of that, so that I can say 'okay, the nurses of the oral health team have learned me practical things, such as 'it is easier if you are brushing the teeth like this or like that or if you do this."

"Feedback to each other is a bit of a sticking point with us. It is also a bit to see who you are speaking to... with one you already have a closer contact than with the other, really"…

Implementation process. Many nurses told that involvement in a scientific study, including measurements of oral hygiene levels by external observers, was a stimulating factor. Assistance from the implementation coordinator (the implementation of an oral hygiene protocol was supervised by a professional oral healthcare provider) and dental hygienist were expressed as valuable. Additionally, internal effect evaluation by nurses, using disclosing solutions making plaque visible, had a positive influence on the daily OHC delivery and its continuity. Many nurses expressed their gratitude to the implementation project and voiced their enthusiasm for delivering OHC.

DISCUSSION

Extensive qualitative data gathered from 66 nurses during 43 interviews in 13 nursing homes revealed a spectrum of factors influencing the delivery of OHC. A possible shortcoming of this study is that factors related to residents were reported by nurses and not by the residents themselves. In order to improve patient centered implementation strategies one has to consider performing qualitative research with residents as participants.
Interview technique cannot prevent social desirable answers. Regarding the residents' self-determination one should take into account this phenomenon as this was mentioned frequently. Nevertheless, in these cases nurses' reactions and interactions were further explored in depth by additional follow up questions in order to gain correct feelings and perceptions. Consequently, in the perception of the interviewers, "residents' right to self-determination" was too easily used by many nurses as an argument not to deliver OHC or to stop too fast trying to perform oral hygiene compared to other body hygiene actions. This behaviour largely depended on the priority of OHC perceived by these particular nurses.

The low prevalence of dentate residents hampers acquiring clear insight and skills into the performance of good oral hygiene related to natural teeth. In Flanders, an increasing proportion of older people keeping natural teeth for life is expected, as in many other European countries. Consequently one could expect a growing dental awareness of future cohorts of residents. Referring to the expressed "demand-driven care", this could be a stimulating factor in the near future. Therefore, besides other important topics on

OHC, implementation strategies should particularly focus on brushing of natural teeth and scraping the tongue. Continuous internal on-site training sessions, experience oriented education and practical training sessions are necessary to convince nurses that the mouth is an integrated part of the body. In this way they can possibly overcome their fear and reserved attitude of looking inside the residents' mouth.

Nurses did not really know what was meant by 'oral plaque' and consequently they expressed their perception in a non-professional way. Through the nurses' eyes dentures, teeth and even tongues are "dirty" or "disgusting" referring to the presence of food remains and not to the presence of plaque with bacterial load. As a consequence, nurses do not understand and sometimes do even not know that inadequate oral hygiene may cause diseases with serious consequences for residents' general health and quality of life.

Many interviewees demonstrated a lack of reflection. Nevertheless, self-reflection can be the first step of behavioural change resulting in a more positive attitude towards OHC. Curricula of undergraduate nurses have to be upgraded taking into account aspects of theoretical and practical OHC, individual and collective OHC approaches and skills to enhance self-reflection on OHC delivery.

The "non-noticeability" of oral health problems can be tackled by implementation protocols who should undeniably underline the importance of an oral assessment of residents by admission. 'Individualised OHC' based on the assessment is an important aspect in the OHC delivery. This refers to OHC in relation to the individual needs of the resident with respect to his/her oral health status, general health and degree of dependency. Residents still capable of a degree of self-care should be encouraged to be as independent as possible9 and should be actively involved in daily OHC.

The intramural care in Flanders is limited by financial constraints and a high proportion of highly dependent older people. Shortness of staff leads to a continuous high pressure of work. However, regarding workload there was ambiguity in how nurses dealt with workload within the same institutions and even within the same wards. Many inter-

viewed nurses contended that they have difficulties to manage their professional practice because of too high workload, leaving no possibilities to interact with additional tasks such as OHC. This was inconsistent with the experience of other nurses who stated that it was just a matter of time management. In their perception delivery of OHC did not depend on time, but on attitude, behaviour and mentality. Director of nursing homes has to continuously invest in education in order to maintain or to further improve oral health care.

The implementation process of both projects already mentioned[21,22] didn't achieve the integration of all OHC actions as described in the protocol and the compliance of participating nursing homes was not as expected. These shortcomings have to be further explored by additional qualitative research focusing on different aspects of the implementation process.

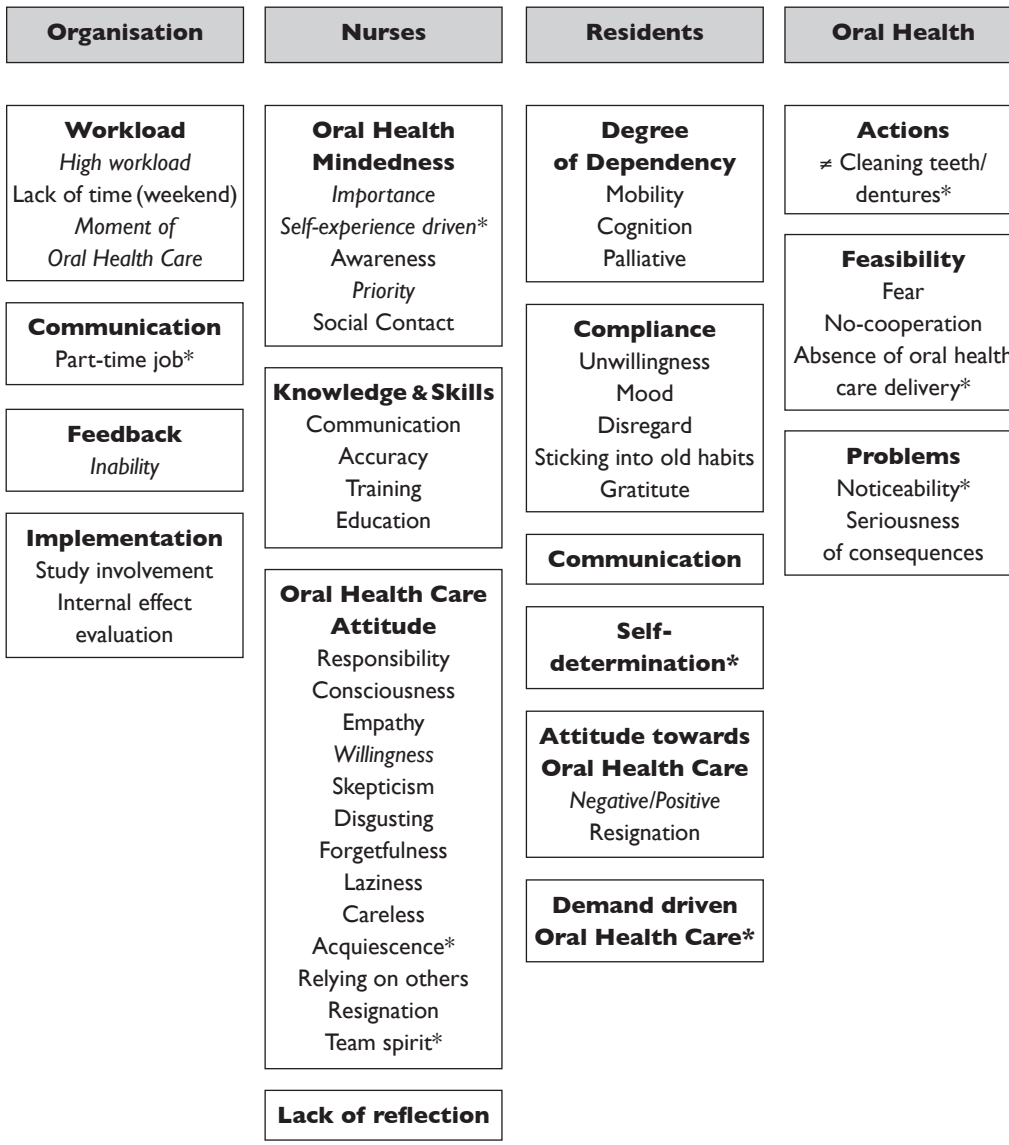
CONCLUSION

Despite nurses' willingness and enthusiasm to improve oral health in nursing homes the integration of OHC into general daily care seemed to be a major problem for many of them due to a multitude of resistant barriers. The (supervised) implementation of an oral health protocol with practical advices only partly succeeded to help staff members to overcome these barriers.

REFERENCES

1 Chalmers J, Pearson A. Oral hygiene care for residents with dementia: a literature review. J Adv Nurs 2005; 52(4):410-419.
2 Jablonski RA, Munro CL, Grap MJ, Elswick RK. The role of biobehavioral, environmental, and social forces on oral health disparities in frail and functionally dependent nursing home elders. Biol Res Nurs 2005; 7(1):75-82.
3 Fitzpatrick J. Oral health care needs of dependent older people: responsibilities of nurses and care staff. J Adv Nurs 2000; 32(6):1325-1332.
4 Paley GA, Slack-Smith LM, O'Grady MJ. Aged care staff perspectives on oral care for residents: Western Australia. Gerodontology 2004; 21(3):146-154.
5 Reed R, Broder HL, Jenkins G, Spivack E, Janal MN. Oral health promotion among older persons and their care providers in a nursing home facility. Gerodontology 2006; 23(2):73-78.
6 De Visschere LM, Grooten L, Theuniers G, Vanobbergen JN. Oral hygiene of elderly people in long-term care institutions--a cross-sectional study. Gerodontology 2006; 23(4):195-204.
7 Preston AJ, Kearns A, Barber MW, Gosney MA. The knowledge of health care professionals regarding elderly persons' oral care. Br Dent J 2006; 201(5):293-295.
8 Vanobbergen JN, De Visschere LM. Factors contributing to the variation in oral hygiene practices and facilities in long-term care institutions for the elderly. Community Dent Health 2005; 22(4):260-265.
9 Frenkel H, Harvey I, Newcombe RG. Improving oral health in institutionalised elderly people by educating caregivers: a randomised controlled trial. Community Dent Oral Epidemiol 2001; 29(4):289-297.
10 Brady M, Furlanetto D, Hunter RV, Lewis S, Milne V. Staff-led interventions for improving oral hygiene in patients following stroke. Cochrane Database Syst Rev 2006;(4):CD003864.
11 Frenkel H, Harvey I, Needs K. Oral health care education and its effect on caregivers' knowledge and attitudes: a randomised controlled trial. Community Dent Oral Epidemiol 2002; 30(2):91-100.
12 Sweeney MP, Williams C, Kennedy C, Macpherson LM, Turner S, Bagg J. Oral health care and status of elderly care home residents in Glasgow. Community Dent Health 2007; 24(1):37-42.
13 Weeks JC, Fiske J. Oral care of people with disability: a qualitative exploration of the views of nursing staff. Gerodontology 1994; 11(1):13-17.
14 Adams R. Qualified nurses lack adequate knowledge related to oral health, resulting in inadequate oral care of patients on medical wards. J Adv Nurs 1996; 24(3):552-560.
15 Chalmers JM, Levy SM, Buckwalter KC, Ettinger RL, Kambhu PP. Factors influencing nurses' aides' provision of oral care for nursing facility residents. Spec Care Dentist 1996; 6(2):71-79.
16 McKelvey VA, Thomson WM, Ayers KM. A qualitative study of oral health knowledge and attitudes among staff caring for older people in Dunedin long-term care facilities. N Z Dent J 2003; 99(4):98-103.
17 Wardh I, Hallberg LR, Berggren U, Andersson L, Sorensen S. Oral health education for nursing personnel; experiences among specially trained oral care aides: one-year follow-up interviews with oral care aides at a nursing facility. Scand J Caring Sci 2003; 17(3):250-256.
18 Fleuren M, Wiefferink K, Paulussen T. Determinants of innovation within health care organizations: literature review and Delphi study. Int J Qual Health Care 2004; 16(2):107-123.
19 Grol R. Personal paper. Beliefs and evidence in changing clinical practice. BMJ 1997; 315(7105):418-421.
20 De Visschere L, De Baat C, Schols JMGA, Deschepper E, Vanobbergen J,. Evaluation of the implementation of an 'oral hygiene protocol' in nursing homes: a 5-year longitudinal study. Community Dent Oral Epidemiol. Oct. 2009 submitted; Febr. 2010 revision.
21 De Visschere L, Schols J, van der Putten GJ, de Baat C. and Vanobbergen J,. Effect evaluation of a supervised versus non-supervised implementation of an oral health care guideline in nursing homes: a cluster randomized controlled clinical trial. Gerodontology 2010 submitted.
22 Strauss A, Corbin J. Basics of qualitative reaearch: grounded theory procedures and techniques. London: Sage, 1990.

Figure 1. Classification model of barriers and enabling factors



* new barriers; italic: inconsistency between interviewees

GENERAL DISCUSSION AND CONCLUSION

GENERAL DISCUSSION

The aim of this section is to discuss the most important findings aiming to comply with the objectives or research questions of this thesis. There were two main goals.

The first main goal was the exploration of the field with regard to:

- the oral health of institutionalised older people and the variations in oral hygiene levels and related practices and facilities in nursing homes
- the opinions of dentists towards the delivery of oral healthcare and towards new concepts in developing a community approach
- the knowledge of ageing and the attitude towards institutionalised older people of recently graduated dentists depending on their undergraduate education in geriatric dentistry.

The second main goal was the development of an oral hygiene protocol in nursing homes and the exploration of the effect of the implementation of it and the exploration of barriers and enabling factors which influence the implementation of an oral hygiene protocol in nursing homes.

The exploration of the field

Nearly no epidemiological data exists on older people's oral health conditions in Flanders. About 60% of institutionalised older people in nursing homes in East- and West-Flanders are edentate. The mean number of remaining teeth is 10.34 and 16% has more than 20 teeth. Data on caries, periodontal diseases, and other oral diseases are absent. Estimating the subjective and objective treatment need of institutionalised older people seems impossible. Moreover, if institutionalised older people should express a high demand for oral health care, actually it would be very difficult to meet this demand.

Baseline data collection on oral hygiene demonstrated inadequate oral hygiene levels and institutions used neither written reports on the oral health status of the residents nor a structured oral hygiene protocol. Caregivers reported the existence of internal communication on oral hygiene procedures and an active practice of daily oral hygiene in their residents. Basic oral hygiene was often carried out, but without reference to patients' needs. It was obvious that professional oral health care delivery in nursing homes was nearly nonexistent. The nursing home directors failed to monitor over all oral health

care activities. Directors with a more directive and supportive attitude seemed to have a positive impact on the oral hygiene procedures practiced in their institution. Consistent with international studies caregivers' knowledge was insufficient resulting in inadequate oral health care.

Interpreting the results it could be hypothesised that care staff provided some assistance for denture cleaning but virtually no assistance for brushing remaining teeth of dentate older dependent people. Environmental factors and factors characteristic of the individual were associated with oral hygiene of the institutionalised older people. Knowledge of the personnel, residents' mean age and managerial behaviour of the nursing home director were the most likely explanatory variables. However, most of the variance in oral health practices and facilities in nursing homes in the region of Ghent remains unexplained. Accordingly, adequate theoretical and practical training sessions and the involvement of the nursing home director were essential in the development of oral hygiene protocols.

Professional oral health care delivery in institutionalised older people is still not well organised. In the younger age groups of dental professionals, a higher willingness to provide oral health care to frail elderly patients was reported at the one hand, while, on the other, a less positive attitude towards a structured community approach in the organisation of oral health care for frail older people was expressed. This is an expression of the high individualistic attitude of dental care providers.

The high discrepancy between retirement rates and graduation rates of dentists strengthens the idea of legalising and educating dental hygienists or other auxiliaries. Nevertheless, it is remarkable that dental hygienists do not take part of the oral health care workforce in Belgium. Keeping in mind the ageing of the Belgian dentists and the feminisation of the profession, the oral health system suffers from serious organisational problems. Besides this, dental schools are obliged to improve their geriatric oral health care curriculum in order to accord with the European guidelines on dental education.

A quantitative evaluation of the implementation of an oral hygiene protocol

Two oral health promotion projects were started up in order to improve caregivers' awareness of oral health care and to ameliorate oral health conditions of institutionalised older people. The 5-year longitudinal AMOR-project followed a cohort of 14 nursing homes in

the region of Ghent (2003-2008) and the 6-month longitudinal ABRIM-project a cohort of residents in 12 nursing homes in West Flanders and Flemish Brabant (2009). The latter study was part of a multi-centre study simultaneously conducted in the Netherlands and Flanders.

The AMOR-project applied an oral hygiene protocol in intervention nursing homes and compared the effect of this application with control nursing homes. This protocol was based on available evidence from international literature complemented by the results of the studies presented in chapter 2 to 5. The ultimate goal was to integrate 'oral hygiene' into the residents' daily care. Experiences gained during the AMOR-project and the multidisciplinary Guideline 'Oral Health Care for dependent residents in long term care facilities' were used to develop a comprehensive implementation procedure to be studied in the ABRIM-project.

In the AMOR-project the implementation was introduced at the start of the 5-year implementation period and only supported by a yearly visit on the occasion of the impact evaluation. In the second trial, the implementation was supervised actively during the 6-months study period.

After 5 years of implementation (AMOR) dental plaque levels (>1.5) and denture plaque levels (>2) still reflected the large proportion of frail older people who were unable to brush their teeth or dentures adequately and who did not receive any assistance. Nevertheless, why most nurses and nurse' aides didn't succeed to carry out oral hygiene in residents remained unexplained in this quantitative approach. Important confounding factors were found related to both the intervention (explanatory variable) and the oral hygiene levels (outcome). Capacity of the nursing home and the presence of toothpaste were correlated to denture plaque levels, while the degree of residents' dependency and the presence of mouth rinse were related to dental plaque levels. It seemed that as long as the resident was able to adequately clean his/her own natural dentition, the problem of oral hygiene seemed minimal. But as soon as the resident became more vulnerable and care-dependent, oral hygiene of natural dentition failed rapidly and had to be taken over by the care givers. Yet, care givers were generally able to clean residents' dentures but not to clean residents' natural dentition as anecdotally mentioned during feedback.

The oral hygiene protocol was implemented in a real life nursing home situation. Conse-

quently, some confounding factors were difficult to control for, such as high staff turnover and the difficulty to control the compliance to the protocol within intervention nursing homes. A novelty and Hawthorne effect was observed, where the new care protocol resulted in an initial benefit which faded out over time. On the other hand, within the Hawthorne effect both intervention and control groups benefitted directly or indirectly by the study participation.

Baseline denture and dental plaque levels scored in the ABRIM-project were lower compared to the AMOR-project. Nevertheless, denture and dental plaque has been improved by the supervised implementation intervention although with lower benefit than expected. The intervention was most satisfactory for denture plaque followed by tongue plaque and dental plaque. A highly significant difference was found between the different nursing homes for all plaque levels. The variable institution accounted for almost all the variation in hygiene levels during the experimental period. In addition, the Hawthorne and/or novelty effect might have had a positive impact on hygiene levels, in particular at baseline. This was explained by the tendency to perform better when participating in an experiment, resulting in a short-lived improvement of the outcome of interest. Analysing differences between intervention and control groups led further to the assumption that individual characteristics of the institutions had influenced the outcomes. The complexity of these characteristics hampered a quantitative analysis of their impact on the different plaque levels, what gave rise to the qualitative approach in further research.

A qualitative exploration of barriers and enabling factors

Qualitative data were obtained from nurses employed in nursing homes and involved in the implementation of the prescribed oral hygiene protocol. A majority of revealed barriers were consistent with previous findings in the literature. Despite nurses' willingness and enthusiasm to improve oral health in nursing homes, the integration of oral health care into general daily care seemed to be a major problem for many of them. Major barriers were reserved attitude of residents and nurses, high workload, lack of reflection of nurses, lack of adequate feedback, lack of communication and continuous education.

On organisational level workload was indicated as the most prominent factor, but contradictions were observed within the same institution and even within the same wards.

In this context, the involvement of the whole team in the project in order to reach the assumed goals was an important enabling factor.

The interviews showed that the implementation process did not succeed in integrating all oral health care actions in daily care. Only denture brushing was performed as routine. A train-the-trainer concept together with the internal effect and process evaluation, resulted in an increasing awareness of oral health care, but failed to increase nurses' knowledge and to change their reserved attitude towards tooth brushing and tongue scraping. Education on oral health related to older people is still not included in the educational programme of undergraduate nurses.

The compliance of participating nursing homes was not as expected. Not all nurses received the internal training sessions due to workload, job time, absence, holidays, and lack of inter- and intra-ward communication.

FINAL CONCLUSIONS AND RECOMMENDATIONS

The implementation of an oral hygiene protocol did not meet all expectations. Plaque levels at follow up remained in both studies unsatisfactory, demonstrating the difficulty to obtain and maintain adequate oral hygiene levels in institutionalised older people.

Influencing factors on individual and institutional level were explored in order to find some logical explanations for these disappointing results. Quantitative data analyses showed clearly that all individual influencing factors were overruled by the institution, in particular in the ABRIM-study.

This phenomenon has to be taken into account when developing future implementation strategies. The qualitative data analysis showed that the oral hygiene protocol itself was well accepted by nurses. This indicates that the oral hygiene protocol can be disseminated for broader use taking into account some necessary adaptations. Additional evidence obtained by further research is needed to underpin oral hygiene advices and to support their widespread clinical use.

On the other hand it seemed that some parts of the implementation procedure were performed insufficiently and inadequately Two important shortcomings were the insufficient internal education of all nurses and nurse' aides and the resistance to use the periodically internal effect evaluation by disclosing procedures.

Additional qualitative data are necessary in order to explore why some aspects of the implementation procedure did not succeed equally in all participating nursing homes or in the different wards within a nursing home. Analyses of the results of both studies in Flanders and the Netherlands probably will yield valuable information on the implementation process.

Yet, some recommendations (see figure 1) can be given in order to support nursing homes who want to start with the implementation of an oral hygiene protocol. Before the start of the implementation of an oral health protocol, oral health attitudes and perceptions of nurses has to be assessed on ward level. Consequently, the obtained results should guide further implementation strategies, including content and frequency of the theoretical and practical training sessions on both institutional and ward level. Education and training sessions have to purposefully anticipate observed attitudes and perceptions of care staff

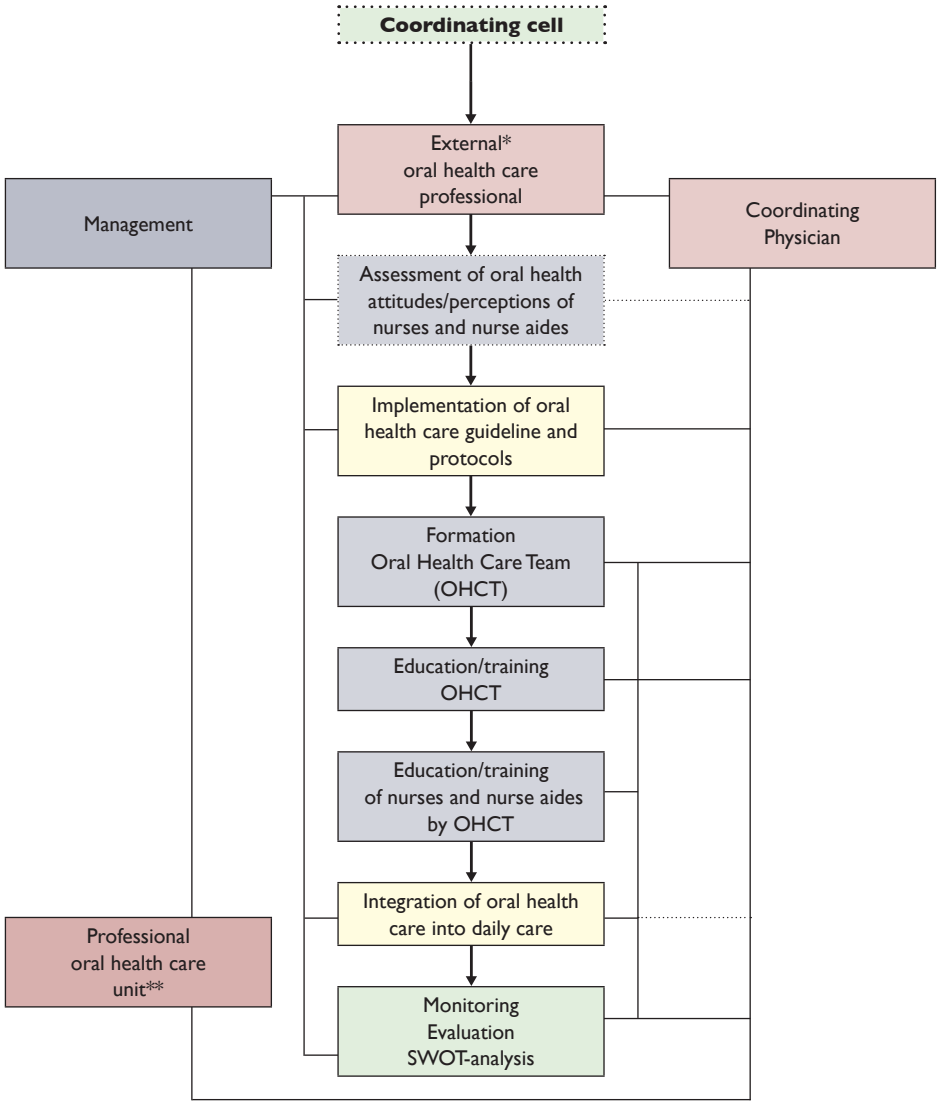
involved in daily care. The implementation procedure has to be supervised and actively guided and continuously monitored by an oral health care professional. In order to fulfil this recommendation, the involvement of a dentist, an oral hygienist or other auxiliaries are recommended.

Internal evaluations of residents' oral health conditions and ongoing processes have to be performed periodically in order to follow the progress of the implementation. Additional external monitoring and feedback is recommended.

In order to meet the assessed oral health care needs of residents, new initiatives with mobile dental equipment have to be realised providing the necessary oral health care and supporting the implementation procedures and the oral health care workers in the nursing homes.

In order to optimize this new oral health care model additional quantitative and qualitative data have to be gathered exploring possible influencing factors in particular on institutional level.

Figure 1. Oral Health Care Model



* the external oral health care professional can be replaced in time by an internal oral health care professional (oral hygiënist or dentist)
** assistance in providing preventive and curative oral health care

SUMMARY

SUMMARY

Adequate oral health is an essential part of general health in all age groups, but in particular in older age groups. Good oral health is a prerequisite to physical, mental and social wellbeing. Research shows that inadequate oral health can lead to a decline in quality of life and can also be associated with malnutrition, loss of weight, and systemic diseases such as diabetes, pneumonia, cardiovascular and cerebrovascular diseases and systemic infections. Within a short or long term, this will result in an increasing morbidity and mortality. International research shows inadequate oral health in older people, in particular in frail older people residing in residential care homes or at home. In these settings, a consistent lack of oral health care and oral health care policies was observed. Oral health care was mostly performed ad hoc. Major barriers reported in these reports are a lack of oral health care guidelines, protocols, and practical advices, knowledge and skills, and rather negative attitude to oral health care and shortness of time to perform daily oral care due to a high workload.

This doctoral thesis concerns the development and application of a oral health care model for older people in nursing homes emphasizing the integration of oral health care into daily care.

In particular, the objectives were:

- To explore the oral health of institutionalised older people in Flanders in an European context.
- To explore the long-term effect of implementing an oral hygiene protocol in nursing homes.
- To develop a protocol based on guidelines, approved by evidence based assessment tools
- To compare a supervised versus a non-supervised implementation of the guideline "Oral health care Guideline for Older people in Long-term care Institutions".
- To gain insight into factors potentially influencing the effectiveness and impact of an implementation protocol, aiming the integration of an oral hygiene protocol in nursing homes.

Exploring the field

Chapter 1 concerns the approaches of oral health problems of institutionalized older people in a European context regarding the most common oral health diseases and complaints and the oral health care delivery in this target Group. Oral health data in this field are scarce in Europe and a spectrum of different epidemiological criteria hampers international comparability. These findings emphasize the need for an international agreement on clinical validated criteria for the assessment of different oral health aspects in older age groups. Nevertheless one can conclude that oral health care in frail older people in Flanders and in most European countries is inadequate.

Chapter 2 is based on a cross-sectional study exploring variations in oral hygiene practices and facilities in long-term care institutions for older people in the region of Ghent. The provision of oral health care varied widely between different nursing homes. Knowledge of nurses and nurse' aides and the involvement of the management appeared to be important factors explaining these differences. However, most of the variance in oral health practices and facilities remained unexplained.

Oral hygiene care of institutionalized older people (Chapter 3) is poor, both for dentures and natural dentition. The observed plaque levels are of the highest compared to international studies using the same diagnostic criteria. Environmental factors, characteristic to the long-term care institutions, and factors characteristic to the individual resident have an impact on their daily oral hygiene care.

Chapter 4 deals with the oral health care delivery in older people in nursing homes and with opinions of dentists towards new insights into a collective oral health care approach. Considering the limited external validity of the results one could conclude that oral health was delivered sporadically and the core is curative care rather than prevention. The older the dentist, the greater the tendency to refuse oral health care services. Young dentists showed willingness to deliver oral health care outside the dental surgery, but on an individual basis.

The aim of chapter 5 was to verify whether or not undergraduate geriatric dentistry education has impact on knowledge of recently graduated dentists (2004, 2005 and 2006) in Belgium related to aging and on attitude towards older people in nursing homes. A great variability between the six Belgian dental schools was observed with respect to the un-

dergraduate education in geriatric dentistry. Knowledge on aging of graduated dentists is very low and their attitude towards older people in nursing homes is negative. Meanwhile, several dental schools upgraded their curricula.

The AMOR and ABRIM project

Implementing innovative care delivery models remains difficult, especially the integration of oral health care into daily care. Chapter 6 concerns the effect of the implementation of an oral hygiene care protocol in nursing homes during a 5 year longitudinal trial (AMOR). After 5 year of implementation obtained plaque levels were unsatisfactory and a lot of uncertainties remained on the impact of characteristics of individual nursing homes. Obtaining adequate oral hygiene levels in nursing homes remains an important ongoing challenge. Consequently, chapter 7 describes the aim and content of the Dutch Oral health care Guideline for Older people in Long-term care Institutions. This guideline was developed by a multidisciplinary research group of physicians, dentists, and oral hygienists based on a comprehensive literature search. In Flanders, subsequently implementation protocols were developed based on the guideline and taking into account the results of previous research. These protocols were implemented in nursing homes in Flanders and residential care homes in the Netherlands during a 6 months study period (ABRIM). Regarding the implementation in Flanders chapter 8 reports the methodology, the implementation procedure and the effect evaluation of this project. The results revealed a decreasing amount of denture plaque only. Again factors on institutional level, difficult to assess quantitatively, influenced the final results. During both research projects data regarding the process of implementation were collected using a qualitative research design. Barriers and enabling factors on the implementation processes were explored and summarised in a basic classification model documented in Chapter 9. Most revealed barriers were consistent with previous findings in the literature. Newly reported barriers were respect for residents' self-determination, experience based oral health care by nurses, residents' oral health status and the limited obviousness of residents' oral health status. Demand driven oral health care was found to be an enabling factor.

Conclusion

In Flanders, as in many European countries, adequate oral health care in institutionalized older people causes great concern. A multidisciplinary approach is needed to tackle these problems. A high need exists to re-orientate geriatric dentistry education for physicians, dentists, oral hygienists, nurses and nurse aides. Activities inducing positive perceptions and empathic positive caring attitudes towards older people should be included. Taking into account the demographic changes in our society, a better balance between theory and practice of geriatric dentistry education has to be considered in the education of future dental professionals. The continuous integration of oral health care into daily care of institutionalized older people remains difficult. Guidelines and protocols has to be adapted to the actual oral health care needs. Adequate implementation strategies have to be developed coping with the assessed barriers. Without any doubt, the cornerstone of good oral health care is regular oral hygiene. Oral health is inextricably associated with general health and oral health care has to be integrated into daily care. Adequate and accessible oral health service is a fundamental right of "all" vulnerable older people living in a community.

SAMENVATTING

SAMENVATTING

Goede mondgezondheid is essentieel voor de algemene gezondheid van ieder individu, jong of oud. Goede mondgezondheid is een voorwaarde tot fysiek, psychisch en sociaal welbevinden. Onderzoek toont aan dat inadequate mondgezondheid kan leiden tot een daling van de kwaliteit van leven maar ook geassocieerd is met ondervoeding, gewichtsverlies en andere ernstige aandoeningen zoals diabetes, pneumonie, cardiovasculaire en cerebro-vasculaire aandoeningen en systemische infecties. Dit kan op korte of lange termijn leiden tot verhoogde morbiditeit en mortaliteit.

Uit onderzoek blijkt dat de mondgezondheid van ouderen en in het bijzonder van kwetsbare ouderen in woonzorgcentra en in de thuiszorg ondermaats is. Literatuur toont een weinig coherent mondzorgbeleid in deze settings en mondzorg wordt vaak uitsluitend op ad hoc basis uitgevoerd. Belangrijke drempels zijn het ontbreken van richtlijnen, protocollen, concrete adviezen, gebrek aan kennis, vaardigheden en goede attitude van de zorgverleners en de hoge werkdruk.

Dit proefschrift betreft het ontwikkelen en toepassen van een protocol voor mondzorg van ouderen die in woonzorgcentra verblijven. De klemtoon wordt hierbij vooral gelegd op het integreren van mondhygiëne in het dagelijkse zorgaanbod.

Voor dit proefschrift werden volgende objectieven vooropgesteld:

- het inwinnen in Vlaanderen van gegevens over mondgezondheid bij kwetsbare ouderen die in woonzorgcentra verblijven en het vergelijken van de bevindingen met andere landen in Europa.
- het effect nagaan van het implementeren van een protocol voor mondzorg
- een aangepast protocol voor mondzorg met begeleide implementatie ontwikkelen, toepassen en effect- en procesmatig evalueren

De intramurale mondzorg in Vlaanderen in een Europese context

Hoofdstuk 1 is gebaseerd op een uitgebreid literatuur onderzoek over mondgezondheid en hieraan gerelateerde aspecten bij kwetsbare ouderen in Vlaanderen en Europa. Aandacht gaat uit naar de meest voorkomende aandoeningen in de mond en het aanbod aan zorgverlening voor deze doelgroep. Voor de verschillende onderzochte landen zijn de

gegevens eerder schaars en moeilijk onderling te vergelijken door het gebruik van diverse onderzoeksmethoden. Dit toont de nood aan voor het ontwikkelen van een gestandaardiseerde methode om de mondgezondheid van kwetsbare ouderen in Europa in kaart te brengen. Toch kan men concluderen dat in Vlaanderen en in de meeste andere Europese landen de mondgezondheid van deze doelgroep onvoldoende scoort.

Hoofdstuk 2 gaat aan de hand van een cross-sectioneel onderzoek na op welke manier mondzorg verleend wordt in woonzorgcentra in de regio Gent. De manier waarop mondzorg verleend wordt verschilt sterk tussen de verschillende woonzorgcentra en gebeurt eerder op een ad hoc basis. De kennis van de zorgverleners en de betrokkenheid van de directie blijken belangrijk in het verklaren voor deze verschillen.

De mondhygiëne van de bewoners van deze woonzorgcentra (hoofdstuk 3) scoort in vergelijking met gelijkaardig onderzoek in het buitenland zeer laag. Verder blijkt dat heel wat omgevingsfactoren (eigen aan het woonzorgcentrum) en factoren eigen aan de oudere zelf een invloed hebben op de kwaliteit van hun mondhygiëne.

Hoofdstuk 4 behandelt het aanbod aan tandheelkundige zorgverlening aan ouderen in woonzorgcentra en de mening van tandartsen ten opzichte van nieuwe inzichten in een collectieve aanpak. Rekeninghoudend met de beperkte externe validiteit van de resultaten kon geconcludeerd worden dat de organisatie van tandheelkundige zorgverlening slechts sporadisch gebeurt en veeleer curatief dan preventief gericht is. Jonge tandartsen staan open voor het behandelen van kwetsbare ouderen in woonzorgcentra maar eerder op individuele basis. Met het ouder worden zijn tandartsen minder vlug geneigd behandelingen in woonzorgcentra of aan huis uit te voeren.

Het doel van hoofdstuk 5 was na te gaan of de al of niet gekregen opleiding in geriatrische tandheelkunde een invloed heeft op de kennis van pas afgestudeerde tandartsen (2004, 2005 en 2006) in België over het fenomeen 'ouder worden' en hun attitude ten opzichte van ouderen die in woonzorgcentra verblijven. Er bestaan grote verschillen in het aanbod aan geriatrische tandheelkunde aan de verschillende universiteiten en dit aanbod is beperkt. De kennis over het ouder worden van deze pas afgestudeerde tandartsen is gering en hun attitude ten overstaan van ouderen in woonzorgcentra is negatief. Ondertussen is een inhaalbeweging merkbaar binnen de Europese tandheelkundige scholen.

Het AMOR en ABRIM onderzoek

Het integreren van innovatieve zorg blijkt een moeilijk probleem. Dit is niet anders voor het integreren van mondzorg in het dagelijks zorgaanbod. In hoofdstuk 6 wordt het effect nagegaan van het implementeren van een protocol voor mondhygiëne bij ouderen in woonzorgcentra (AMOR). Na 5 jaar blijft de kwaliteit van de mondhygiëne onvoldoende. De beoogde verbetering wordt sterk beïnvloed door factoren intrinsiek aan het woonzorgcentrum.

Hoofdstuk 7 beschrijft in het kort het doel en de essentie van de richtlijn mondzorg voor zorgafhankelijke cliënten in verpleeghuizen. Deze richtlijn werd ontwikkeld door een multidisciplinaire groep artsen, tandartsen en mondhygiënisten in Nederland op basis van een uitgebreid literatuuronderzoek. Voor het implementeren van deze richtlijn in Vlaanderen werden uitvoeringsprotocollen[4] ontwikkeld rekening houdend met de bevindingen uit de vorige hoofdstukken.

Gedurende een 6 maanden durend onderzoek (ABRIM) waarbij de implementatie van de uitvoeringsprotocollen actief werd begeleid, werd het effect nagegaan op de mondhygiëne van ouderen in 6 woonzorgcentra in West-Vlaanderen en Vlaams-Brabant (hoofdstuk 8). In dit hoofdstuk wordt de begeleide implementatie beschreven voor het onderzoek, dat zowel in Vlaanderen als in Nederland werd uitgevoerd. Dit onderzoek toont aan dat in Vlaanderen, na 6 maanden begeleid implementeren, enkel de gebitsprothesen beter gepoetst werden. Opnieuw blijkt dat factoren intrinsiek aan het woonzorgcentrum een belangrijke invloed hebben op het resultaat.

Bij de aanvang van beide implementatie onderzoeken werden ook gegevens verzameld in verband met het implementatieproces aan de hand van een kwalitatief onderzoeksdesign. Hoofdstuk 9 bevat de neerslag van dit deel van het onderzoek aan de hand van een classificatiemodel van de opgespoorde belemmerende en bevorderende factoren die hun invloed hebben gehad op het effect van beide implementatieprocessen. Een groot aandeel gerapporteerde drempels komt overeen met drempels reeds vermeld in de literatuur. Nieuw gevonden factoren zijn het zelfbeschikkingsrecht en de toestand van de mondgezondheid van de residenten, het omgaan van zorgverleners met de eigen mondzorg en de zichtbaarheid van de mondproblemen. Vraaggestuurde mondzorg werd vermeld als een belangrijke stimulerende factor.

---

4 De uitvoeringsprotocollen kunnen opgevraagd worden via Luc.DeVisschere@UGent.be

Conclusie

Zoals in andere landen van Europa baart de mondhygiëne van de ouderen in woonzorgcentra in Vlaanderen grote zorgen. De aanpak van dit probleem dient multidisciplinair te gebeuren. Er is nood aan het aanpassen van de opleiding van artsen, tandartsen, verpleegkundigen en zorgkundigen met aandacht voor theoretische en praktische aspecten van mondzorg. Naast het verhogen van de kennis dient ook de attitude te wijzigen. Het inte-greren van mondzorg in de dagelijkse zorg van kwetsbare ouderen in woonzorgcentra blijkt bijzonder lastig. Richtlijnen en protocollen dienen verder aangepast aan de bestaande noden en goede implementatiestrategieën dienen verder ontwikkeld te worden rekeninghoudend met de aanwezige belemmerende en bevorderende factoren. De hoeksteen van deze aanpak is zonder twijfel adequate dagelijkse mondhygiëne. Mondgezondheid dient onlosmakelijk verbonden te worden met de algemene gezondheid en mondzorg dient geïntegreerd in het dagelijks zorgaanbod. In een maatschappij die zich zelf respecteert hebben ook 'alle' kwetsbare ouderen fundamenteel recht op kwalitatieve en toegankelijke gezondheidszorg.

DANKWOORD

DANKWOORD

Voor het schrijven van wetenschappelijke bijdragen leren we de studenten de ik- of wij-vorm niet te gebruiken. In een voorwoord van een proefschrift mag daarvan afgeweken worden, vandaar…

Mijn eerste woorden van dank gaan uit naar mijn broer Patrick om mij als doctorandus vooraf te gaan in 1981. Ik herinner me nog tijdens zijn openbare verdediging dat ik mezelf wijsmaakte dat wat hij kon ik misschien ook moest kunnen. Wie kon toen vermoeden dat Prof. Jacques Vanobbergen mij 25 jaren later zou overtuigen deze uitdaging aan te gaan.

Toen ik in 1994 als vrijwillige bestuurder van het St-Anna rusthuis te Wingene voor het eerst in contact kwam met het reilen en zeilen in de intramurale sector werd ik zeer snel aangenaam verrast door het vriendelijk onthaal van zowel bewoners als zorgverleners. In de daarop volgende jaren werd ik als tandarts echter ook geconfronteerd met de zeer bescheiden aandacht voor mondzorg. Ongeveer 10 jaren geleden brachten Professor Jacques Vanobbergen (promotor van dit proefschrift) en ikzelf, samen met studenten tandheelkunde, onze eerste bezoeken aan rust- en verzorgingstehuizen om mondgezondheid te promoten. Van bij de aanvang ervaarden wij dankbaarheid en respect van de bewoners en een grote leergierigheid en welwillendheid van de zorgverleners. Een stimulerende ervaring die ons in de volgende jaren zou drijven naar een mix van menselijke contacten en boeiend wetenschappelijk onderzoek met dit proefschrift als resultaat.

Voor ingewijden is het duidelijk dat bij het tot stand komen van een proefschrift zelden de promovendus alleen betrokken partij is. Het was een lange weg, een zoektocht naar kennis en inzicht, met de hulp van velen die ik hierna wil danken, wellicht met het gevaar iemand te vergeten. Aan diegenen nu reeds een oprecht dank u wel.

Mijn eerste woorden van dank gaan uit naar alle bewoners, zorgverleners en directieleden die deelnamen aan verschillende onderzoeksprojecten. Methodologie in onderzoek kan streng zijn en zo werd ons opgelegd om onaangekondigd metingen uit te voeren, wat voor jullie niet altijd zo evident was. Hiervoor onze oprechte excuses. Binnen de intramurale zorg wens ik een speciaal woord van dank te betuigen aan de directeurs en medewerkers van de Groepering van voorzieningen van ouderenzorg, in het bijzonder aan Bernard, Linus en Hans. Op misschien voor jullie niet onmiddellijk te duiden momenten was jullie steun, jullie woord, jullie interesse een drijfveer voor mij om door te zetten.

Woorden van dank ook voor alle tandarts-onderzoekers die op professionele wijze en met zin voor wetenschappelijk onderzoek de klinische onderzoeken hebben uitgevoerd, in het bijzonder voor Prof. Joke Duyck. Joke, desondanks je volle agenda stond je er op 'zelf' deel te nemen als onderzoeker. Woorden van dank ook voor alle studenten tandheelkunde voor hun inzet voor verschillende onderwijsprojecten en voor het uitvoeren van de klinische onderzoeken. Dank aan Lize De Meyer voor het deelnemen aan het kwalitatief onderzoek, aan Faris Younes voor het discreet uittikken van kwalitatieve interviews en voor dr. Ellen De Schepper voor de ondersteuning in de statistiek. Bijzondere dank voor mevrouw Andrea Engl en Ariane Stengers van de firma Gaba International voor het financieel ondersteunen van de datacollectie.

Christine, Wouter en Nele, Tom en Marlies en Josefien. Ik mag terecht zeggen dat ik een geweldige familie heb. Dank om me blijvend aan te moedigen en te steunen. Dit proefschrift was meer dan 'af en toe' de oorzaak van fysieke en mentale afwezigheid in onze familiekring. Wouter, dank voor de accurate ICT-EHBO, Nele, Tom en Marlies, voor de blijvende interesse in de voortgang en de vele aanmoedigingen en Josefien, naast je steun en zin voor perfectie, voor het nauwgezet ingeven van bijzonder veel data. Jullie hulp en steun was voor mij een bijzondere ervaring, namelijk nu eens geholpen te worden in plaats van te helpen, terugdenkend aan jullie studietijd. Misschien een knipoog naar mijn oude dag. Christine nog een bijzondere merci voor het ingeven van de vragenlijsten, je steun, je kritische nalezingen en je zin voor realiteit. Hopelijk is de periode van 'proefschriftweduwe' nu voorbij.

Sara, jij studeerde niet alleen op het juiste moment af maar ook op de juiste plaats, aan onze tandheelkundige school. Jij besliste vrij snel in te gaan op mijn vraag om in Wingene uw beroep uit te oefenen. Zo verlichtte je voor mij de druk van het alleen runnen van een solopraktijk en bleef voor mij de combinatie studenten- en patiëntenzorg en het voltooien van dit onderzoek mogelijk. Sara, jij leerde Thomas kennen op voor mij althans het juiste moment. Als promovendus en met ervaring in grafische aanpak verzorgde hij op professionele wijze de layout van dit proefschrift. Sara en Thomas dank u wel.

Voor niet ingewijden is de P8 de tandheelkundige school van de universiteit Gent en sedert meer dan 34 jaren deels mijn biotoop. Alle medewerkers en alle professoren van de P8 wil ik hier dan ook danken voor de ontelbare aangename momenten, voor de collegialiteit

en vriendschap, voor jullie respect, voor de aan mij geboden kansen. Voor meerderen was ik ooit één van jullie leermeesters. Gedurende dit proefschrift vond ik het een eer en genoegen jullie student te mogen zijn. Voor Dr. Hilde Browaeys, speciaal een woord van dank voor de vlotte samenwerking en het continueren van de patiëntenzorg als ik er eens niet kon zijn. Een bijzonder woord van dank voor Prof. Emeritus Luc Dermaut en Prof. emeritus Jan De Boever. Tijdens mijn studententijd en pril assistentschap begon jullie universitaire loopbaan. Zonder twijfel hebben jullie op de één of andere manier een aandeel gehad in dit proefschrift. Binnen de P8 is de afdeling 'maatschappelijke tandheelkunde' een groep van enthousiaste sociaal geëngageerde medewerkers die elk op hun manier direct of indirect hun steentje hebben bijgedragen tot dit werkstuk. Jackie, Eddy, Griet, Barbara en Marie, een bijzonder dankwoord voor jullie luisterend oor, de prettige sfeer, de inspirerende babbels, de stimulerende reflecties en surplus voor Marie, voor de "ontstressende" zoetigheden.

Het Belgisch-Nederlands Consortium Onderzoek Mondzorg voor Ouderen (Benecomo) is een groep wetenschappers (artsen, tandartsen en mondhygiëniste) uit Vlaanderen en Nederland, geïnteresseerd en geëngageerd in onderzoek over mondzorg bij kwetsbare ouderen. Deze groep ontstond naar aanleiding van dit proefschrift. Beste Benecomoërs, dank voor de vele contacten, overlegmomenten, discussies, anekdotische verhalen in binnen- en buitenland en de vanzelfsprekendheid kennis te delen. Jackie, Jos, Cees en Rob, binnen deze groep zijn jullie de professoren, de inspirators, de begeleiders. Dank voor jullie overtuiging, gedrevenheid en expertise. Gert-Jan is arts ouderenzorg. Gert-Jan, het tweede deel van mijn proefschrift voltrok zich in een intense samenwerking met je. Dit was voor mij een boeiende, verruimende en verrijkende ervaring. We hebben samen cursussen gevolgd, tandarts-onderzoekers gekalibreerd, verpleeghuizen en woonzorgcentra bezocht, onze ideeën uitgedragen en vooral veel intense discussies gevoerd. Met belangstelling kijk ik uit naar de resultaten van je gelijkaardig onderzoek in Nederland. Ik wens je veel geluk bij het voltooien van je proefschrift en op mij kan je verder rekenen. Verder ook succes aan Kersti, Claar, Nelleke, Dennis en Barbara. Hopelijk mogen jullie binnen onafzienbare tijd ook een dankwoord uitschrijven voor jullie promotieonderzoek. Kersti, voor jouw speciaal een bijzondere appreciatie voor al je 'visites', zoals je die zelf noemde, in onze Vlaamse rusthuizen.

Prof. dr. Jos Schols en Prof. dr. Ronald Verbeeck zijn beiden lid van de begeleidingscommissie. Jos, uw enthousiasmerende gesprekken, uw engagement, uw inzet spijts een bijna onmogelijke agenda doen mensen bergen verzetten. Je draagt het menselijk aspect hoog in het vaandel en dat siert je. Jos, dank je wel. Ronald, jij leerde mij jaren terug als tandarts ook 'materiaalkundig' te denken en je wakkerde mijn interesse voor het uitvoeren van onderzoek aan. Mijn voorkeur ging uiteindelijk uit naar onderzoek met een sociale inslag. Dank voor de aangename, inspirerende en leerrijke gesprekken die beslist op mij invloed hebben gehad.

Promotor (Prof. dr. Jacques Vanobbergen), co-promotor (Prof. dr. Cees de Baat), leden van de begeleidingscommissie (promotor, co-promotor, Prof. dr. Jos Schols, Prof. dr. Ronald Verbeeck), en leden van de leescommissie (Prof. dr. Nele Van Den Noortgate, Prof. dr. Linda Van Den Berghe, , Prof. dr. Joke Duyck en Prof. dr. Rob Schaub) en leden van de examencommissie (Prof. dr. Guy Vanderstraeten (voorzitter), Prof. dr. Nele Van Den Noortgate, Prof. dr. Linda Van Den Berghe, Prof. dr. Joke Duyck , Prof. dr. Rob Schaub en Prof. dr. Roeland De Moor (secretaris), dank voor jullie beoordeling, het kritisch nalezen van dit werkstuk en de inspirerende suggesties die onbetwist een meerwaarde hadden die ik bijzonder weet te appreciëren.

Cees, je onmiddellijk 'JA' om co-promotor te willen zijn voor dit proefschrift blijft voor altijd in mijn gedachten. Je aarzelde geen moment en dit deed mij toen reeds besluiten dat ik op je zou kunnen rekenen. Gedurende meer dan 4 jaar, ondanks de lange afstand tussen Nijmegen en Gent, was je altijd zeer snel nabij via email. Dank voor uw expertise, betrokkenheid en passie om teksten in het correcte Engels neer te zetten.

Jackie, ik herinner mij nog heel goed ons eerste gesprek ergens in 1999 tijdens het volgen van een postgraduaat cursus. Jij bereidde toen, samen met Prof. dr. Luc Martens de grondlegger van de maatschappelijke tandheelkunde, de oprichting voor van een aparte afdeling maatschappelijke tandheelkunde binnen de vakgroep tandheelkunde. Luc en Martine, bij deze ook merci voor jullie ingesteldheid en appreciatie ten opzichte van onze gelijkaardige doelstellingen. Jackie, ik had toen bijzonder veel geluk je als de 'right man on the right place and at the right time' tegen het lijf te lopen. En wat voor een lijf, fysiek en mentaal bijzonder sterk, bijna onuitputtelijk. De vele mails tot in de vroege uren toe, getuigen van je inzet, wilskracht en overtuiging. Je motto is goede gezondheidszorg te

realiseren voor iedereen en vooral voor risicogroepen. Kon ik, met mijn probleem van onvoldoende mondzorg voor kwetsbare ouderen, iemand beters tegen het lijf lopen? Kon ik een betere promotor treffen? Eventjes heb ik getwijfeld, maar toen ik hoorde dat je dit jaar in juli te voet naar Compostella zou gaan om dit proefschrift te doen slagen, nam dit alle twijfel weg. Last but certainly not least dank voor je leermeesterschap, je nauwgezetheid, je intellectuele en warme menselijke steun en je altijd aanwezige glimlach. Ik hoop dat dit proefschrift de aanzet kan zijn voor een betere mondzorg voor kwetsbare ouderen. Dit lijkt mij de meest gepaste dank u wel die ik je kan geven. Voor Carmen meer dan één woord van dank om gedurende de voorbije jaren beslag te hebben gelegd op Jackie en vooral ook voor de aangename en markante babbels.

CURRICULUM VITAE

Luc De Visschere

Geboren te Ruiselede op 28 februari 1953.

Opleiding:

1971: Algemeen Secundair Onderwijs aan het St.-Barbaracollege te Gent

1974: Kandidaat in de geneeskundige wetenschappen aan de RUG

1976: Licenciaat in de Tandheelkunde aan de RUG

1976: Tandartspraktijk te Wingene en assistentschap aan de afdeling Restauratieve Tandheelkunde (1976-2003) aan de Universiteit Gent.

Heden:

- wetenschappelijk medewerker van de Maatschappelijke Tandheelkunde (sinds 2000)
- tandarts-coördinator verantwoordelijk voor de Algemene Diagnose aan de Kliniek voor Tand- Mond- en Kaakziekten (UGent) (sinds 2004)
- wetenschappelijk medewerker aan de Artevelde Hogeschool te Gent (sinds 2009)
- wetenschappelijk expert project mondzorg voor personen met specifieke noden (Riziv-project)

Hij verzorgt lesopdrachten in het domein van de Maatschappelijke Tandheelkunde en de Algemene Diagnostiek en Behandelingsplanning. Hij is auteur en mede-auteur van rapporten in opdracht van het RIZIV en het Federaal Kenniscentrum voor Gezondheidszorg (KCE). Als bestuurder van de Groepering van voorzieningen voor ouderenzorg vzw (GVO) heeft hij kennis en ervaring betreffende de organisatie van de intramurale ouderenzorg. Hij coördineert diverse mondgezondheidsprojecten in woonzorgcentra en in het universitair ziekenhuis. Hij is auteur van diverse publicaties over mondzorg voor zorgbehoevende ouderen.

Hij is lid van de European Association of Dental Public Health, councillor van de European College of Gerodontology en mede-oprichter van Benecomo, een Belgisch-Nederlands consortium mondzorg.

ISBN: 978 90 382 1678 2

Graphic design: Thomas Ameye
Printed by: Academia Press — Scientific Publishers — B-9000 Gent

The development and application of an oral health care model for institutionalised older people

Luc De Visschere

Adequate oral health is an essential part of general health in all age groups, but in particular in older age groups. Good oral health is a prerequisite to physical, mental and social wellbeing and quality of life. Adequate and accessible oral health service is a fundamental right of "all" vulnerable older people living in a community. This doctoral thesis demonstrates inadequate oral health and oral health care delivery in institutionalised older people and concerns the development and application of an oral health care model for older people in nursing homes emphasizing the integration of oral health care into daily care.

Thesis submitted in partial fulfilment of the requirements for the degree of 'Doctor in de Tandheelkunde'.

2010, Ghent University (Belgium)

Promotor:	**Prof. dr. Jacques Vanobbergen – Ghent University**
Co-promotor:	**Prof. dr. Cees de Baat – Radboud University Nijmegen Medical Centre (RUNMC)**
Advisory committee:	**Prof. dr. Jacques Vanobbergen – Ghent University**
	Prof. dr. Cees de Baat – RUNMC
	Prof. dr. Jos Schols – Maastricht University
	Prof. dr. Ronald Verbeeck – Ghent University