

The Sensitivity of the Geriatric Oral Health Assessment Index to Dental Care

Teresa A. Dolan, D.D.S., M.P.H.

Dr. Dolan is Associate Professor, University of Florida College of Dentistry. Direct correspondence to her at JHMHC, Box 100405, Gainesville, FL 32610-0405. E-mail: TDolan@Dental.UFL.EDU

Abstract: The sensitivity of the Geriatric Oral Health Assessment Index (GOHAI) to dental treatment was evaluated using data from a community-based oral health promotion project. Ninety-six subjects completed baseline and twenty-four-month follow-up interviews that included the GOHAI as well as other self-reported measures of oral health. Subjects were predominantly white, female, not currently married, with less than a high school education, and had average age of seventy-six years at baseline. Through the health promotion project, participants were offered low cost diagnostic and preventive services on a sliding fee basis. At twenty-four months, subjects' records were abstracted regarding the receipt of dental hygiene, transportation, emergency, diagnostic, restorative, and prosthodontic services. Subjects were also asked about dental expenditures in the previous year and the type of dental care received, regardless of the source of care. The mean change in GOHAI scores from baseline to the twenty-four-month interview was 2.2 (std. dev. 6.6) and ranged from -15 to 30. Findings suggest that the GOHAI is sensitive to the provision of dental care, although additional research is needed to understand the impact of various dental services on the individual items of the GOHAI, as well as the overall index score. The potential applications of self-reported oral health outcome measures such as the GOHAI in dental education are discussed.

Key words: oral health, health status measurement, patient outcomes, oral health assessments

Structure, process, and outcome make up the classic triad used to define quality of care.¹ While many quality assessment efforts have focused on structure and/or process measures, there is a growing emphasis on health outcomes as the ultimate indicator of quality of care. Outcomes are the end results of health care. They help us understand what happens to a patient following a dental experience in terms of palliation, control of disease, or rehabilitation.² Outcomes research in dentistry asks global questions such as: What difference does dental care make to a patient? Do patients derive perceptible benefits from their dental care? What treatment works the best?³ To maximize outcomes, a clinician or policy maker should select treatments that are effective and best meet the needs and desires of individuals or groups. This is particularly important to the dental care of older adults, who have a life course of experiences and related abilities or disabilities that can affect the dental care provided.⁴ Care decisions should reflect these experiences and preferences,

and resultant health outcomes should be tracked to evaluate the effectiveness of the care provided.

An assumption accompanying any dental treatment is that the benefits will at least equal, if not outweigh, any negative consequences of that treatment.⁵ Thus, appropriate care, as defined by RAND, is an intervention in which "the expected health benefit . . . exceeded the expected negative consequences . . . by a sufficiently wide margin that the procedure was worth doing."⁶ Outcome measures are needed to assess both the positive and the negative consequences of treatment. This information is essential to all decision-makers—the clinician making treatment decisions with an individual patient, a dental educator working with a student in a clinical teaching program, or a health policy maker or insurer making decisions affecting populations. Thus, the Institute of Medicine's report on the future of dental education focused on four broad health objectives, which included "improving our knowledge of what works and

what does not work to prevent, diagnose, or treat oral health problems.⁷⁷ Dental educators have a central role in encouraging and promoting clinical and health services research to distinguish effective and ineffective oral health services.

General as well as disease-specific patient-based outcome assessments have been developed in both medicine and dentistry to capture the impact of disease and conditions on health status, functional ability, and quality of life. During the past twenty years researchers including Cohen and Jago,⁸ Nikias,⁹ Sheiham,¹⁰ Locker,¹¹ and Reisine¹²⁻¹³ published important papers conceptualizing oral health in broad terms incorporating oral functional abilities, social function, and quality of life, as well as describing sociodental indicators. This research demonstrated that oral diseases impose a significant burden on individuals and communities. Oral diseases can result in work loss, eating restrictions, pain, discomfort, aesthetic dissatisfaction, sleep disturbance, change in dietary habits, and reduced social contacts.

The Geriatric Oral Health Assessment Index (GOHAI)¹⁴ is an example of a patient-based assessment of oral health problems commonly affecting older adults. The GOHAI is intended to comprehensively assess oral problems in a measure that is psychometrically sound and easy to administer in clinical as well as research settings. As a foundation for the development of GOHAI, oral health was defined as freedom from pain and infection and consisting of a comfortable and functional dentition (natural or prosthetic) that allows an individual to continue in his or her desired social role.⁴ Thus, the twelve items of the index assess oral health-related problems affecting people in three hypothesized dimensions: 1) physical function, including eating, speech, and swallowing; 2) psychosocial function, including worry or concern about oral health, dissatisfaction with appearance, self-consciousness about oral health, and avoidance of social contact because of oral problems; and 3) pain or discomfort, including the use of medication to relieve pain or discomfort from the mouth. Subjects are asked if they have always, often, sometimes, seldom, or never experienced any of twelve problems in the previous three months. A simple summative score ranging from twelve to sixty is calculated for each subject, with a higher score indicating better self-reported oral health.

While the GOHAI was evaluated in a cross-sectional study documenting its acceptable psychometric properties,¹⁴ the GOHAI's sensitivity to dental in-

terventions has not been studied. The pilot study evaluates the GOHAI as a potential treatment outcome measure. We hypothesized that the GOHAI could be used to evaluate the effects of dental services provided as part of an oral health promotion project. Specifically, we proposed that the receipt of care would improve an older adult's oral health status and this improvement would be reflected in an improved (higher) GOHAI score.

Methods

Study population. Residents of a federally subsidized, church-affiliated senior apartment complex located in Jacksonville, Florida, participated in an oral health needs assessment as part of an oral health promotion program. Subjects were systematically sampled from among 315 residents of two apartment buildings until the desired sample of 200 participants was achieved. Recruitment strategies included advertising project activities in a monthly newsletter distributed to all apartment residents, mailing each resident an introductory letter describing the project, and inviting all residents to an "Open House" to visit the project office and clinical facilities.

Baseline data. After enrollment including informed consent, participants completed a baseline interview and a clinical evaluation. Approximately 76 percent of those contacted agreed to participate (200 of 263 people approached). Of these, 168 or 83.6 percent agreed to have an oral examination. The face-to-face structured interview was completed either in the patient's apartment or the project office/dental clinic located in one of the apartment buildings, based on the patient's preference. Four trained staff members completed the interviews between March and September of 1990. During the ninety-minute interview, participants were asked about their sociodemographic characteristics including their age, gender, race, income, education, their general and dental health rating (as excellent, very good, good, fair, or poor), and their dentate status (dentate vs. edentulous). The interview included the twelve items of the GOHAI.

Participants were scheduled for an oral examination by one dentist (TAD) generally within two weeks of the interview and were provided feedback regarding any significant clinical findings, as well as recommendations for self-care and referral for dental care, if indicated. Participants were offered low

cost diagnostic and preventive services in the project dental clinic, and grant funds were used to offer dental care at a nearby university-affiliated dental clinic on a sliding fee basis.

Follow-up data. Two years later, 119 subjects or 59.5 percent of the original participants were re-interviewed to assess changes in oral health behaviors and oral health self-reports including the GOHAI; sixteen subjects completed an abbreviated survey instrument which did not include the GOHAI items. The twenty-four-month interview asked all participants to rate their dental health compared to one year ago, if they were currently in need of dental treatment, if they had a regular source of dental care, when was their last visit to the dentist, recent dental expenditures, and services received in the previous year regardless of whether they were provided as part of the project or by a dentist not affiliated with the project. Of the 119 subjects who remained in the study at the twenty-four-month follow-up period, ninety-six subjects had complete data on key variables including the twelve GOHAI items both at baseline and at twenty-four months. Thus, all analyses were conducted on these ninety-six subjects.

Subjects' records were abstracted to document all dental treatment received as part of the health promotion project. Participants who received services through the project had one or more of the following type of encounters: a dental hygiene visit, an emergency visit, a dental examination, a preventive service including oral health education session and/or a fluoride treatment, an operative dentistry visit including the provision of restoration and/or single crowns, removable prosthodontic services including denture adjustments, relines or fabrication of a new prosthesis, and transportation services to dental appointments.

Participants were free to seek dental care privately as well as use services provided by the project. Although we cannot completely control for this possible confounder, we conducted analyses examining changes in GOHAI score in relation to self-reported information on dental expenditures and the use of specific dental services in the previous year, regardless of source of care, collected at the 24-month interview.

An attempt was made to assess the impact of attrition on the analyses at twenty-four months. Subjects who dropped out at twenty-four months either moved (13.9 percent of the original 200 participants), died (11.4 percent), refused (10.9 percent), or moved to a nursing home or were too ill to participate (4.5

percent). There were no statistically significant associations between attrition status and any of the participant characteristics listed in Table 1. There was a trend for subjects over the age of eighty-five years to leave the study, but this was not statistically significant.

Table 1. Baseline characteristics of study participants (n=96)

	n	% ¹
Age:		
65-74 years	37	41.6
75-84 years	37	41.6
85+ years	15	16.9
missing	7	
Gender		
male	20	20.8
female	76	79.2
Race or Ethnicity		
white	82	85.6
non-white	14	14.4
Household Income ²		
< poverty level	41	45.1
100-150 percent of poverty level	28	30.8
> 150 percent of poverty level	22	24.2
missing	5	
Education		
≤ high school graduate	69	71.9
> high school graduate	27	28.1
General Health Rating		
excellent/very good	34	35.4
good	34	35.4
fair/poor	28	29.2
Dental Health Rating		
excellent/very good	31	32.6
good	37	38.9
fair/poor	27	28.4
missing	1	
Dentate status (self-reported)		
dentate (≥ 1 tooth)	53	55.2
edentulous	43	44.8
Most recent dental visit		
within one year	36	37.1
more than one year ago	61	62.9

¹ valid percent (excludes cases with missing values)

² The income levels defining poverty in 1990 are \$6,280 for an individual, and \$8,420 for a family of two (Florida Statistical Abstract, 1990.)

Statistical analysis. Analyses were done using SPSS (SPSS 6.1 Macintosh version¹⁵). Comments about statistical significance refer to probabilities of less than 0.05. Descriptive statistics were generated to characterize the sample. The chi-square and Mantel-Haenszel chi-square trend tests were used for bivariate comparisons when variables were nominal or ordinal, respectively. T-tests and analysis of variance were used for comparisons when variables were on an interval or ratio scale.

GOHAI scale scores at baseline and at twenty-four months were calculated as a simple summation of the twelve items (response set is always=1, often=2, sometimes=3, seldom=4, never=5) after reversing the response set of three items (item 3: swallow comfortably; item 5: eat anything without feeling discomfort; item 7: happy with looks). Thus, the sum of the GOHAI twelve items has a possible range of 12-60. Change in GOHAI score was calculated as the follow-up score minus the score at baseline.

Results

Subject characteristics. At baseline, subjects were predominantly white, female, not currently married, with less than a high school education, and had a mean age of 75.6 years (std. dev. 8.2, range fifty-four to ninety-two) (Table 1). Many of the participants "aged in place," having moved to the apartments when they first opened about twenty-five years ago and when the residents were in the beginning of their seventh decade of life. Consequently, many of the apartment residents are currently in their eighth and ninth decade of life. The predominantly unmarried female sample reflects this circumstance. Most of the respondents had low or moderate incomes; 45.1 percent of the sample had incomes at or below the poverty level, and 75.8 percent had annual incomes of less than \$10,000. Yet, only 10 percent received Supplemental Security Income and 10 percent received Medicaid benefits; 3 percent had private dental insurance. At baseline, 29.2 percent of subjects rated their general health as fair or poor, 28.4 percent of subjects rated their dental health as fair or poor, and 37.1 percent reported having visited the dentist in the previous year.

Edentulism rates at baseline were determined by patient self-report as well as by clinical examination. Because the rates were nearly identical (44.8 percent vs. 44.2 percent, respectively), self-reported

dentate status was used in order to maximize the number of cases analyzed. Subjects had a mean of 10.3 natural teeth (std. dev. 11.5, range 0 - 30). Respondents were not asked about their dentate status at twenty-four months.

Self-reported dental problems. Individual GOHAI item responses at baseline and at twenty-four months are summarized in Table 2. At baseline, subjects most commonly reported that they had trouble biting or chewing any kinds of food, such as firm meat or apples (36.5 percent), were not pleased or happy with the looks of their teeth, gums, or dentures (25.0 percent), and were worried or concerned about the problems with their teeth, gums, or dentures (32.3 percent). Subjects least commonly reported that they limited contacts with people because of the condition of their teeth or dentures (3.1 percent) or were not able to swallow comfortably (4.3 percent).

Subjects were categorized as having changed for the better, for the worse, or stayed the same from baseline to the twenty-four-month follow-up for each of the GOHAI items (the response set was dichotomized as always/often/sometimes vs. seldom/never) (Table 2). The items with the greatest proportion of subjects who moved in a positive direction from baseline to the twenty-four-month interviews were: item 7 (pleased or happy with looks), item 9 (worried or concerned about problems with teeth, gums, or dentures), and item 12 (teeth or gums sensitive to hot, cold, or sweets). Perhaps more importantly, the majority of subjects were unchanged in their responses to each of the twelve items. This is particularly true for items 3 and 6. Very few subjects said they seldom or never could swallow comfortably at both time points. Likewise, few subjects said they always, often, or sometimes limited their contacts with people because of the condition of their teeth or dentures.

We found a statistically significant difference between dentate and edentulous subjects on item 2 at the twenty-four month follow-up; edentulous subjects were more likely to report having trouble biting and chewing ($\chi^2 p < 0.05$). The dichotomized responses to the remaining items were not associated with dentate status.

Change in GOHAI score. The mean change in GOHAI score from baseline to the twenty-four-month interview was 2.2 (std. dev. 6.6) and ranged from -15 to 30 (Table 3). Subjects were categorized as those who had worse GOHAI scores at twenty-four months (n=37), those who stayed the same (n=14), and those who had improved or higher scores (n=45). Change

Table 2. Prevalence of dental problems as measured by the individual GOHAI items at baseline and at the twenty-four-month follow-up interview. Subjects were also categorized as to whether they were better, the same, or worse on the particular item from the baseline to the follow-up interview (n=96).

GOHAI Item In the past 3 months, how often...	Baseline %	24-month follow-up %	Change from baseline to 24-months*		
			Better %	Same %	Worse %
1. did you limit the kinds or amounts of food you eat because of problems with your teeth or dentures? (always/often/sometimes)	17.7	12.5	12.5	80.2	7.3
2. did you have trouble biting or chewing any kinds of food, such as firm meat or apples? (always/often/sometimes)	36.5	30.2	13.5	79.2	7.3
3. were you able to swallow comfortably? (seldom/never)	4.3	1.0	3.2	96.8	0
4. have your teeth or dentures prevented you from speaking the way you wanted? (always/often/sometimes)	11.5	14.6	5.2	86.5	8.3
5. were you able to eat anything without feeling discomfort? (seldom/never)	12.5	9.4	10.4	82.3	7.3
6. did you limit contacts with people because of the condition of your teeth or dentures? (always/often/sometimes)	3.1	2.1	2.1	96.9	1.0
7. were you pleased or happy with the looks of your teeth and gums or dentures? (seldom/never)	25.0	8.4	22.6	73.1	4.3
8. did you use medication to relieve pain or discomfort from around your mouth? (always/often/sometimes)	14.6	10.4	9.4	85.4	5.2
9. were you worried or concerned about the problems with your teeth, gums, or dentures? (always/often/sometimes)	32.3	16.7	20.8	74.0	5.2
10. did you feel nervous or self-conscious because of problems with your teeth, gums, or dentures? (always/often/sometimes)	10.5	10.4	5.2	89.5	5.3
11. did you feel uncomfortable eating in front of people because of problems with your teeth or dentures? (always/often/sometimes)	14.9	13.5	8.5	84.1	7.4
12. were your teeth or gums sensitive to hot, cold, or sweets? (always/often/sometimes)	24.5	9.4	17.0	80.9	2.1

* always/often/sometimes vs. seldom/never

Table 3. Mean (std. dev.) GOHAI score at baseline, at 24 months, and mean change in GOHAI score at the 24-month follow-up period (n=96)

	mean	std. dev	range
GOHAI at baseline	52.7	8.4	24 to 60
GOHAI at 24 months	54.9	5.6	28 to 60
Change in GOHAI	2.2	6.6	-15 to 30

in GOHAI score using the three categories was not associated with the subject's age, gender, race, income, number of chronic diseases, functional health status, or level of social support.

Having a better GOHAI score was associated with having more teeth. Half of the edentulous subjects had worse GOHAI scores at twenty-four months as compared to 28.3 percent of subjects with one or more teeth; only 37.2 percent of edentulous subjects had better scores as compared to 54.7 percent of the dentate group; 11.6 percent of the edentulous and 17.0 percent of the dentate subjects stayed the same (χ^2 $p < 0.05$). Subjects who improved had an average of 12.2 teeth, those who stayed the same had an average of 12.6 teeth, and those who got worse had an average of 7.0 teeth, but this association was not statistically significant (ANOVA, $p > 0.05$).

Effect of treatment. Subjects received an average of 2.3 service types from the health promotion project during the twenty-four months, with 11.5 percent receiving no services, 53.1 percent receiving one service type, and 35.4 percent receiving more than one service type. Subjects who received no dental services from the project over the twenty-four-month period had a mean GOHAI score change of -3.4 as compared to a mean increase of 2.9 for subjects who received one or more services (Table 4). With the exception of emergency dental services (which were provided to only four subjects), the receipt of each type of service, from assistance with transportation to dental appointments, was associated with a positive and statistically significant mean change in GOHAI score from baseline to the twenty-four-month follow-up. We found a moderate correlation between

the number of dental services received by a participant (scored as one point for each service used with a possible range of 0 to 7 services per subject) and change in GOHAI score ($r = 0.36$, $p < 0.01$).

Subjects were more likely to have higher (better) GOHAI scores at follow-up if they received any of the services provided by the health promotion project, with the exception of emergency services. Of the thirty-three subjects who were treatment planned for restorative care, twenty-three or 69.7 percent completed that care, and those who completed the care had a mean 5.5 point increase in GOHAI. Although 73.9 percent of those participants who completed their restorative care had higher GOHAI scores at follow-up, this association was not statistically significant. Subjects who were maintained on preventive recall at either the project clinic or the university-affiliated clinic had a mean change score of 3.8 and were more likely to have higher scores at follow-up than subjects who were not maintained on recall.

Self-reported data from the twenty-four-month interview were used to examine changes in GOHAI score in relation to dental expenditures and types of services received in the previous year, regardless of the source of care. Subjects reported spending an average of \$130.73 on dental care in the year previous to the follow-up interview (std. dev. \$274.35, range 0 - \$1500). The mean change in GOHAI score was associated with dental expenditures and in the expected direction. For example, subjects who spent more than \$100.00 in the previous year on dental care had a mean GOHAI increase of 4.5, and 70.6 percent had higher follow-up GOHAI scores as compared to baseline scores (Table 5). This can be compared to a mean -0.1 change in GOHAI in subjects with no dental expenditure; 72.7 percent of these subjects had lower (worse) GOHAI scores at follow-up than at baseline. Similarly, subjects who received a dental examination, dental cleaning, dental fillings, dental extractions, or new dentures had higher mean GOHAI scores at follow-up as compared to subjects who did not report receiving these services. It is also interesting that having dentures relined or repaired was not associated with change in GOHAI score, but having new dentures made was associated with positive score change.

Table 4. Comparison of mean change in subjects' GOHAI scores over the 24-month follow-up period by type of service provided/coordinated by the health promotion program. Subjects were also categorized as those who had better, the same, or worse GOHAI scores from the baseline to the 24-month interviews.

Type of service	n	GOHAI mean change (SD) ¹	Change from baseline to 24-months ²		
			better %	same %	worse %
Received dental care					
yes	85	2.9 (6.4)	52.9	12.9	34.1
no	11	-3.4 (4.5)**	0	27.3	72.7**
Dental hygiene services					
yes	24	5.3 (7.6)	75.0	12.5	12.5
no	72	1.2 (5.8)**	37.7	15.3	47.2**
Transportation services					
yes	25	6.5 (7.4)	76.0	12.0	12.0
no	71	0.7 (5.5)**	36.6	15.5	47.9**
Emergency services					
yes	4	2.6 (2.2)	75.0	0	25.0
no	92	2.2 (6.7)	45.7	15.2	39.1
Diagnostic services					
yes	82	2.9 (6.5)	52.4	13.4	34.1
no	14	-2.1 (4.9)**	14.3	21.4	64.3*
Dental x-rays					
yes	26	4.9 (7.4)	69.2	11.5	19.2
no	70	1.2 (5.9)*	38.6	15.7	45.7*
Restorative dentistry					
yes	16	6.4 (7.9)	81.8	12.5	6.3
no	80	1.4 (5.9)**	40.0	15.0	45.0**
Removable prosthodontics					
yes	17	6.1 (8.6)	70.6	0	29.4
no	79	1.4 (5.7)**	41.8	17.7	40.5*
Restorative care completed ³					
yes	23	5.9 (7.6)	73.9	8.7	17.4
no	10	0.4 (4.1)*	40.0	30.0	30.0
On preventive recall					
yes	17	5.2 (5.6)	76.5	11.8	11.8
no	74	1.4 (6.5)*	40.5	16.2	43.2*

¹ T-test of means

² Chi-square; * p<0.05, ** p<0.01

³ Includes only those subjects who had operative dentistry procedures planned for completion at either the project clinic or the nearby university-affiliated clinic.

Table 5. Comparison of mean change in subjects' GOHAI scores over the two-year follow-up period by dental expenditure and type of service received during the previous year, regardless of service provider, as self-reported by the participant. Subjects were also categorized as those who had better, the same, or worse GOHAI scores from the baseline to the 24-month interviews for each service type.

	n	GOHAI mean change (SD)	Change from baseline to 24-months ³		
			better %	same %	worse %
Dental expenditure in previous year ²					
none	41	-0.1(4.9)	0	27.3	72.7
0 to \$100	28	3.6 (6.7)	41.2	15.7	43.1
> \$100	24	4.5 (8.0)**	70.6	8.8	20.6**
missing	3				
Dental check-up or examination ¹					
yes	54	5.4 (7.1)	55.6	11.1	33.3
no	42	0.7 (5.4)*	35.7	19.0	45.2
Dental cleaning ¹					
yes	47	3.7 (7.0)	57.4	12.8	29.8
no	49	0.8 (5.7)*	36.7	16.3	46.9*
Dental fillings ¹					
yes	24	4.6 (7.1)	69.6	8.7	21.7
no	73	1.5 (6.2)*	39.7	16.4	43.8*
Crowns, caps or bridges ¹					
yes	10	3.4 (6.2)	50.0	10.0	40.0
no	86	2.1 (6.6)	46.5	15.1	38.4
Tooth or teeth pulled ¹					
yes	12	7.3 (9.1)	83.3	8.3	8.3
no	84	1.5 (5.8)**	41.7	15.5	42.9**
Dentures relined/ repaired ¹					
yes	10	2.3 (7.8)	40.0	0	60.0
no	86	2.2 (6.4)	47.7	16.3	36.0
New dentures made ¹					
yes	12	7.2 (9.2)	83.3	0	16.7
no	84	1.4 (1.5)**	41.7	16.7	41.7*

¹ T-test of means; ² ANOVA; ³ Chi-square; * p<0.05, ** p<0.01

Discussion

There is a growing body of literature supporting the importance of assessing oral health status in a broad context which includes the impact of oral conditions on the overall functioning and well-being of individuals. Several measures have been developed to "capture" this dimension of oral health. However, we lack prospective clinical research evaluating the sensitivity of such measures to dental treatments. Exceptions to this were pointed out in a recent paper by Locker.¹⁶ For example, Kiyak et al.,¹⁷ Reisine and Weber,¹⁸ and Fiske and Watson¹⁹ used measures of psychological well-being, generic health status measures, or sociodental indicators to monitor the outcomes of orthognathic surgery, treatment for TMD, or routine oral health care for the elderly. More recently, Slade and Spencer reported a worsening of the Oral Health Impact Profile scores during a two-year period for dentate people who experienced tooth loss²⁰ and an improvement for edentulous people who received prosthodontic treatment, although the effects were conditional on baseline oral status and perceptions of need.²¹ These reports suggest that self-reported oral health outcomes have potential for evaluating the appropriateness and effectiveness of dental therapies provided to older individuals or groups of older adults, but they require further evaluation in clinical trials and applied settings.

In developing the GOHAI instrument, we proposed that the GOHAI could be useful as a treatment outcome measure and could be used to evaluate the impact of dental care on the oral health of older adults. In the case of the health promotion project described in this study, we were interested in learning whether participation in the project and the receipt of dental care resulted in fewer self-reported oral health problems. Despite limitations of the data and study design, our findings suggest that study participants perceived improvement in their oral health over time. When examining the twelve GOHAI items at baseline and at twenty-four months, participants generally reported fewer problems at the follow-up period. There was a moderate correlation in the expected direction between the change in GOHAI score and the number of services provided to study participants. We consistently found higher mean GOHAI change scores for participants who received services as compared to subjects who did not receive services, suggesting that the GOHAI is sensitive to the receipt of care.

Data for this investigation were obtained from a community-based oral health promotion project, and not a randomized clinical trial. Thus, data limitations and potential biases must be considered when interpreting these pilot findings. The obvious concern is that there was no control group. Perhaps the experience of being a study participant and receiving an oral examination and feedback about oral health status resulted in subjects reporting fewer oral health problems at the follow-up, regardless of whether they received any dental treatment. Also, the effects of possible confounders such as visiting a dentist other than one affiliated with the university project must be considered. However, the use of dental services was tracked two ways—via chart abstraction to summarize the use of services provided by the project, and by patient self-reports of care received from any dental provider in the year prior to the follow-up interview. The consistent finding that GOHAI scores improved with the receipt of dental care, assessed by either method, supports the conclusion that the GOHAI is potentially useful as an outcome measure.

Because our sample size was limited, particularly at the follow-up period, we were not able to make more detailed examinations such as changes in GOHAI score or individual items by specific subject characteristics, oral health states, or specific treatments received. Also, our sample is not representative of all older adults and underrepresents males, members of racial and ethnic groups, elders with more education and higher incomes, and those residing in rural areas. Additional research is needed to investigate the individual items of the GOHAI as well as its summary score in relation to subject characteristics not only in cross-sectional studies but, more importantly, in prospective research. The proportion of subjects reporting problems identified in two of the GOHAI items having to do with the patient's ability to swallow comfortably and limiting contacts with people because of oral problems was very low and remained virtually unchanged between the baseline and twenty-four-month follow-up period. Perhaps the inclusion of these two items in the GOHAI score should be reconsidered. In addition, the sensitivity of the GOHAI to specific dental treatments may vary with disease extent and severity. Thus, the GOHAI and similar measures must be evaluated in diverse groups of older people receiving a variety of dental treatments and within various dental delivery settings.

Dental educators should appreciate the importance of patient-based assessments, when used in con-

junction with traditional measures of oral disease, to maximize clinical outcomes in the care of older adults. While further work is needed to develop and test self-reported health outcomes, dental educators should be challenged to participate in this research, and to incorporate such assessment tools as a routine part of patient care to assist students in their clinical decision-making for older patients. For example, the GOHAI could be administered as part of a comprehensive patient assessment, then re-administered at the completion of treatment to assess whether or not the treatment provided resulted in improvement in the patient's oral health. Kressin²² recently suggested that the movement toward evidence-based dentistry has created a demand for data that can document patients' perception of treatment need and of the benefits of care. The GOHAI or similar measures could be used to systematically document problems associated with a patient's oral function, psychosocial function related to oral conditions, or pain or discomfort experienced due to dental disease. One of the goals of dental care would be to minimize impacts measured by the GOHAI. Thus, educating dental students to use standardized and psychometrically sound, patient-based assessments can enhance their ability to communicate effectively with patients regarding their oral health conditions and treatment needs and, better evaluate the effectiveness of care from the patient's perspective.

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