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Health State Valuation in Mild to Moderate Cognitive Impairment: Feasibility of Computer-Based, Direct Patient Utility Assessment

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Abstract

Background—Most patients with dementia will, at some point, need a proxy health care decision maker. It is unknown whether persons with various degrees of cognitive impairment can reliably report their health related preferences.

Methods—Cross-sectional and retest study. We performed health state valuations (HSVs) of current and hypothetical future health states on 47 pairs of patients with mild to moderate cognitive impairment and their caregivers using computer-based standard gamble, time trade-off, and rating scale techniques.

Results—Patients' mean (SD) age was 74.6 (9.3) years. About half of the patients were women (48%) as were most caregivers (73%) who were on average younger (mean age = 66.2 years, SD = 12.2). Most participants were White (83%); 17% were African-American. The mean (SD) Mini-Mental State Examination (MMSE) score of patients was 24.2 (4.6) of 30. All caregivers and 77% of patients (36/47) completed all 18 components of the HSV exercise. Patients who completed the HSV exercise were slightly younger (mean age (SD) = 74.1 (8.5) vs. 75.9 (11.8); $p = .569$) and had significantly higher MMSE scores (mean score (SD) = 25.0 (4.3) vs. 21.4 (4.4); $p = .018$). Although MMSE scores below 20 did not preclude the completion of all 18 HSV ratings, being classified as having moderate cognitive impairment was associated with a lower likelihood of completing all scenario ratings (44 % vs. 82%). Patient and caregiver responses showed good consistency across time and across techniques, and were logically consistent.

Conclusion—Obtaining HSVs for current and hypothetical health states was feasible for most patients with mild cognitive impairment and many with moderate cognitive impairment. HSV assessments were consistent and reasonable.

Keywords

health state valuation; utilities; dementia; cognitive impairment; computer-based techniques; reliability

INTRODUCTION

Dementia, an acquired and progressive illness that impairs intellectual function, is an increasingly frequent challenge to an aging America. It currently affects an estimated 4 to 5 million persons in the United States [1]. In the absence of effective prevention or cure, it is estimated that dementia will affect more than 13 million Americans by 2050. [2] Unlike most other chronic illnesses where the ability of patients to state their own preferences for care is predictably preserved even late in the illness, the ability of patients with dementia to state their preferences for care is eventually lost. Sooner or later, virtually all patients with dementia will need a proxy health care decision maker.

Dementia affects memory but also impairs many other cognitive domains. Emotions, features of personality, language, and aspects of cognition such as executive function (central to decision making) may be affected as well. Little is known about when the progression of dementia begins to affect the ability of persons with dementia to reliably state their own preferences. It is also unknown whether persons with various degrees of dementia can reliably report their preferences or values, e.g., to quantitatively estimate the degree to which various health states are valued relative to perfect health.

Methods used for health state valuation in which utilities or preferences are obtained directly from the subject include techniques such as the basic reference gamble or standard gamble, time trade-off, and visual analog or rating scale. These direct methods are contrasted with techniques such as the Health Utilities Index [3] or the EuroQol [4] that obtain health state ratings from subjects that are converted to utilities using algorithms or other population-based valuation systems. Health state valuations of current health states or future potential outcomes provide an assessment of utilities which are considered to be a measure of the preference for current health or for each potential future outcome. [5,6] Although controversy exists about the degree to which the standard gamble or time trade-off may provide more desirable estimates of utility [7], there is general agreement that the scores obtained from the rating scale method do not provide utilities; rather the scores provide only an assessment of preference.

Prior studies of health state preferences in dementia include one by Neumann and colleagues [8] in which caregivers acted both as proxies for patients and as respondents for themselves. In this cross-sectional study, utility-related data were collected on 679 patient-caregiver pairs using the Health Utilities Index Mark II, a generic multiattribute, preference based system. Three recent studies used the EuroQol 5D (EQ 5D), a generic health-related quality of life instrument, to obtain health state ratings from both patients with dementia and their caregivers [9-11]. Coucill et al studied 64 patients with questionable to moderate dementia and found that responses across raters were "highly variable"[9]. Ankri et al, [10] using a French version of the EQ 5D, found a satisfactory response rate and a moderate test-retest reliability. They also found that the EQ 5D scores did not systematically vary with their dementia severity measure among the 137 patients studied. A larger study by Jonsson and colleagues [11] (n = 208) reports that the agreement between patients' and caregivers' scores was not lower among the more severely affected cases and that patients tended to rate their health state as being better than the (proxy) ratings given by their caregivers. This was true even among those with mild dementia.

The current project is part of a larger research effort to better understand the process of defining desirable and realistic therapeutic goals in dementia. The current report concentrates on the issues important to the valuation of health states by patients with varying degrees of cognitive impairment and their adult caregivers. Health state values and quality of life are related, but not equivalent, quantities [12, 13] and only health state valuations will be reported here.

The feasibility of having persons with cognitive impairment participate in the direct valuation of their current and potential future health states is suggested by the successful measurement of utilities in several disease processes that have features in common with dementia: seriously ill hospitalized adults, [14] hospitalized elderly, [15] HIV/AIDS, [16] and schizophrenia. [17, 18] In a letter to the editor, Mador and colleagues [19] reported the successful use of the time trade-off technique in 64 patients with Alzheimer disease who had an average Mini-Mental State Examination score of 20 (observed range 11-26; total score possible = 30, indicating normal mental status; 20 suggesting mild to moderate dysfunction). In aggregate, these studies demonstrate the possibility of directly obtaining utility measures in patient populations for whom it may be cognitively demanding.

We performed a cross-sectional and retest study to determine whether health state valuations can be reliably elicited directly from persons with cognitive impairment across a spectrum of MMSE scores. We also examined the relationship between severity of cognitive impairment and the frequency with which reliable health state valuations could be produced. Lastly we examined the relationships among health state valuations provided by persons with cognitive impairment and health state valuations for the same health states provided by the self-identified caregivers of persons with cognitive impairment.

Central to addressing feasibility in the initial phases of this research project was the need to answer five questions. 1) Can health state valuations (HSV) be obtained by a computer-aided process from persons with mild to moderate cognitive impairment, i.e., can patients with mild to moderate cognitive impairment actually perform the task? 2) Are the HSV results obtained by the computer-aided process consistent across time (baseline to one month), and across methods (consistency across methods of preference assessment)? [17, 20] 3) Are the HSV results obtained by the computer-aided process 'reasonable', i.e., are the stated preferences for less severe disease scenarios higher than the stated preferences for scenarios that describe more severe stages of disease? 4) Do patients' HSV results for their own current health state vary across levels of severity of cognitive impairment? 5) Do patients and their caregivers generally agree about their valuations of patients' current health state?

METHODS

Subjects

Subjects were patients with cognitive impairment and their caregivers. Patient eligibility was not influenced by type of dementia (e.g., Alzheimer's disease, vascular dementia, mixed dementia, Lewy Body dementia, etc). Patients were eligible if they were able to orally communicate and had a Mini-Mental State Exam (MMSE) [21] score of at least 10 out of a possible score of 30. No prior computer experience was required.

Pairs of patients and their caregivers were recruited from the Caregiver Core of the University Hospitals Memory and Aging Center in Cleveland, Ohio, where they had expressed an interest in participating in research studies. Caregivers were self-identified as the person who spent the most time in day-to-day care of the person with cognitive impairment and were not required to live with the patient. Patient/caregiver dyads were

recruited from among patient participants who had completed a Clinical Core Evaluation. The Clinical Core Evaluation includes a Clinical Dementia Rating Scale score, a health history from an informant (usually the caregiver), as well as neuropsychological, behavioral, and functional evaluations as part of the initial assessment process of the Clinical Core Registry of the Case Western Reserve University Memory and Aging Center (UMAC). The Caregiver Core is a registry of primary caregivers of persons with cognitive impairment who are enrolled in the UMAC Research Registry.

Subjects who were interested in participating were scheduled for a total of three visits: neuropsychological testing, initial HSV session, and retest HSV session one month after the initial session.

Instruments

Mental Status: The Mini-Mental State Exam [21] was used as a global index of severity of cognitive impairment. It is a 30-item mental status scale assessing orientation, attention, memory, language, and visual-spatial ability and was administered to patients as part of the Clinical Core evaluation. A brief (9-item) version of the MMSE [22] was administered to caregivers. A series of descriptive variables were abstracted from the Alzheimer Disease Research Center registry, including age and gender.

Health State Valuation: formal utilities (standard gamble and time trade-off) and rating scale preference data were obtained using a computer-based program (iMPACT3). [23] For the standard gamble, the program determines the maximum risk of immediate death the subject would be willing to accept to live in full/excellent health rather than to live in the specified health state for a 10-year survival span. Although the program does not produce the exact indifference point in the trade-off, this model is a close approximation, and is well understood by patients. [24] For the time trade-off, the computer determines the maximum number of years of life, out of a 10-year life span (in 6 month increments), that the subject would be willing to give up to live in full/excellent health rather than live the full 10 years in the specified health state. The rating scale was implemented as a vertical visual analog scale with “death” = 0 and “perfect health” = 100.

The program has training modules for each of the health state valuation techniques (rating scale followed by standard gamble and time trade-off in random order) that describe hypothetical health states for wearing glasses and being blind. The program then asks for rating scale, standard gamble, and time trade-off valuations for each patient's current health state. Subjects were then asked to provide HSVs for descriptions of hypothetical states: mild cognitive impairment, mild to moderate dementia, and severe dementia. The screen display is written in large type and is narrated. The hypothetical health states are illustrated and are read in book-like fashion with text scrolled onto the screen as it is being read. The caregiver version of the program is available for detailed review at http://www.umac.info/Dawson/survey_hsv/af/ using an Internet Explorer (Microsoft) browser.

The software has the capability to recognize inconsistencies in the ranking of health state valuation across scenarios (within HSV techniques) and assist subjects with corrections. [25] This method improves the accuracy of utility elicitations. Imagine two health conditions with one being dominated (the alternative offers a better quality of life in every way than the dominated option). If a rater should rate the dominated health condition as being better, due to some kind of error, the computer points this out to the rater in a non-threatening way and offers the rater the opportunity to correct this error.

Procedures

The individual self-identified as the person providing most of the day-to-day care for each patient subject was contacted by phone and the study was explained. For caregivers who expressed interest and believed the patient would be interested, appointments were made for an initial interview and a follow-up interview one month later. At the beginning of the first appointment, the study was explained in detail and written informed consent was obtained from both the patient and the caregiver. The study protocol was approved by the Institutional Review Board (IRB) of University Hospitals of Cleveland and the IRB at MetroHealth Medical Center.

Different research assistants interviewed patients and caregivers in separate locations. Patients completed the Dementia Quality of Life [26] scale and the Quality of Life in Alzheimer's Disease [27] scale prior to beginning their health state valuation session. The sequence of performing the time trade-off prior to or after the standard gamble was determined by random assignment. Each subject pair (patient and caregiver) was assigned the same sequence for performing the standard gamble and time trade-off. Each session was facilitated by a research assistant who guided the subjects through the HSV exercises and answered questions during the session. Subjects were initially introduced to the three health state valuation procedures: visual analog (rating) scale, time trade-off, and standard gamble. To practice using the tools, the subjects were presented with two hypothetical health states. The first practice scenario used wearing glasses as an example followed by the next practice scenario which depicted the more severe visual state, blindness. Subjects were asked to practice each of the three health state valuation procedures by responding to the practice health states. For example, after the subjects were introduced to the visual analog scale, they were instructed to use the tool to assess the state of visual dependence on glasses and then were asked to assess the health state of blindness. This pattern was repeated for the time trade-off and standard gamble scales. Patients and caregivers were then asked to evaluate the patient's current health state using each of the three HSV scales. The two practice scenarios and current health evaluation were followed by individual descriptions of mild cognitive impairment, mild to moderate Alzheimer's disease, and severe Alzheimer's disease. In addition to the descriptions, each of the three scenarios was presented using text that was scrolled onto the computer screen as it was read by either a narrator or by actors portraying characters in the scenario. Pictures (simple line drawings of each scene) also accompanied the written text.

Each set of scenarios presented information about a patient who was of the same gender and race as the participating patient. Each subject pair (patient and caregiver) saw the same set of scenarios, and each cognitive state was evaluated separately using the standard gamble, time trade-off, and visual analog scales. The research assistant who performed the initial HSV related interview also performed the follow-up interview for each patient or caregiver. Procedures for the follow-up visit were the same as for the initial HSV visit.

A short debriefing session followed the end of each HSV assessment session during which subjects were encouraged to share their impressions of the computer based exercise.

Analyses

Patients and caregivers were characterized by age, gender, race and Mini-Mental State Exam (MMSE). Moderate cognitive impairment was defined as including those patients with MMSE scores of 10 – 20 (inclusive). Patients with MMSE scores of 21 – 30 (inclusive) were categorized as having mild cognitive impairment. Caregivers were administered the brief 6 item version with a total possible score of 9, as opposed to the full MMSE with a

complete score of 30. Associations between categorical variables were assessed by chi square (e.g. level of dementia and race).

Patients and caregivers were considered to be “completers” if they were able to perform the health state valuation for all six scenarios, using all three methods of elicitation. We used a t-test to examine differences in MMSE score or age between patients able to complete and those unable to complete the health state valuations. A preliminary test for equality of variances for both age and MMSE score showed that we were able to use pooled variances when using the t-test.

When considering consistency of responses across time, within subject differences were analyzed by first calculating the difference between the paired baseline and 1-month scores, and then providing statistics on the distribution of these results. The inter-quartile range (25th to 75th percentile) of the mountain plots (folded empirical cumulative distribution plots) [28] was calculated to represent the middle half of the distribution of spread of the differences of the paired scores.

Consistency across methods of HSV assessment was examined in two portions of the data following the warm-up scenarios: 1) the valuation of current health vs. the severe dementia scenario, and 2) in the valuation of mild cognitive impairment vs. mild-moderate dementia vs. severe dementia scenarios. In each of these situations, the rank order of the valuation using one technique (e.g., the rank order of current health vs. severe dementia using the standard gamble) was compared with the rank order valuation in the other two techniques. If current health was preferred (given a higher utility or preference value) to the severe dementia scenario using the standard gamble technique, was current health also preferred to the severe dementia scenario using the time trade-off and rating scale techniques? Consistency across methods of preference assessment was determined in the final HSV data, i.e., following any changes patients or caregivers made in HSVs after seeing computer prompts indicating inconsistency within scenarios across techniques.

Agreement between baseline and 1-month HSV scores (test-retest repeatability/reliability) were assessed in several different ways [29-31]. Average absolute differences between baseline and 1-month HSVs were calculated within subjects. To determine if baseline to 1-month differences in HSV varied by the magnitude of HSV, Bland-Altman plots [29, 30, 32] were examined. To examine the HSV data for possible systematic error between baseline and 1-month HSVs, mountain plots were reviewed. Regression methods described by Passing and Bablok [33] were used to first test for a linear relationship between baseline and 1-month HSV values and if a linear relationship was present, to then test for an intercept different from zero and a slope different from one. The effect of imprecision in the (x) variable was assessed with Deming regression [34].

MedCalc software, (Kagi, Berkeley, CA) was used to produce Bland-Altman and mountain plots, and to perform Passing-Bablok and Deming regression. The SAS statistical package, Version 9.2 (Cary, NC) was used to perform all other statistical analyses.

Patients' valuations of their own current health state were compared with their valuations of the mild cognitive impairment scenario for all patients who completed baseline and 1-month valuations. To estimate valuations made by standard gamble, time trade-off, and rating scale, baseline and 1-month valuations were averaged within each HSV technique for current health and for the mild cognitive impairment scenario. Average valuations for the mild cognitive impairment scenario were subtracted from the average valuations for current health. The mean differences were compared using a paired t-test (H_0 : mean = 0). Similar comparisons were made for caregivers paired with these patients.

RESULTS

Demographic characteristics obtained at the baseline interview are displayed in Table 1 for the 47 pairs of participating patients and caregivers. Most caregivers were spouses (76%). On average, patients were about 8 years older than caregivers. Caregiver ages ranged from 53 to 84. The distribution of caregiver age was bimodal with the average age of spouse caregivers being 69.6 years and the mean age of all other caregivers being 51.4 years. Patients were somewhat more frequently male (53%) and caregivers were more frequently female (70%). Patients and caregivers were concordant for race with the majority being White (83%) and the remainder being African-American. Patients had a range of types and severity of dementia including Alzheimer's (n = 28; 60 %), other causes of dementia (n = 9; 19%), and mild cognitive impairment (n = 10; 21%). On average, patients had been diagnosed with dementia for 5.6 years (SD=3.6). The mean MMSE (SD) score for patients was 24.1 (4.6). Brief MMSE scores for the 46 caregivers that were screened averaged 8.9 with a range of 7-9. Eighty nine percent of patients and caregivers lived together. About 80% (n = 38) of patients had MMSE scores higher than 20 and were classified as having mild cognitive impairment. Patients with mild cognitive impairment were about 4 years younger than those with moderate cognitive impairment (73.8 vs. 78 years, $p = .22$). Severity of cognitive impairment was not significantly associated with age or race ($p > .18$ for both).

Clinical Dementia Rating (CDR) scores ranged from 0.5 (uncertain/deferred diagnosis) to 3 (severe dementia). As expected, as CDR scores increased, MMSE scores decreased: 13 patients had a CDR score of 0.5, mean (SD) MMSE score = 28.5 (1.6), range = 27 – 30; 24 patients had a CDR score = 1, mean (SD) MMSE score = 23.6 (3.3), range 17-28; 7 patients had a CDR score = 2, mean (SD) MMSE score = 15.6 (3.9), range 10 – 22; 3 patients had a CDR score = 3, mean (SD) MMSE = 17.3 (4.0), range = 13-21.

Table 2 addresses the most fundamental question posed in this paper: Can persons with mild to moderate cognitive impairment provide valuations of health states using a computer-aided system? Nearly all patients in this cross-sectional sample (44/47, 94%) were able to complete the training scenarios (glasses and blindness states) using the rating scale (visual analog). About three quarters of the patients (36/47, 77%) were able to complete the severe dementia scenario, the last of the valuation tasks. In general, more patients were able to complete the valuation tasks using the rating scale as compared with the time trade-off or standard gamble, although the differences among the three techniques were not large (largest difference was 83% vs. 94% for blindness, $p = .103$).

Table 3 provides data on patients who were or were not able to complete all aspects of the health state valuation task. The 35 patients who were able to complete all aspects of the HSV task were only slightly younger (1.8 years difference, 74.1 vs. 75.9 years; $p = .569$) than the 12 patients who failed to complete at least part of the task. Completion of all aspects of the HSV task was also associated with better cognitive functioning as assessed by their higher MMSE scores. The 3.6 point difference in average MMSE scores (25.0 vs. 21.4) between those who finished the task and those who did not finish was statistically significant ($p = .018$) (see Table 3). Patients in the mild cognitive impairment group by MMSE were almost twice as likely to complete all aspects of the HSV task (31/38, 82% vs. 4/9, 44%; $p = .02$).

Of the 44 patients who completed at least the rating scale HSV for glasses and blindness, most received at least one computer prompt indicating inconsistency within HSV scenarios across ascertainment techniques. Only 2 patients received no computer prompts. The mean

number of patient prompts was 2.6 (2.1) with a range of 8 and a median of 2. The total number of prompts possible was 12.

All but one caregiver completed all 18 scenarios (46/47). Of the 46, only 4 received no prompts for inconsistency across HSV techniques. The mean number of computer prompts received by caregivers was 2.0 (1.5) with a range of 6 and a median of 2.

Of the 47 patients who attended the first HSV session, 31 (66%) returned for retesting at 1 month. Compared with patients who returned at one month for retesting, patients who did not return ($n = 16$) were more likely to be men (4/22 vs. 12/25, $p = .03$) and trended toward a higher proportion of African-Americans (5/8 African-Americans vs. 11/39 Whites), $p = .069$. There were no significant differences for age (75.1 vs. 74.3, $p = .80$) or MMSE scores (23.2 vs. 24.6, $p = .34$) between patients who did not return and those who did return for retesting.

The consistency of patients' health state valuations at baseline and 1-month sessions by HSV technique are shown in Table 4. The range of within subject differences in preference scale points between baseline and 1-month retest were $< .06$ for the standard gamble, $< .06$ for time trade-off, and $< .07$ for the rating scale. Bland-Altman plots revealed no systematic relationships between baseline and 1-month mean differences in HSVs and the magnitude of the HSV values. Mountain plots were centered around zero suggesting no systematic error between baseline and 1-month HSVs. Passing-Bablok and Deming regressions revealed most intercepts being not different from zero and most slopes being not different from one.

All 32 caregivers who returned for 1-month retesting were able to complete HSVs for all three techniques. The consistency of valuations by HSV technique provided by caregivers at the baseline and 1-month sessions is shown in Table 5. The range of within subject differences between baseline and 1-month retest preference scale points were $< .04$ for the standard gamble, $< .05$ for time trade-off, and $< .13$ for the rating scale. Bland-Altman plots revealed no systematic relationships between baseline and 1-month mean differences in HSVs and the magnitude of the HSV values. Mountain plots were centered on zero suggesting no systematic error across time. Passing-Bablok and Deming regressions demonstrated that most intercepts were not different from zero and most slopes were not different from one.

Consistency across methods of HSV assessment was examined in 1) the valuation of current health vs. the severe dementia scenario and 2) in the valuation of mild cognitive impairment vs. mild-moderate dementia vs. severe dementia scenarios. As demonstrated in Table 6, nearly all patients (34/36, 94%) gave consistent responses across techniques for Current Health. Eighty nine percent of patients (31/35) gave consistent responses across techniques when all three scenarios depicting a spectrum of severity levels of cognitive impairment were considered. All caregivers except one (44/45, 98%) gave consistent responses for Current Health and for the three scenarios depicting a spectrum of severity levels of cognitive impairment.

Although most patients and caregivers provided responses that were consistent across HSV techniques, one can also ask whether or not the responses were 'reasonable'. In other words was the scenario for wearing glasses given higher (or at least not lower) valuations than the scenario for blindness and were more severe scenarios of dementia given lower (or at least not higher) valuations than were scenarios describing less severe disease?

Among patients and caregivers attending the baseline HSV sessions, all but one patient rated wearing glasses as being better than or equal to blindness using both the standard gamble (38/39, 97%) and time trade-off techniques (40/41, 98%). All caregivers (45/45) rated

wearing glasses as being better than or equal to blindness for both the standard gamble and time trade-off tasks. All patients (43/43) and all but one caregiver (45/46, 98%) rated wearing glasses as being better than or equal to blindness by the rating scale. The standard for 'reasonableness' for the scenarios describing various levels of cognitive impairment was rating mild cognitive impairment $\geq$ mild-moderate dementia $\geq$ severe dementia. Most patients (31/35, 89%) and nearly all caregivers (44/45, 98%) provided 'reasonable' ratings by standard gamble. All but one patient (35/36, 97%) and all caregivers (45/45) gave 'reasonable' responses by time trade-off. Nearly all patients (34/36, 94%) and all caregivers (45/45) provided 'reasonable' responses by rating scale.

In addition, we evaluated the degree to which health state valuations tended to systematically vary with the severity of cognitive impairment among affected participants. Table 7 demonstrates the variation among mean HSV scores for current health by HSV technique and severity of illness (mild or moderate cognitive impairment). Neither average valuations nor spread of the responses vary systematically with severity of cognitive impairment. Current health was rated significantly better by patients with mild cognitive impairment than by patients with moderate cognitive impairment only when the rating scale was used ($p = .035$; $p > .43$ for standard gamble and time trade-off). Caregiver ratings of patients' current health were not significantly different for patients with mild versus moderate dementia (p -values $> .68$ for all three HSV techniques). Patients' self-ratings of current health were numerically higher than the ratings of their caregivers (except for moderate cognitive impairment when the rating scale was used). However, patients' ratings were statistically significantly higher than the caregivers' ratings only for those with mild cognitive impairment when the time trade-off was used ($p = .041$) and had borderline significance for rating scale ($p = .056$; for standard gamble, $p = .49$). Patients with moderate cognitive impairment were significantly older than patients with mild cognitive impairment (total $n = 42$; $p = .0048$).

Lastly we compared mean valuations for current health and the mild cognitive impairment scenario for patients who completed both baseline and 1-month valuations. For patients, valuations of current health were significantly higher than for the mild cognitive impairment scenario: mean rating scale difference = .19 (.17 standard deviation), $p < .0001$, $n = 28$; mean time trade-off difference = .08 (.15), $p = .01$, $n = 29$; mean standard gamble difference = .06 (.13), $p = .02$, $n = 27$. Among caregivers, mean valuations for patients' current health were higher than mean valuations of the mild cognitive impairment scenario only when the rating scale was used: mean rating scale difference = .10 (.18), $p = .01$, $n = 28$; mean time trade-off difference = .04 (.18), $p = .30$, $n = 29$; mean standard gamble difference = -.01 (.13), $p = .63$, $n = 27$.

Observations during the debriefing sessions led to potentially important findings. After completing the computer-based exercise, several patients and caregivers expressed to the research assistant that they had never before given this much thought to their potential future health states and decisions. Some subjects also stated that they now felt it was important to discuss these potential future health states and associated decisions with their loved ones.

DISCUSSION

The ability to consider and sometimes explicitly state how one values potential health states can be important to personal decision making and is essential to shared decision making. Unlike most other chronic illnesses where the ability of patients to state their own preferences for care is predictably preserved even late in illness, the ability of most patients with dementia to state their preferences for care will, sooner or later, need to be deferred to a proxy health care decision maker. These two realities underscore the importance of

understanding when preferences stated by patients with dementia are likely to be reproducible and thus more likely to reflect their genuine preferences. In addition it is essential to know whether techniques that are commonly used for health state valuation can be used successfully by patients with cognitive impairment.

We found that most patients with MMSE scores between 10 and 30 could use the computer assisted rating scale technique to rate their own current health state. About three out of four patients could perform the training, current health, and cognitive health state scenario tasks using all three of the health state valuation techniques. Patients who were able to complete the entire task were, in general, younger and had somewhat less severe cognitive impairments although there was no sharp threshold of age or illness severity that precluded the completion of the three health state valuation tasks. In addition, most patients in this sample were able to provide responses that were both consistent (across both time and technique) and 'reasonable'.

Similar to the findings of Ankri et al [10] using the EQ 5D, we found that standard gamble and time trade-off scores did not vary significantly with level of cognitive impairment severity. Consistent with findings by Jonsson and colleagues [11] also using the EQ 5D, self ratings of current health by patients with mild cognitive impairment in the current study tended to be higher than paired caregiver ratings when the time trade-off or rating scale assessment methods were used.

Our findings suggest that it is feasible to use the same approaches in most patients with mild to moderate cognitive impairment that have been used successfully in patient groups that had severe physical illness [14] or chronic mental illness [18]. Recent qualitative research has suggested that some patients with mild to moderate dementia have difficulty in imagining future health states [35]. This may have been a limiting factor for patients in the current study who found it difficult to complete any of the scenarios that described potential future states of cognitive decline. Future studies will be needed to pursue this possibility.

An additional area for future research comes from the observations made during the debriefing process. For some patients, going through the computer-based health state valuation exercise apparently prompted them to want to talk with their care giver about their own futures and the associated health care decisions they might face.

On average both patients and paired caregivers valued the patients' current health state more highly than the mild cognitive impairment scenario using the rating scale. Patients, but not caregivers, also valued their current health more highly than the mild cognitive impairment scenario when the time trade-off and standard gamble techniques were used. For patients, this observation may relate to the well known phenomenon of patients adapting to their illness and often rating that illness state more highly than the unaffected state that illness state. For both patients and caregivers, higher ratings for current health may relate to their having not given in-depth consideration to the details of the current health state as discussed in the paragraph above.

Some limitations of the current study should be recognized and considered. The sample was derived from patients and caregivers who had expressed an interest in potential participation in dementia-related research projects. This self-selection process may influence the generalizability of the current study findings. About 80% of patients had MMSE scores above 20 and were classified as having mild cognitive impairment. Although MMSE scores below 20 did not preclude the completion of all 18 HSV ratings, being classified as having moderate cognitive impairment was associated with a lower likelihood of completing all scenario ratings (44% vs.82%). Although this 38% difference is a clinically important one, the small number of patients with moderate cognitive impairment limits our ability to make

strong statements about comparisons made between patients with mild vs. moderate cognitive impairment. Because the scenarios were always presented in the same sequence, we cannot make any statements about whether the decline in participation during the HSV elicitation process (Table 2) was due to scenario complexity or subject fatigue. Although the time period for retesting (one month) was short relative to the usual rates of decline in dementia, we cannot rule out real change as a potential cause of variation between baseline and 1-month health state valuations. Men and African-Americans tended to be somewhat less likely to return for 1-month retesting, but those returning were of similar ages and had similar MMSE scores to those who did not return for retesting.

As the sample size in the current study increases, we will determine what findings from the neuropsychological battery are associated with the inability of patients with mild to moderate cognitive impairment to complete all or parts of the health state valuation process. This should provide a better understanding of how the loss of particular types of cognitive functioning lead to the inability of patients to state clear preferences for potential future health states. Linking the loss of specific cognitive functions with the loss of the ability to clearly state one's preferences could also be mapped more directly with features measured by the MMSE which is used as a convenient screening tool for cognitive decline. An improved understanding of these relationships could help physicians and other health care providers to better anticipate when a proxy decision maker may be needed to aid with health care and other decisions for patients with dementia.

Being able to obtain reliable utility assessments directly from patients with mild to moderate cognitive impairment is an important step toward providing appropriate utility values for cost-utility, cost-effectiveness, and pharmaco-economic evaluations. These findings relate to the use of research assistant facilitated computer elicitation techniques with audio tracks for instructions and interactive error correction techniques. Our study design did not allow us to comment on the level of support required for successful completion. However, given the frequent problems observed in the population with casual logic errors (errors that were subsequently corrected), this technology certainly played an important role in allowing these patients with significant impairments to express their preferences using formal methods.

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References

1. Alzheimer's Association. Facts: Statistics about Alzheimer's Disease. Alzheimer's Association Fact Sheet; 2003.
2. Cahan V, Feldman C. New prevalence study suggests dramatically rising numbers of people with Alzheimer's disease. NIH News Release. Aug.18:2003.
3. Torrance GW, Fenny DH, Furlong WJ, Barr RD, Zhang Y, Wang Q. Multi-attribute preference functions for a comprehensive health status classification system: Health Utilities Index Mark 2. *Med Care*. 1996; 24:702–22. [PubMed: 8676608]
4. Kind, P. The EuroQol instrument: an index of health –related quality of life.. In: Spiker, B., editor. *Quality of Life and Pharmacoeconomics in Clinical Trials*. Lippincott-Raven; Philadelphia: 1996.
5. Levin, HM. *Cost-Effectiveness: A Primer*. Sage Publications; Newbury Park, CA: 1983. p. p118

6. Keeney, RL.; Raiffa, H. Preferences and Value Tradeoffs. Cambridge University Press; New York: 1993. Decisions with Multiple Objectives..
7. van Osch SMC, Wakker PP, van den Hout WB, Stiggelbout AM. Correcting biases in standard gamble and time tradeoff utilities. *Med Decis Making*. 2004; 24:511–7. [PubMed: 15359000]
8. Neuman PJ, Kuntz KM, Leon J, et al. Health utilities in Alzheimer's disease: a cross-sectional study of patients and caregivers. *Med Care*. 1999; 37:27–32. [PubMed: 10413389]
9. Coucill W, Stirling B, Bentham P, Buckley A, Laight A. EQ-5D in patients with dementia: an investigation of inter-rater agreement. *Med Care*. 2001; 39:760–71. [PubMed: 11468496]
10. Ankri J, Beaufils B, Novella J- L, et al. Use of the EQ-5D among patients suffering from dementia. *J Clin Epidemiol*. 2003; 56:1055–63. [PubMed: 14614996]
11. Jonsson L, Andreasen N, Kilander L, et al. Patient- and proxy-reported utility in Alzheimer disease using the EuroQol. *Alzheimer Dis Assoc Disord*. 2006; 20:49–55. [PubMed: 16493236]
12. Tsevat J, Weeks JC, Guadagnoli E, et al. Using health-related quality of life information: clinical encounter, clinical trials, health policy. *J Gen Intern Med*. 1994; 9:576–82. [PubMed: 7823230]
13. Covinsky KE, Wu AW, Landefeld CS, et al. Health status versus quality of life in older patients: does the distinction matter? *Am J Med*. 1999; 106:435–40. [PubMed: 10225247]
14. Tsevat J, Cook EF, Green ML, et al. Health values of the seriously ill. *Ann Intern Med*. 1995; 122:514–20. [PubMed: 7872587]
15. Tsevat J, Dawson NV, Wu AW, et al. Health values of hospitalized patients 80 years or older. *JAMA*. 1998; 279:371–5. [PubMed: 9459470]
16. Tsevat J, Solzan JG, Kuntz KM, et al. Health values of patients infected with human immunodeficiency virus: relationship to mental health and physical functioning. *Med Care*. 1996; 34:44–57. [PubMed: 8551811]
17. Lenert LA, Morss S, Bergen MR, Goldstein MK, Garber AM. Measurement of the validity of utility elicitation performed by computerized interview. *Med Care*. 1997; 35(9):15–20.
18. Lenert LA, Ziegler J, Lee T, Sommi R, Mahmoud R. Differences in health values among patients, family members, and providers for outcomes in schizophrenia. *Med Care*. 2000; 38:1011–21. [PubMed: 11021674]
19. Mador J, Clark M, Crotty M, Hecker J. Utility-weighted measures of quality of life in Alzheimer disease. *Alzheim Dis Assoc Disord*. 2002; 16:202.
20. Lenert LA, Treadwell JR. Effects on preferences of violations of procedural invariance. *Med Decis Making*. 1999; 19:473–81. [PubMed: 10520685]
21. Folstein MF, Folstein SE, McHugh PR. Mini-Mental State. *J Psychia Resear*. 1975; 12:189–98.
22. Callahan CM, Unverzagt FW, Hui SL, Perkins AJ, Hendrie HC. Six-item screener to identify cognitive impairment among potential subjects for clinical research. *Med Care*. 2002; 40:771–81. [PubMed: 12218768]
23. Lenert LA, Sturley A, Watson ME. iMPACT3: Internet-based development and administration of utility elicitation protocols. *Med Decis Making*. 2002; 22:464–74. [PubMed: 12458976]
24. Lenert LA, Soetikno RM. Automated computer interviews to elicit utilities: potential applications in the treatment of deep venous thrombosis. *J Am Med Inform Assoc*. 1997; 4:49–56. [PubMed: 8988474]
25. Lenert LA, Sturley A, Rupnow M. Toward improved methods for measurement of utility: automated repair of errors in elicitation. *Med Decis Making*. 2003; 23:67–75. [PubMed: 12583456]
26. Brod M, Stewart A. Conceptualization and measurement of quality of life in dementia: The Dementia-QOL Instrument. *Gerontologist*. 1999; 38:25–35. [PubMed: 10028768]
27. Logsdon RG, Gibbons LE, McCurry SM, Teri L. Quality of life in Alzheimer's disease: Patient and caregiver reports. *J Men Sci*. 1999; 5:21–32.
28. Krouwer JS, Monti KL. A simple, graphical method to evaluate laboratory assays. *Eur J Clin Chem Clin Biochem*. 1995; 33:525–7. [PubMed: 8547437]
29. Bland JM, Altman DG. Statistical methods for assessing agreement between two methods of clinical measurement. *Lancet*. 1986; 1:307–10. [PubMed: 2868172]

30. Altman DG, Bland JM. Measurement in Medicine: the analysis of method comparison studies. Statistician. 1983; 32:307–17.
31. Feinstein, AR. Principles of Medical Statistics. Chapman & Hall/CRC; New York: 2002. p. 407-32.
32. Dewitte K, Fierens C, Stockl D, Thienpont LM. Application of the Bland-Altman plot for interpretation of method-comparison studies: a critical investigation of its practice. Clin Chem. 2002; 48:799–801. [PubMed: 11978620]
33. Passing H, Bablok W. A new biometrical procedure for testing the quality of measurements from two different analytical methods. J Clin Chem Clin Biochem. 1983; 21:709–20. [PubMed: 6655447]
34. Cornbleet PJ, Gochman N. Incorrect least-squares regression coefficients in method comparison analysis. Clin Chem. 1979; 25:432–8. [PubMed: 262186]
35. Lindstrom HA, Smyth KA, Sami SA, et al. Medication use to treat memory loss in dementia: perspectives of people with dementia and their caregivers. Dementia. 2006; 5(1):27–50.

Table 1

Patient and Caregiver Characteristics (n=47)

Characteristic	Patients	Caregivers
Age, mean (SD)	74.6 (9.3)	66.2 (12.3)
mild (n = 38) ^a	73.8 (8.5)	
moderate (n = 9) ^b	78.0 (12.2)	(n = 41)
Gender, Female, n (%)	22 (47%)	32 (70%)
mild	17 (77%)	
moderate	5 (23%)	(n = 46)
Male	25 (53%)	
mild	21 (84%)	
moderate	4 (16%)	
Race, White, n (%)	39 (83%)	39 (85%)
mild	33 (84%)	
moderate	6 (16%)	
African-American, n (%)	8 (17%)	7 (15%)
mild	5 (63%)	
moderate	3 (33%)	
MMSE, mean (SD)	24.1 (4.6) ^c	8.9 (0.4) ^d
mild (n = 38)	25.9 (2.8)	
moderate (n = 9)	16.4 (2.1)	(n = 45)

^a mild cognitive impairment^b moderate cognitive impairment^c MMSE = Mini Mental State Exam, total score = 30^d 6 item MMSE, total score = 9; two caregivers did not complete the screen

Table 2

Number of Patients Completing HSVs by Valuation Procedure (n=47)

Scenario	Standard Gamble	Time Trade-off	Rating Scale
Glasses	40 (85%)	43 (91%)	44 (94%) ^c
mild ^a	35 (74%)	36 (77%)	38 (81%)
moderate ^b	5 (11%)	7 (15%)	6 (13%)
Blindness	39 (83%)	41 (87%)	44 (94%)
mild	35 (74%)	35 (74%)	38 (81%)
moderate	4 (9%)	6 (13%)	6 (13%)
Current health	39 (82%)	40 (85%)	42 (89%)
mild	35 (74%)	35 (74%)	37 (79%)
moderate	4 (9%)	5 (11%)	5 (11%)
Mild cognitive impairment	37 (79%)	38 (80%)	40 (85%)
mild	33 (70%)	34 (72%)	36 (77%)
moderate	4 (9%)	4 (9%)	4 (9%)
Mild-moderate	36 (77%)	36 (77%)	38 (80%)
mild	32 (68%)	32 (68%)	34 (72%)
moderate	4 (9%)	4 (9%)	4 (9%)
Severe	36 (77%)	36 (77%)	36 (77%)
mild	32 (68%)	32 (68%)	32 (68%)
moderate	4 (9%)	4 (9%)	4 (9%)

^a mild cognitive impairment (n = 38)^b moderate cognitive impairment (n = 7)^c Two patients with moderate cognitive impairment were unable to complete the quality of life survey that preceded the HSV task and were not requested to attempt the HSV exercise.

Table 3

Age and Cognitive Performance of Patients Who Were or Were Not Able to Complete All Aspects of the Health State Valuation Task (n = 47)

	Not able to Complete (n=12) Mild (n=7) Moderate (n=5)	Able to Complete (n=35) Mild (n=31) Moderate (n=4)	P-Value
Age range	53-91	53-86	-
mild ^a	64-89	64-86	
moderate ^b	53-91	82-84	
Mean age (SD)	75.9 (11.8)	74.1 (8.5)	.569
mild	77.3 (9.1)	73.0 (8.3)	
moderate	74.0 (15.8)	83.0 (0.8)	
MMSE range	15-29	12-30	-
mild	21-29	21-30	
moderate	15-19	12-18	
Mean MMSE (SD)	21.4 (4.4)	25.0 (4.3)	.018
mild	24.4 (2.9)	26.2 (2.7)	
moderate	17.2 (1.5)	15.5 (2.6)	

^a mild cognitive impairment (n = 38)

^b moderate cognitive impairment (n = 9)

Table 4

Consistency of Patients' Responses across Time: Baseline to 1-Month (Test-Retest) (n=31)

Scenario	Standard Gamble	Time Trade-Off	Rating Scale
<u>Glasses</u> , mean (SD)			
Baseline	.95 (.13)	.98 (.09)	.86 (.15)
1-month	.95 (.12)	.99 (.05)	.85 (.12)
Mean absolute difference (1-month – baseline)	.03 (.12)	.009 (.10)	.01 (.15)
Mountain plot median (Inter Quartile Range: IQR)	0 (-.1 to .1)	0 (0 to 0)	.05 (-.1 to .25)
<u>Blindness</u> , mean (SD)			
Baseline	.70 (.24)	.70 (.32)	.48 (.19)
1-month	.70 (.23)	.69 (.31)	.43 (.16)
Mean absolute difference (1-month – baseline)	.002 (.24)	.008 (.31)	.05 (.23)
Mountain plot median (IQR)	-.06(-.14 to .15)	0 (0 to .06)	.05 (-.09 to .12)
<u>Patient's current health</u> , mean (SD)			
Baseline	.83 (.21)	.94 (.19)	.82 (.15)
1-month ^a	.88 (.15)	.94 (.15)	.80 (.16)
Mean absolute difference (1-month – baseline) ^a	.03 (.16)	.005 (.20)	.02 (.17)
Mountain plot median (IQR)	0 (-.1 to 0)	0 (0 to .1)	0 (-.05 to .12)
<u>Mild cognitive impairment</u> , mean (SD)			
Baseline ^b	.78 (.18)	.86 (.20)	.65 (.17)
1-month ^c	.82 (.19)	.84 (.18)	.62 (.18)
Mean absolute difference (1-month – baseline) ^d	.04 (.23)	.05 (.21)	.02 (.21)
Mountain plot median (IQR)	0 (-.2 to .05)	0 (0 to .21)	0 (-.1 to .17)
<u>Mild-moderate dementia</u> , mean (SD)			
Baseline ^e	.54 (.25)	.56 (.35)	.44 (.23)
1-month ^c	.58 (.24)	.56 (.29)	.35 (.18)
Mean absolute difference (1-month – baseline) ^c	.05 (.20)	.02 (.19)	.06 (.23)
Mountain plot median (IQR)	-.06 (-.15 to .04)	0 (-.03 to .11)	0 (-.025 to .03)
<u>Severe dementia</u> , mean (SD)			
Baseline ^f	.41 (.29)	.41 (.34)	.23 (.19)
1-month ^c	.39 (.27)	.43 (.33)	.23 (.20)
Mean absolute difference (1-month – baseline) ^c	.002 (.22)	.006 (.27)	.005 (.15)
Mountain plot median (IQR)	0 (-.05 to .16)	0 (-.2 to .2)	0 (-.1 to .025)
<u>Range</u>			
Mean absolute differences	0.002 to .05	.05 to .009	.06 to .005

Scenario	Standard Gamble	Time Trade-Off	Rating Scale
Mountain plot medians	-.06 to 0	0	0 to .05

^aFor standard gamble and time trade-off, n = 30; for rating scale, n = 31

^bFor standard gamble, n = 30

^cFor standard gamble and rating scale, n = 28; for time trade-off, n = 29

^dFor standard gamble, n = 27; for time trade-off, n = 29; for rating scale, n = 28

^eFor standard gamble and time trade-off, n = 30

^fFor standard gamble, time trade-off, and rating scale, n = 30

Table 5Consistency of Caregiver Responses across Time: Baseline to 1-Month (Test-Retest) (n=32)^a

Scenario	Standard Gamble	Time Trade-Off	Rating Scale
<u>Glasses</u> , mean (SD)			
Baseline	.94 (.12)	.98 (.10)	.86 (.12)
1-month	.95 (.15)	.99 (.03)	.87 (.13)
Mean absolute difference (1-month – baseline)	.001 (.17)	.02 (.11)	.06 (.16)
Mountain plot median (Inter Quartile Range: IQR)	0 (0 to .025)	0 (0 to 0)	0 (-.09 to .05)
<u>Blindness</u> , mean (SD)			
Baseline	.80 (.20)	.81 (.27)	.42 (.24)
1-month	.78 (.21)	.76 (.25)	.53 (.24)
Mean absolute difference (1-month – baseline)	.03 (.27)	.05 (.29)	.11 (.25)
Mountain plot median (IQR)	0 (-.11 to .18)	0 (-.06 to .16)	-.1 (-.25 to .02)
<u>Patient's current health</u> , mean (SD)			
Baseline	.80 (.20)	.87 (.19)	.78 (.16)
1-month	.78 (.24)	.84 (.21)	.77 (.21)
Mean absolute difference (1-month – baseline)	.02 (.23)	.03 (.12)	.02 (.16)
Mountain plot median (IQR)	0 (0 to .1)	0 (0 to .1)	0 (-.03 to .05)
<u>Mild cognitive impairment</u> , mean (SD)			
Baseline	.81 (.15)	.83 (.17)	.67 (.16)
1-month	.82 (.16)	.80 (.14)	.71 (.16)
Mean absolute difference (1-month – baseline)	.02 (.19)	.04 (.21)	.05 (.20)
Mountain plot median (IQR)	-.05 (-.12 to .03)	0 (-.125 to .2)	-.07 (-.18 to .05)
<u>Mild-moderate dementia</u> , mean (SD)			
Baseline	.61 (.22)	.60 (.24)	.40 (.15)
1-month	.61 (.22)	.56 (.23)	.45 (.19)
Mean absolute difference (1-month – baseline)	.03 (.21)	.04 (.19)	.05 (.17)
Mountain plot median (IQR)	0 (-.13 to .05)	0 (-.08 to .1)	-.05 (-.15 to .05)
<u>Severe dementia</u> , mean (SD)			
Baseline	.42 (.25)	.37 (.26)	.22 (.11)
1-month	.41 (.25)	.40 (.26)	.27 (.15)
Mean absolute difference (1-month – baseline)	.007 (.14)	.03 (.15)	.05 (.16)
Mountain plot median (IQR)	0 (-.05 to .05)	-.025 (-.15 to .06)	-.025 (-.16 to .08)
<u>Range</u>			
Mean absolute difference	.001 to .03	0 to .05	.02 to .11
Mountain plot medians	-.05 to 0	-.025 to 0	-.1 to 0

^a One caregiver completed baseline and 1-month interviews even though their spouse (patient) was unable to complete either of the interviews

Table 6

Patient and Caregiver Consistency Across Methods of Preference Assessment (n = 45)

	Consistency Across Methods of Assessment ^a		
	Yes	No	Missing
<u>Current Health</u>			
Patients, number (%)	34 (94.4)	2 (5.6)	9
Caregivers	44 (97.8)	1 (2.2)	0
<u>Scenarios</u>			
Patients, number (%)	31 (88.6)	4 (11.4)	10
Caregivers	44 (97.8)	1 (2.2)	0

^aCalculations of percentages only include those patients and caregivers who were able to complete the pertinent valuations: 1) Current Health: patient's Current Health vs. Severe Dementia scenario; 2) Scenarios: Mild Cognitive Impairment vs. Mild-Moderate vs. Severe Dementia scenarios.

Table 7

Patient and Caregiver Valuations of Current Health by Patients' Severity of Cognitive Impairment (paired responses)

	Mean Utility or Rating			
	Mild Cognitive Impairment		Moderate Cognitive Impairment	
Patient Characteristic's ^a	Patients	Caregivers	Patients	Caregivers
Patients Age, mean (SD)	73.4 (8.3) *	--	84.6 (3.6) *	--
Patients MMSE, mean (SD)	25.8 (2.7) *	--	16.2 (2.8) *	--
Valuation Procedure				
Standard Gamble, mean (SD)	0.83 (.21) (n=35) ^b	.78 (.23)	0.91 (.12) (n=4) ^b	.84 (.20)
Time Trade Off, mean (SD)	0.95 (.18) (n=35)	.84 (.22)	0.93 (.10) (n=5)	.86 (.17) (n = 4)
Rating Scale, mean (SD)	0.84 (.14) ** (n=37)	.77 (.18)	0.69 (.18) ** (n=5)	.71 (.14)

^a Mean age and MMSE scores are based on data from patients who were able to complete the Rating Scale to assess Current Health (n=42)

^b Numbers vary due to the inability of some patients to complete all three HSV techniques to assess Current Health

* p < .005 comparing age and MMSE in mild versus moderate cognitive impairment groups

** p = .035 comparing mean rating scale values for mild versus moderate cognitive impairment groups