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ABSTRACT

The aim of this study was to test the inter-rater reliability of a revised oral assessment guide (ROAG) for patients residing in a geriatric rehabilitation ward. A consecutive sample of 140 patients was recruited for the study. Oral assessments were performed for 133 newly admitted patients by one registered nurse (RN) during a period of six months. A dental hygienist (DH) carried out 103 oral assessments during the same half-year. For 66 patients, the RN and the DH performed independent assessments. There was an agreement between the RN and the DH in the majority of the independent assessments, except for tongue and teeth/dentures. The percentage agreement exceeded 80 percent. Inter-rater agreement measured by Cohen's Kappa coefficient ranged from moderate to very good and percentage agreement had a range of 58 to 91 percent. The agreement was highest in assessment of voice and swallowing (91%). Assessments of teeth and dentures seemed to be most difficult for the RN to evaluate. ROAG was found to be a clinically useful assessment tool. Additional education and training is needed to improve the reliability of the oral assessments and should include continuous support from a dental hygienist as well as a pictorial manual on how to use the ROAG.

KEYWORDS: Inter-rater reliability, elderly, oral health, oral assessment guide, nursing care.

Inter-rater reliability of an oral assessment guide for elderly patients residing in a rehabilitation ward

INTRODUCTION

The elderly, particularly the institutionalized elderly, face many challenges in maintaining oral health. For example, sickness and the use of medications that affect the salivary secretion rate may be hazardous to the oral health of elderly people.¹⁻³ Chronic diseases that affect functional status may result in decreased ability to carry out daily oral hygiene procedures.^{4,5} Poor oral hygiene, caries, periodontal diseases, oral mucosal lesions, and xerostomia are common among institutionalized elderly persons.^{5,6} Poor oral health may affect general health, nutritional status and the well being of elderly persons.⁷ Assessments of oral health status and interventions designed to improve oral health are therefore an essential component in the nursing care of elderly persons.^{8,9}

An oral assessment tool used routinely by nurses can identify oral health problems and be used to suggest appropriate interventions.^{10,11} Eilers *et al.*¹¹ developed an Oral Assessment Guide (OAG) to evaluate the oral health status among patients who were undergoing bone marrow transplantation (BMT). The OAG was used during radiation and/or chemotherapy treatment in patients who were undergoing BMT. The OAG has been used in several studies among patients with cancer.¹²⁻¹⁵ The OAG also has been modified and tested in a Swedish care setting for patients with hematological problems, who are undergoing chemotherapy. Inter-rater reliability was found to be moderate between a dental hygienist and nurses in this ward.¹⁰

It is possible that a modification of the OAG may be used to evaluate oral health problems in the nursing care of elderly persons. If so, the reliability of such a tool has to be investigated to prove its value in this patient group. The stability of the measurements can be judged by testing the degree of agreement between different observers (inter-rater reliability).¹⁶

The aim of this study was to test the inter-rater reliability of an oral assessment guide revised for use among elderly patients residing in a rehabilitation unit.

MATERIALS AND METHODS

The study was carried out in a geriatric rehabilitation ward of a hospital in the south of Sweden. The patients primarily were admitted to the ward for rehabilitation after a stroke. Prior to this study, no standardized oral assessments had been performed; as part of this study, oral assessments were completed for each patient on admission. A consecutive sample of 140 patients admitted from November 1996 to May 1997, were included in the study. Oral assessments were performed by a registered nurse (RN) at the beginning of the hospital stay for 133 patients, 48 men and 85 women. Three patients refused the oral assessment, and for an additional four patients, the oral assessment was not performed due to unknown reasons. The mean age was 81-years (range 61-96 years).

Category	Method	Numerical and Descriptive Rating			Procedures
		1	2	3	
Voice	Converse with the patient	Normal	Deep or rasping	Difficulty talking or painful	Consult physician
Lips	Observe	Smooth and pink	Dry or cracked, and/or angular cheilitis	Ulcerated or bleeding	Consult physician or dentist
Mucous membranes	Observe	Pink and moist	Dry and/or change in color, red, blue-red or white	Very red, or thick, white coating Blisters or ulceration with or without bleeding	Consult physician or dentist
Dentures remove	Use light and mouth mirror				
Tongue	Observe Use light and mouth mirror	Pink, moist and papillae present	Dry, no papillae present or change in color, red or white	Very thick white coating Blisters or ulceration	Consult physician or dentist
Gums	Observe Use light and mouth mirror	Pink and firm	Edematous and/or red	Bleeding easily under finger pressure	Support with oral care Consult dentist or dental hygienist
Teeth/dentures	Observe Use light and mouth mirror	Clean, no debris	1) Plaque or debris in local areas 2) Decayed teeth or damage dentures	Plaque or debris generalized	1) Support with oral care 2) Consult dentist
Saliva	Slide a mouth mirror along the buccal mucosa	No friction between the mouth mirror and mucosa	Slightly increased friction, no tendency for the mirror to adhere the mucosa	Significantly increased friction, the mirror adhering or tending to adhere to the mucosa	Support with oral care Artificial saliva substitute
Swallow	Ask the patient to swallow Observe Ask the patient	Normal swallow	Some pain or difficulty on swallowing	Unable to swallow	Consult physician

Figure 1. Revised Oral Assessment Guide, ROAG. Modified from Eilers *et al.* (1988) with permission from Nebraska Medical Center.

A dental hygienist (DH) trained the RN, who had no experience doing oral assessments using the revised oral assessment guide (ROAG) before the start of study. The training session consisted of a lecture on oral health problems and oral assessments performed on five patients by both the nurse and hygienist. The lecture and training session was three hours in length and was carried out three days before the start of the study. The DH visited the ward twice a week and carried out oral health assessments for 103 of the patients. During the study period 66 patients were independently examined by the DH and the RN within 24 hours of each other. The RN had the opportunity to consult the DH if needed during the course of study.

Revised Oral Assessment Guide

The OAG, originally designed by Eilers *et al.*,¹¹ was translated into Swedish and modified by Andersson *et al.*¹⁰ It was further revised for this study focusing on older patients. Eight categories were included in this revised oral assessment tool (ROAG): voice, lips, mucous membranes, tongue, gums,

teeth/dentures, saliva and swallowing (Figure 1). Each category was described and rated according to a score of 1 (healthy) to a score of 3 (severe problems). The modifications in ROAG as compared with OAG used in the previous study in Sweden¹⁰ were made after a review of the literature, followed by suggestions expressed by an expert panel. Accordingly, assessment of angular cheilitis was added to the assessment category "lips," assessment of dryness was added to the assessment category "mucous membranes," assessment of decayed teeth was added to the assessment category "teeth/dentures," and white coating was excluded from the assessment category "gums." Assessment of the tongue was included as a separate category as in the original OAG by Eilers *et al.*¹¹ A method developed by Henricsson¹⁷ was used to assess oral dryness. Procedures to be used when problems in oral status were identified were also included in the ROAG.

Information about the study was given to the patients when they were admitted to the ward. It was stressed that participation was voluntary. The Ethics Committee of the Medical Faculty, Lund University (LU-90-97) had reviewed the proposal and given its approval to the study.

Statistical analysis

Scores were recorded in accordance to the ratings from ROAG (Figure 1). Inter-rater agreement between the oral assessments was calculated for the registered nurse (RN) and the dental hygienist (DH) using percentage agreement and Cohen's Kappa coefficient. Weighted Kappa (K_w) focusing on the degree of disagreement¹⁸ was used except in the assessments categories of "voice" and "gums." The exact Kappa (K) values were based on the frequencies of exact agreements. Agreements by chance were used when calculating assessments of voice and gums since no patient was assessed as having a score of 3. Values < 0.20 were considered as poor, 0.21-0.40 as fair, 0.41-0.60 as moderate, 0.61-0.80 as good and > 0.80 as very good agreement.¹⁹ Investigations of differences between oral assessments performed by the DH and the RN were calculated by using the number and mean value; $p < 0.05$ was regarded as statistically significant. The statistical software package SPSS 8.0 was used for analysis.

RESULTS

In Table 1 inter-rater agreement between oral assessments of

Table 1. Inter-rater agreement between a dental hygienist (DH) and a registered nurse (RN) calculated using percent and Cohen's Kappa coefficient (n=66)

Category	Percent of agreement	Kappa coefficient
Voice	91	0.45 ¹
Lips	86	0.68
Mucous membranes	83	0.58
Tongue	70	0.52
Gums	88	0.67 ¹
Teeth/dentures	58	0.46
Saliva	89	0.53
Swallow	91	0.84

¹Not weighted

Table 2. Number of disagreements between oral assessments performed by a registered nurse (RN) and a dental hygienist (DH) in 66 patients at a geriatric rehabilitation center.

Category	Disagreement in oral assessments performed by the RN in relation to the DH	
	RN assessed a better oral score	RN assessed a worse oral score
Voice	2	4
Lips	4	5
Mucous membranes	7	4
Tongue	9	11
Gums	5	4
Teeth/dentures	24	4
Saliva	7	0
Swallow	2	4

the DH and the RN were measured by Cohen's Kappa coefficient and percentage agreement is presented. The DH and the RN agreed for the majority of the assessments. In all assessment categories except for "tongue" and "teeth/dentures" the percentage agreement exceeded 80 percent. The Kappa coefficient went from moderate to very good agreement, and percentage agreement had a range of 58 percent to 91 percent. Percentage agreement was highest for assessment of voice and swallowing (91%). According to the Kappa coefficient, voice was 0.45 and swallowing 0.84. Assessment of teeth/dentures had a Kappa value of 0.46 which was the lowest percentage agreement (58%).

The oral health status was evaluated using a total of 528 assessments that were completed for 66 patients and were carried out by both the DH and the RN. The number of oral assessment disagreements between the RN and the DH are shown in Table 2. The RN assessed oral health better than the DH in 60 assessments and worse in 36 assessments. "Teeth/dentures" were assessed as being in a better condition for 24 patients by the RN as compared with the DH, and "tongue" was assessed as better for 9 patients and as worse for 11 patients by the RN.

Mean values for each oral assessment carried out by the DH and the RN are presented in Table 3. The most pronounced difference was found for assessments of the teeth/dentures. The mean value of assessments by the DH was higher (1.9) when compared with the RN (1.5). The mean value of the total oral score for ROAG was 10.5 (SD±3.9) for the DH, as compared with 9.9 (±3.4) for the RN.

DISCUSSION

This study analyzed inter-rater agreement between a dental hygienist (DH) and a registered nurse (RN) for an oral assessment guide modified for use in a geriatric rehabilitation ward. The inter-rater agreement ranged from moderate to very

Table 3. Mean value of the oral assessments performed by a dental hygienist (DH) and a registered nurse (RN) in patients at a geriatric rehabilitation center.

Category	Oral assessments performed by DH n = 103	Oral assessments performed by RN n = 133
	Mean ± SD	Mean ± SD
Voice	1.1 ± 0.3 ^a	1.1 ± 0.3 ^e
Lips	1.2 ± 0.4	1.3 ± 0.5
Mucous membranes	1.3 ± 0.5	1.1 ± 0.4
Tongue	1.4 ± 0.6 ^b	1.4 ± 0.6
Gums	1.3 ± 0.5	1.2 ± 0.4
Teeth/dentures	1.9 ± 0.7 ^c	1.5 ± 0.6 ^f
Saliva	1.2 ± 0.4	1.1 ± 0.2
Swallow	1.1 ± 0.4 ^d	1.1 ± 0.4 ^g

Missing data in:

^a16 patients due to aphasia and frailty.

^b1 patient due to difficulty to assess.

^c3 patients due to refused assessment.

^d4 patients due to dysphagia.

^e9 patients due to aphasia.

^f1 patient due to unknown reasons.

^g1 patient due to dysphagia.

good between the RN and the DH.

Interpretation of Kappa values may however be difficult. Altman (pp 407)¹⁸ pointed out that “the value of Kappa depends upon the proportion of subjects (prevalence) in each category” (agreement/disagreement). Even if seemingly good agreement between the examiners occurs this may result in low Kappa values due to skewness in the proportions. In this study, the Kappa coefficient for the “voice” category was low (0.45), although the DH and the RN agreed in 60 out of 66 assessments (91%). It should be noted that assessment of swallowing had the same percentage agreement as for voice. However, the different distribution in cells agreement or disagreement resulted in a higher Kappa value (0.84) (Table 4). Furthermore, assessments for “gums” resulted in a higher Kappa value (0.67) as compared with assessments of voice despite fewer assessments in agreement between the two examiners (Table 5). Although Kappa coefficient often is used to evaluate inter-rater reliability, the results presented in this study may question if Kappa values alone are enough to give an appropriate picture of the results. A combination of Kappa values and a description of the percentage agreement will give the reader more complete information of the distribution on the measurements.

In this study a moderate inter-rater agreement, with a mean Kappa coefficient of 0.59 (range 0.45-0.84), was found between oral health assessments performed by the DH and the RN. This result should be compared with other reports of assessments used for older individuals. The Brief Oral Health Status Examination (BOHSE)⁹ is an assessment tool that includes 10 categories to evaluate oral health status. The mean Kappa coefficient for BOHSE comparing a dentist and the registered nurses assessments was 0.41 (range 0.10-0.82).⁹ The two assessment guides (ROAG and BOHSE) have some corresponding categories (lips, tongue, mucous membranes, gums, and saliva). The descriptions of the ratings are somewhat more detailed in BOHSE. The Kappa coefficient was however considerably lower in BOHSE. This may indicate that ROAG is a more robust assessment tool than BOHSE.

In general, the RN assessed oral health status of the subjects as being better when compared with the assessments by the DH. This is in concordance with the results reported by Henriksen *et al.*,²⁰ who found some lower mucosal-plaque scores when the patients were assessed by a medical nurse compared with a dentist and two dental hygienists. The mucosal-plaque score is the sum of a mucosal and a plaque index. The mucosal and plaque index is rated from 1 to 4.

Kayser-Jones *et al.*,⁹ on the other hand, found higher mean values in total BOHSE score when registered nurses evaluated subjects as compared with those of a dentist. Differences between observers may occur even if the examiners work in the same profession. In the study by Henriksen *et al.*,²⁰ a low inter-rater agreement was found between two dentists in their assessment of the oral mucosa.

The mean value between the DH and the RN was similar for their assessments of the tongue. The percentage agreement was however only 70 percent. This is similar to the results reported by Eilers *et al.*¹¹ and Kayser Jones *et al.*⁹ A low percentage agreement for assessment of tongue may indicate that tongue alterations are difficult to assess. Tongue lesions are common in elderly individuals and can be induced by nutritional deficiencies. Although tongue lesions are often

Table 4. The proportion of agreement and disagreement in 66 assessments of the voice performed by a dental hygienist (DH) and a registered nurse (RN).

		Assessments performed by the RN	
		Normal	Moderate alteration
Assessments performed by the DH	Normal	57	4
	Moderate alteration	2	3

Table 5. The proportion of agreement and disagreement in 66 assessments of the gums performed by a dental hygienist (DH) and a registered nurse (RN).

		Assessments performed by the RN	
		Normal	Moderate alteration
Assessments performed by the DH	Normal	46	4
	Moderate alteration	4	12

benign these changes may cause symptoms interfering with eating and talking.²¹ It is therefore of value to include assessments of tongue changes in an oral assessment guide.

Many of the patients admitted to this ward had experienced a stroke. Dryness of the mouth, candida infection of the throat, and dysphagia related to stroke may be possible reasons why so many of them had problems with swallowing.^{22,23} Identifying swallowing difficulties is a common task in the nursing care of stroke patients.²⁴ The inter-rater reliability was high for the assessment of swallowing. One reason may be that this is something that the nurses are accustomed to assessing in their daily work.

Although the category “teeth/dentures” in the ROAG include a number of items (plaque and debris, decayed teeth, and damaged dentures), the inter-rater agreement was higher in this study than in the study by Kayser-Jones *et al.*⁹ In our study, the Kappa coefficient was 0.46 and the percentage agreement 58 percent. These figures are low but compared with 0.27 and 51 percent, respectively, as reported for oral cleanliness by Kayser-Jones *et al.*,⁹ ours are better.

Better dental care and effective preventive measures have improved the oral health of older adults during the last decades.²⁵⁻²⁷ Hugoson *et al.*²⁷ reported an increase in number of retained teeth from 15 to 18 in 70-year-old individuals between the years 1983 and 1993. Elderly individuals who retain more of their natural teeth run a great risk of developing caries and periodontal disease.^{28,29} Consequently, it will become even more important to identify and treat problems related to teeth and gingiva to reduce the risk of deterioration of the mouth. During their hospitalization, many elderly persons may have difficulties with daily oral care and may need help from the nursing staff. Using an oral assessment

guide such as the ROAG, nursing staff may detect problems at an early stage.

Patients who have had a stroke may suffer from hemiparesis, and oral function may be affected.²⁵ Therefore, oral assessments among this patient group may require patience and time.

The use of ROAG is designed to be an aid for clinical decisions related to the oral health problems of residents in nursing care. Registered nurses should have sufficient knowledge about oral diseases, how to prevent them, and how to use an oral assessment guide. Currently, nursing care personnel lack knowledge in these areas.³⁰⁻³² Arvidson-Bufano *et al.*³³ reported that the accuracy in assessments of oral health status and treatment needs were improved by a training session for nurses. As registered nurses have the responsibility for nursing care, education in oral health and training in oral assessments during basic nurse education is necessary. Before application of ROAG in a nursing care environment, dental professionals must provide oral health education for the nurses. The categories and ratings used in this assessment tool could be improved using colored clinical photographs in a manual. Continued support and education from a dental hygienist may further increase the reliability of these assessments.

CONCLUSION

ROAG seems to be a clinically useful oral assessment tool for use in the nursing care of elderly patients.

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