

## Factors contributing to the variation in oral hygiene practices and facilities in long-term care institutions for the elderly

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**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 Gent (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 Gent remains unexplained. Knowledge, mean age and managerial behaviour were the most likely explanatory variables.

**Key words:** Institutionalised elderly, nursing homes, oral health, oral hygiene

### 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 (Lebrun, 2001).

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 (Heeren and Thewys, 1999).

No epidemiological data exists on the oral health of 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 (Mattson *et al.*, 1990; Shay, 1994). 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 (Holmes, 1998). Since ageing people become more vulnerable it is recommended that oral hygiene

should be an integral part of total care (Sumi *et al.*, 2001). Oral health has been reported as an important component of overall health, wellbeing, and quality of life of institutionalised elders (Coleman, 2002). It appears that the oral hygiene of institutionalised elderly people is poor (Jokstad *et al.*, 1996; Knabe and Kram, 1997; MacEntee *et al.*, 1987; Vigild *et al.*, 1993). Not only the oral hygiene status of the remaining teeth scored low (Frenkel *et al.*, 2000; Jokstad *et al.*, 1996) but also most denture-wearing patients living in nursing homes do not keep their prostheses clean (Frenkel *et al.*, 2000; Pietrovski *et al.*, 1995). The number of natural teeth (Lester *et al.*, 1998; Mattson *et al.*, 1990), workload of personnel (Weeks and Fiske, 1994), the degree of functional dependency (Berkey *et al.*, 1991), uncooperativeness of residents (Hardy *et al.*, 1995; Wardh *et al.*, 1997) and the lack of knowledge of the personnel employed in nursing homes are barriers to the practice of good oral care (Adams, 1996; Holmes, 1998; MacEntee *et al.*, 1999; Sumi *et al.*, 2001; Wardh *et al.*, 1997). On the other hand the willingness of staff to provide care stimulates initiatives to promote oral care (Adams, 1996; Frenkel, 1999).

Some authors promote the need for successful oral health programmes (Hardy *et al.*, 1995; De Baat *et al.*, 1993; Ettinger, 1992; Johnson and Lange, 1999), dental management (Knabe and Kram, 1997), assessments, strategies and standards (Adams, 1996; Call *et al.*, 1986), procedures and facilities and protocols of care for this population (Berkey, 1996; Hoad-Reddick, 1991; Kambhu and Levy, 1993; Logan *et al.*, 1991; Strayer and Henry,

1996). 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 Gent 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 were 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 ( $p < 0.001$ ). 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.

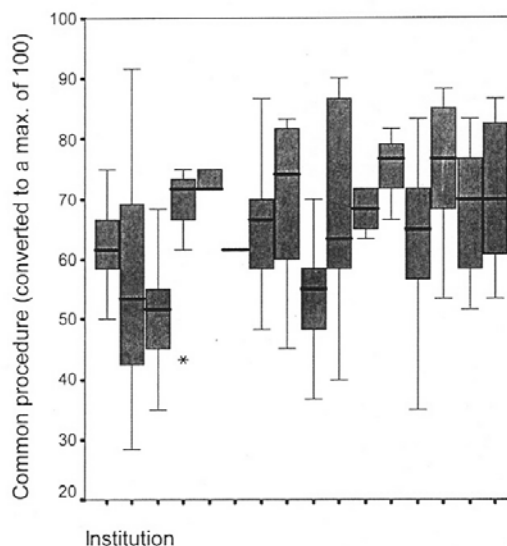
The results of the bivariate correlation analysis between the 'common procedure' used in the institutions to perform oral hygiene with their residents (global measure) and the different explanatory variables are shown in Table 3. A significant positive correlation was found for 'knowledge of personnel' ( $p < 0.001$ ), supportive and directive behaviour of the management ( $p < 0.001$ ). A negative correlation was found for the mean age of the

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

	Mean	SD
<b>Global measure</b>	<b>64.9</b>	<b>13.20</b>
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
<b>Work-climate</b>		
Supportive behaviour of director	69.24	17.59
Directive behaviour of director	49.42	16.64
Committed behaviour of caregivers	67.67	8.65
Independent behaviour of caregivers	68.03	14.66
<b>Knowledge of personnel</b>	<b>53.77</b>	<b>8.44</b>



**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.

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.

**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 director	0.36	<0.001
Directive behaviour director	0.35	<0.001
Committed behaviour personnel	0.13	0.06
Independent behaviour personnel	-0.01	0.86
Knowledge 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

	$\beta$	B	(SE)	95% CI	p	Collinearity statistics VIF	Durbin-Watson
Constant		72.635	(17.630)	37.842-107.427	0.000		
Knowledge	0.299	0.510	(0.114)	0.286-0.735	0.000	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

R<sup>2</sup> = 0.304 p = 0.045

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 values show that the strongest unique contribution, explaining the dependent variable, is found in the variable 'knowledge of the caregivers' ( $\beta=0.30$ ), followed by 'mean age' ( $\beta=-0.20$ ) and then 'directive behaviour of the management' ( $\beta=0.19$ ). This model resulted in a Durbin-Watson value of 1.63 and a Variance Inflation Factor ranging from 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 assessed 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 (1991) who concluded that regular dental control and assistance with oral hygiene were often thought to be unnecessary by the management. Kambhu and Levy (1993) reported that the oral hygiene assessment procedures, used in some retirement homes, appear to be deficient. A lack of assessment and documentation was highlighted by Adams (1996). Sumi *et al.* (2001) mentioned that caregivers have little experience of systematic oral care.

Hardy *et al.* (1995) found that nursing aides generally provided daily oral hygiene services to nursing home residents. 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.* (1995). 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 (1993) 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.

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 (1994) 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.

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 contrary to the study of Wardh *et al.* (1997) who found differences in willingness and attitude. A possible explanation could be the difference in tasks of nurses and home care aides between Swedish and Belgian nursing homes. Belgian nursing homes paid more attention to 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 (1991) 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. The same conclusion was reported by de Baat *et al.* (1993) who interviewed the staff of 300 nursing homes. It is important to reference the study findings of Johnson and Lange (1999) 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.

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 (Adams, 1996). In particular, caregivers are poor at recognising oral disorders and assisting with oral hygiene (MacEntee *et al.* 1999).

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 percent 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 optimise oral health programmes for institutionalised elders.

A structured oral health protocol that provides dental status information of residents on admission (Hoed-Reddick, 1991) and the subsequent development of an individual oral hygiene protocol together with regular dental examination (Ettinger, 1992) has been suggested as an important part of an intervention programme to obtain acceptable levels of oral care of institutionalised elderly (Adams, 1996; Berkey, 1996; Hardy *et al.*, 1995; Knabe and Kram, 1997; Nitschke and Hopfenmüller, 1991). Adequate training of personnel to handle this protocol must be the first step together with the development of information programmes 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 suggest that increasing the knowledge of the caregivers and that 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.

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