SCREENING FOR DENTAL CARE NEED AMONG INSTITUTIONALIZED OLDER ADULTS

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Summary

This study formed part of a program of research examining the relationship between self-perceived and clinically defined treatment needs in older adults. It assessed two subjective oral health status indicators that could be completed by non-dental personnel, in terms of their ability to identify institutionalized older adults with a high probability of needing dental treatment: the Geriatric Oral Health Assessment Index (GOHAI) and the Oral Health Impact Profile (OHIP).

Data were analyzed using statistics to determine the accuracy and predictive power of a diagnostic test. Sensitivity, specificity, positive predictive values and positive likelihood ratios for both instruments were low. However, if the results are interpreted more broadly in terms of contemporary concepts of need, the instruments did identify a sub-group whose dental conditions compromised health and well-being and who are, as a consequence, likely to obtain the most benefit from dental treatment. Identifying this group may be important in situations where treatment resources are scarce and must be targeted at those most in need. The utility of these measures as screening instruments is, then, dependent upon the circumstances in which they are used and the aims and objectives of those who use them.

Introduction

It is well documented that institutionalized older adults have a higher prevalence of oral health problems, face significant barriers to accessing care and have lower utilization rates for dental services[1] than other population groups. Surveys of institutionalized older adults consistently have found high rates of dental disease, treatment need and oral health problems. The most common findings are: high levels of untreated periodontal disease, poor oral hygiene, mucosal lesions such as stomatitis, defective dentures and increased rates of decay and urgent problems[2,3,4,5].

Reasons for the reported poor oral health status of institutionalized seniors stem from a variety of factors. These include: a reluctance by many dental professionals to provide care outside the traditional practice setting, lack of adequate facilities within collective living centres (CLCs) for care delivery[3], compromised physical and/or mental health of the residents, financial restraints, family members refusing to allow care, and lack of perceived need by the residents themselves[1,2].

The fact that many older adults in Ontario CLCs are disadvantaged by compromised oral health is an important public health issue. Currently in Ontario there are vast differences in the delivery of dental services provided in CLCs by health units. Only a few have comprehensive programs, such as the one provided by the City of Toronto,[6] while in many areas services are non-existent. Restrictions on resources and declining rates of edentulism in older adults[7,8] likely

means an increase in the dental need and treatment complexity for this population, with reduced ability to identify those who need care under the present system.

Many older adults are not aware that they have oral health problems unless there is a direct impact on their lives of a functional, social or psychological nature. There is a great discrepancy between objectively defined need (clinical) by dental professionals and perceived need (subjective) by residents with the clinical needs always being greater[9]. As Sheiham et al have pointed out, definition of need has in the past been based solely on clinical assessments and has not taken into account impacts on the individual and the perceptions and attitudes of the individuals themselves toward ill health[10]. The fact that similar conditions often produce different evaluations from individuals based on their concepts of health and personal values regarding health, further increases the complexity of defining need[11]. While relatively low levels of disease will have a significant impact on some individuals, relatively high levels of disease will have little impact on others[12]. Consequently, older adults have been known to refuse treatment even when it is offered free of charge because they do not perceive a need[1]. They may feel a problem is due to aging, not a disease process, and seem to accept a certain level of pain and disability as inevitable and generally assess their health quite positively[9].

While subjective evaluations do not measure the extent of disease present, clinical indicators do not assess dental functional status. An example of this is the

clinical measure of decayed, missing and filled teeth[13]. Individuals may have high DMF scores, but report no loss of function. Rosenberg found perceived dental health to be based on; dental symptoms, days of pain, and dental and medical functional status[13]. Drake, when assessing the accuracy of oral self perceptions in the elderly, found that while subjects were generally not able to define the extent of their treatment need, their self perceptions of mouth appearance, chewing ability and mouth health had some relationship to their oral health[9]. Eklund found that older adults' subjective appraisal of their chewing ability correlated with the number of retained natural teeth[14]. While subjects' perceptions had some accuracy when compared to their actual oral health status, many individuals had inaccurate perceptions and those with no perceived need were most likely to have periodontal conditions[9].

Since clinical measures do not measure functional and psychosocial outcomes of oral disorders, several subjective oral health indicators have been developed to determine the impact of oral health problems on the quality of life. Atchison and Dolan (1990) developed the Geriatric Oral Health Assessment Index (GOHAI)[15], Slade and Spencer (1994) the Oral Health Impact Profile (OHIP)[16] and most recently, Leao and Sheiham (1995) developed the Dental Impact of Daily Living (DIDL)[17]. Several studies have utilized these subjective oral health indicators and compared the results with clinical oral health data. Weak but significant correlations have been found between subjective indicators and clinical indicators[12,17]. These results suggest that subjective indicators may have some

predictive ability for identifying individuals with treatment need, but that further investigation is warranted. If it was possible to use these indicators as screening instruments to identify those who need to be targeted most for prevention and treatment, services could be allocated to give the greatest gains to those most disadvantaged by oral health problems[18].

Hoad-Reddick (1991) conducted a study to determine if non-dental care workers in institutional settings could assess need using a simple approach[19]. Care workers utilized a four item questionnaire and examined subjects' dentures outside of the mouth. While care workers could identify the need for repairs and labelling, they were unreliable for assessing wear and cleanliness. However, use of the questionnaire and prosthetic evaluation did help alert caregivers to the fact that some subjects needed dental care. While caregivers were able to identify some subjects who needed care, the limitations of the methodology indicate the need for a screening instrument that can identify both dentate and edentulous subjects who require dental care.

The objective of this study was to evaluate the GOHAI and OHIP in terms of their ability to reliably identify institutionalized older adults who need dental treatment and referral. Instruments used to screen populations must have good predictive ability[18]. Therefore, both were assessed in terms of their sensitivity, specificity, predictive values and likelihood ratios.

Method and Materials

Study design, sample selection and data collection

Older adults living in collective living centres (CLC's) in North York were the target population for the study. The administrators of all CLC's located in North York were contacted for permission to conduct the study. Administrators who agreed were asked to compile a list of residents who could be approached to participate; excluding those who were unable to speak English, too ill to participate or cognitively impaired. The study sample was comprised of the names provided by the administrators.

Two hygienists then approached the residents named on the lists at each CLC and requested their participation. The study, its procedures and confidentiality of data were explained to each resident individually. Signed consent was obtained for each person who agreed to participate.

Survey procedures

The Geriatric Oral Health Assessment Index (GOHAI) and the Oral Health Impact Profile (OHIP) were used alternately to interview the residents who agreed to take part. A brief dental examination to determine dental status and treatment needs followed the interview.

The GOHAI, developed by Atchison and Dolan (1990), was specifically designed to administer to older people in clinical settings. It is a twelve item measure containing questions about oral health related problems such as difficulty chewing, swallowing and speaking, pain and discomfort, being concerned, self-conscious or embarrassed about the health or appearance of the teethor dentures, and avoidance of others because of poor oral health[15] (Appendix A).

The OHIP, developed by Slade and Spencer (1994), consists of 49 items organized into seven sub-scales which address the frequency with which an individual experiences problems in functioning and daily living as a result of oral health problems. It is based on a generic model of disease and its consequences

derived from the World Health Organization's International Classification of Impairments, Disabilities and Handicaps[16]. In order to reduce respondent burden, the OHIP was modified to a sub-set of fourteen items. The two most commonly reported items from each of the seven sub-scales were selected for inclusion in the study (Appendix B). Both instruments utilized a three month reference period and a Likert type response format, although there were differences in the descriptors which constituted this format.

The dental assessment consisted of: dental status, prosthetic status, recession, periodontal status, caries and treatment needs. Clinical findings are documented in a preceding report[20].

Statistical Analysis

For the analysis, GOHAI scores were calculated for each individual by counting the number of statements with the responses "always" or "often". Similarly, OHIP scores for each individual were calculated by counting the number of statements with the responses "very often" or "fairly often".

The analysis involved: 1) descriptive statistics; 2) t-tests to test for differences in mean GOHAI and OHIP scores, between those who did and did not require dental treatment; and 3) the performance of each screening instrument in terms of sensitivity, specificity, predictive values and likelihood ratios. Here, GOHAI and OHIP scores were compared with the 'gold standard' provided by clinical assessments using two-by-two tables. Table 1 provides definitions for the technical terms given above. For this analysis, OHIP and GOHAI scores of 0 were considered negative and those with a score of 1 or more were considered positive.

Results

1. Response and Characteristics of Subjects

The administrators of 21 collective living centres in North York were contacted regarding the feasibility of conducting the study in their facility. Three centres had no eligible residents according to the study's criteria and had to be

excluded. Three homes run by Metro Toronto required that the study be approved by their research committee and the process would require five to six months before a decision could be given. These centres were excluded due to time constraints. Refusals were given for two of the centres contacted. In total, 200 residents from 13 centres participated in the study.

Females comprised 70.5% (n=141) and males 29.5% (n=59) of the study population. The mean age of subjects was 82.6 years (sd=7.50). The age and gender distribution for respondents completing either the OHIP or GOHAI questionnaire is shown in Table 2.

2. Frequency of Reported Oral Health Problems

The most frequent oral health problems reported by OHIP respondents were: 21.1% with difficulty chewing, 15.8% having to avoid eating some foods and 13.7% being worried about dental problems (Table 3). GOHAI respondents indicated that the problems occurring most frequently were: 16.2% having trouble biting or chewing foods such as firm meat or apples, and 15.5% being seldom or never pleased with the looks of their teeth or dentures (Table 3).

3. Mean OHIP and GOHAI scores by dental status

Table 4 shows the mean OHIP or GOHAI scores for dentate and edentulous subjects. Only the differences in mean GOHAI scores were significant ($p < .05$).

4. Frequency Distribution of Scores and Cutoff point determinations

Table 5 shows the frequency distribution of scores for both OHIP and GOHAI. Only 33.6% of the OHIP respondents and 41.0% of GOHAI respondents indicated that they had one or more oral health impacts on a constant or frequent basis. The majority of subjects reporting such impacts indicated only one impact or problem. Since responses were skewed to the lower end of the scale, only analyses using 0/1 as the cut-off to define negative and positive test results were used. Too few cases were available for analysis at more stringent cutoff points of 2 or 3.

5. Mean OHIP and GOHAI scores by treatment need

Mean OHIP and GOHAI scores by five clinically defined treatment need categories are presented in Table 6. The categories periodontal, restorative, surgical and urgent included only dentate subjects, while the prosthodontic category included both dentate and edentulous subjects. Analysis of results found virtually no difference in mean GOHAI scores between subjects who required treatment and those who did not. While the mean OHIP scores were higher for those who did require treatment, none of the differences reached statistical significance.

6. Sensitivity, Specificity, Predictive Values and Likelihood Ratios for OHIP and GOHAI

Table 7 provides the results for the OHIP and GOHAI scores dichotomized into negative and positive at a cutoff point of 1, in relation to clinically defined treatment needs.

Sensitivity and specificity are indicators of the validity of the screening instrument. The sensitivity of the GOHAI with respect to any treatment need was 40.5%, compared to 33.8% for the OHIP. Specificities and positive predictive values were 58.1% and 69.8% for the GOHAI and 67.0% and 71.9% for the OHIP.

When individual categories of treatment need were assessed, sensitivities remained low, ranging from 34.2% to 55.6%. While specificities reached higher levels these values were still not high, ranging from 57.9% to 71.4%. Positive predictive values were almost the same as the pre-test probabilities, as defined by the prevalence of clinically determined treatment needs. The OHIP performed marginally better than the GOHAI. However, values that were improved over the pre-test probabilities were still low and associated with low sensitivity. For example, the positive predictive value for restorative need using OHIP was 65.2% vs 56.1% prevalence, yet the sensitivity was only 42.9%.

Positive likelihood ratios for overall treatment need and specific categories of treatment need were very low for both GOHAI and OHIP. They ranged from .8

to 1.1 for GOHAI and 1.0 to 1.8 for OHIP. The maximum positive likelihood ratio of 1.1 for GOHAI was for surgical treatment need, yet this means that an individual with a treatment need is only 1.1 times more likely to have this result than one without.

Discussion

Neither GOHAI or OHIP performed well as tools for predicting dental treatment need in a population of institutionalized older adults.

The poor performance of these indices as indicators for treatment need is likely due to several reasons. The original intent of subjective oral indicators was to measure the impact of oral health problems, particularly of a functional or psycho-social nature on an individual or within a population. They were not developed specifically to screen for dental treatment needs. Second, many oral health problems are asymptomatic and are unlikely to registrar as impacts until the disease process is advanced. Consequently, many individuals judged by professionals to have disease that needs treating will not be identified by these kind of scales. Lastly, normative need is usually much greater than perceived need, which is determined by functional status, attitudes and perceptions about dental health.

Sensitivity, specificity, positive predictive value and positive likelihood ratios were all low. Positive predictive value is strongly influenced by prevalence and in a situation where disease prevalence is high positive, responses should result in a high positive predictive value[21]. This was not the case, and in many instances the positive predictive value was lower than the prevalence rate when it should have been much greater. The same results could have been achieved if individuals were randomly assigned to "a treatment required" or "no treatment" group without regard to their questionnaire responses.

Although these indicators did not perform very well when assessed according to conventional diagnostic testing statistics, we would suggest that the results need to be interpreted more broadly. The reason for this is that these

subjective indicators are not strictly diagnostic tests. As Sheiham and colleagues[10] have indicated, the functional and social dimensions of oral disorders are themselves indicators of need and should be included in assessments of needs. More recently, Kay[23] has described a taxonomy of dental care need in which need may be normatively or subjectively defined (Figure 1). The overlap between them (segment B) is what in diagnostic testing terms is referred to as sensitivity.

Consequently, although the sensitivities of the subjective indicators were low in terms of identifying those with clinically defined dental care needs, they all identified a sub-group whose dental conditions impact on daily living and who, therefore, are probably most likely to benefit from dental treatment.

If the aim is to identify all those encompassed by the circle on the left, then these subjective indicators are not very good as screening instruments. However, in a time of scarce or diminishing resources, it may be more important to identify those for whom health services will produce the most health gain. In this case, the utility of subjective indicators as screening instruments looks much more promising. Consequently, whether or not these measures are useful will depend on the aims and objectives of those who use them in clinical or public health settings.

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TABLE 1

Definitions of sensitivity, specificity, predictive values and likelihood ratios

		Gold standard: Positive	Gold standard: Negative
Screening test	Positive	A True positive	B False positive
	Negative	C False negative	D True negative

SENSITIVITY	Proportion of subjects with the characteristic under study who have a positive test result: A/A+C
SPECIFICITY	Proportion of subjects without the characteristic under study who have a negative test result: D/B+D
PREDICTIVE VALUE (PV)	Probability of the characteristic under study in a subject given the test result
Positive PV	Probability of the characteristic in a subject with a positive test result: A/A+B
Negative PV	Probability of the characteristic in a subject with a negative test result: D/C+D
LIKELIHOOD RATIO (LR)	Indicates how many times a given test result is more likely to occur in a subject with than without the characteristic under study
Positive LR	Ratio of the probabilities for a positive test result to occur in a subject with than without the characteristics: [A/(A+C)] / [B/(B+D)]
Negative LR	Ratio of the probabilities for a negative test result to occur in a subject with than without the characteristics: [C/(A+C) / D/(B+D)]

Table 2: Characteristics of study participants

	ALL		GOHAI		OHIP	
	n	%	n	%	n	%
Sex						
Male	59	29.5	31	29.5	28	29.5
Female	141	70.5	74	70.5	67	70.5
Age						
64-84 years	110	57.3	60	58.8	49	54.4
85+ years	82	42.7	42	41.2	41	45.6

Note: Age numbers do not equal gender numbers due to missing values.

Table 3: Frequency of Reported Problems (%)

GOHAI	%	OHIP	%
Limit kind/amount of food	8.6	Difficulty chewing foods	21.1
Trouble biting or chewing	16.2	Trouble pronouncing words	5.3
Problems swallowing	5.7	Sensitive teeth	3.0
Problem speaking	1.0	Had toothache	1.5
Discomfort when eating	3.8	Been worried	13.7
Limit contact with people	1.0	Uncomfortable with appearance	6.4
Not pleased with looks	15.5	Avoid some foods	15.8
Used medication	2.9	Avoid smiling	3.2
Were worried or concerned	9.5	Sleep interrupted	2.1
Felt self-conscious	12.6	Concentration affected	3.2
Uncomfortable eating with others	3.9	Avoided going out	0.0
Sensitive to hot, cold, sweet	2.1	Irritable with people	3.2
		Not enjoy people's company	1.1
		Life less satisfying	2.3

Table 4: Mean GOHAI and OHIP scores by dental status

Dental Status	Mean GOHAI score	Mean OHIP score
Dentate	0.6 (1.0)	0.8 (1.3)
Edentulous	1.3 (1.8)*	0.8 (1.8)

Table 5: Frequency distribution & Means of GOHAI and OHIP scores

GOHAI			OHIP		
Value	**Frequency**	**Valid %**	**Value**	**Frequency**	**Valid %**
0	62	59.0	0	63	66.3
1	20	19.0	1	13	13.7
2	12	11.4	2	10	10.5
3	7	6.7	3	2	2.1
4	2	1.9	4	3	3.2
6	1	1.0	5	1	1.1
7	1	1.0	6	2	2.1
			8	1	1.1
Total	105	100.0	Total	95	100.0

Mean .81
Standard deviation 1.3

Mean .80
Standard deviation 1.5

Table 6: Mean GOHAI and OHIP scores by treatment need

Treatment Need	Mean GOHAI score	Mean OHIP score
Periodontal		
Yes	0.6 (1.0)	1.0 (1.6)
No	0.6 (0.9)	0.6 (0.9)
Restorative		
Yes	0.7 (1.0)	1.0 (1.5)
No	0.6 (0.8)	0.5 (0.9)
Prosthodontic		
Yes	0.8 (1.1)	0.9 (1.5)
No	0.8 (1.4)	0.7 (1.5)
Surgical		
Yes	0.7 (0.9)	1.1 (1.7)
No	0.6 (1.0)	0.6 (1.1)
Urgent		
Yes	0.6 (0.9)	1.6 (2.0)
No	0.6 (1.0)	0.7 (1.1)

Figures in parentheses - standard deviation

Table 7: Sensitivity, specificity, PPV+, PPV-, LR+, LR- of GOHAI and OHIP in relation to clinically defined treatment need

Treatment Need	Prevalence of need (%)	Sensitivity (%)	Specificity (%)	PV+ (%)	PV- (%)	LR+	LR-
GOHAI							
Periodontal	50.0	34.2	57.9	44.8	46.8	0.8	1.1
Restorative	57.9	36.4	59.4	55.2	40.4	0.9	1.1
Prosthodontic	40.0	40.5	58.7	39.5	59.7	0.9	1.0
Surgical	26.3	40.0	62.5	27.6	74.5	1.1	0.9
Urgent	7.6	37.5	61.8	10.3	89.4	0.9	1.0
Any Need	70.5	40.5	58.1	69.8	29.0	1.0	1.0
OHIP							
Periodontal	47.6	36.7	63.6	47.8	52.5	1.0	0.9
Restorative	55.6	42.9	71.4	65.2	50.0	1.5	0.8
Prosthodontic	37.9	36.1	67.8	40.6	63.5	1.1	0.9
Surgical	25.4	50.0	68.1	34.8	80.0	1.6	0.7
Urgent	12.7	55.6	68.6	15.6	93.7	1.8	0.6
Any Need	71.6	33.8	67.0	71.9	28.6	1.0	1.0

PV+ = Positive Predictive Value PV- = Negative Predictive Value
LR+ = Positive Likelihood Ratio LR- = Negative likelihood Ratio

Appendix A: Geriatric Oral Health Assessment Index (GOHAI)

In the past three months:

	Always	*Often*	*Sometimes*	*Seldom*	*Never*
1. How often did you limit the amount of food you ate because of problems with your teeth or dentures?					
2. How often did you have trouble biting or chewing any kinds of foods such as firm meats or apples?					
3. How often did you have problems swallowing?					
4. How often have your teeth or dentures prevented you from speaking the way you wanted?					
5. How often did you have discomfort when eating?					
6. How often did you limit your contacts with other people because of the condition of your teeth or dentures?					
7. How often were you pleased or happy with the looks of your teeth, gums or dentures?					
8. How often did you use medications to relieve pain or discomfort from around your mouth?					
9. How often were you worried or concerned about the problems with your teeth, mouth or dentures?					
10. How often did you feel self-conscious because of problems with your teeth, gums or dentures?					
11. How often did you feel uncomfortable eating in front of other people because of problems with your teeth or dentures?					
12. How often were your teeth or gums sensitive to hot, cold or sweets?					

Appendix B: Oral Health Impact Profile (OHIP)

During the last 3 months, how often:

	Very Often	*Fairly Often*	*Occas-ionally*	*Hardly Ever*	*Never*
1. Have you had difficulty chewing any foods because of problems with your teeth, mouth or dentures?					
2. Have you had trouble pronouncing any words because of problems with your teeth, mouth or dentures?					
3. Have you had sensitive teeth, for example, due to hot or cold foods or drinks?					
4. Have you had toothache?					
5. Have you been worried by dental problems?					
6. Have you felt uncomfortable about the appearance of your teeth, mouth or dentures?					
7. Have you had to avoid eating some foods because of problems with your teeth, mouth or dentures?					
8. Have you avoided smiling because of problems with your teeth, mouth or dentures?					
9. Has your sleep been interrupted because of problems with your teeth, mouth or dentures?					
10. Has your concentration been affected because of problems with your teeth, mouth or dentures?					
11. Have you avoided going out because of problems with your teeth, mouth or dentures?					
12. Have you been a bit irritable with other people because of problems with your teeth, mouth or dentures?					
13. Have you been unable to enjoy other people's company because of problems with your teeth, mouth or dentures?					
14. Have you felt that life in general was less satisfying because of problems with your teeth, mouth or dentures?					