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The Relationship between Cognitive Function and Non-Prescribed Therapy Use in Older Adults

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Abstract

Objectives—To examine the association of cognitive function with use of non-prescribed therapies for managing acute and chronic conditions, and to determine whether use of non-prescribed therapies changes over time in relation to baseline cognitive function.

Methods—200 community-dwelling adults aged 65 and older were recruited from three counties in south central North Carolina. Repeated measures of daily symptoms and treatment were collected on three consecutive days at intervals of at least one month. The Mini-Mental State

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Examination (MMSE), the primary cognitive measure, was collected as part of the baseline survey. Data were collected on the daily use of common non-prescribed therapies (use of prayer, ignore symptoms, over-the-counter remedies, food and beverage therapies, home remedies, and vitamin, herb, or supplements) on each of the three days of the follow-up interviews for up to six consecutive months.

Results—Older adults with poorer cognitive function were more likely to pray and ignore symptoms on days that they experienced acute symptoms. Poorer cognitive function was associated with increased use of home remedies for treating symptoms related to existing chronic conditions.

Conclusions—Cognitive function may play a role in why older patients use some non-prescribed therapies in response to acute and chronic conditions.

Keywords

cognitive function; self health management; health services

INTRODUCTION

Understanding the health-related practices of older adults with dementia and other illness-associated cognitive disorders is gaining urgency as the population ages and more older adults experience cognitive decrements. The risk of cognitive impairment increases with age, and older adults with poor cognitive function are more likely to have comorbid conditions such as diabetes, hypertension, heart disease, and stroke (Haan & Weldon, 1996; Schillerstrom, Horton, & Royall, 2005; van den Berg, Kloppenborg, Kessels, Kappelle, & Biessels, 2009). While treatment of comorbid conditions generally involves multiple medical therapies, day-to-day management of these conditions falls on the affected individuals who craft self-care strategies (DeFries, Ory, & Vickery, 1998; Ory, 2008).

The use of non-prescribed therapies by older adults is of special interest because the use of non-prescribed therapies is prevalent among older adults. Overall use of non-prescribed therapies among older adults ranges from 28% to 88% (Arcury et al., 2006; Cheung, Wyman, & Halcon, 2007; Ness, Cirillo, Weir, Nisly, & Wallace, 2005). Non-prescribed therapies are generally regarded as complementary to conventional therapy (NCCAM, 2011). For the purpose of this study, non-prescribed therapies are defined as practices initiated by the individual and used in place of, or in parallel to, conventional medical therapies. Non-prescribed therapies include a substantial range of materials and practices, but therapies commonly used in older adults are home remedies, herbs, supplements, over-the-counter medicines and vitamins, and prayer and spirituality (Arcury et al., 2006; Astin, Pelletier, Marie, & Haskell, 2000; Foster, Phillips, Hamel, & Eisenberg, 2000; Grzywacz et al., 2006). Previous studies have linked a number of sociodemographic factors (e.g., gender, ethnicity, age, education, and income) with use of non-prescribed therapies. Greater use of non-prescribed therapies is reported by women, persons of Hispanic and Asian ethnicity, middle-aged adults, and those with higher education and greater income (Arcury et al., 2011; Arcury et al., 2006; Astin et al., 2000; Barnes, Powell-Griner, McFann, & Nahin, 2004). Some research has indicated that overall use of non-prescribed therapies is greater among older adults with larger number of health conditions and poorer health status than among those without comorbid conditions (Arcury et al., 2011; Arcury, et al., 2006; Astin et al., 2000; Barnes et al., 2004). Many chronically ill older adults include non-prescribed therapies to manage such conditions as heart disease (Miller, Liebowitz, & Newby, 2004), diabetes (Payne, 2001), cancer (Ernst & Cassileth, 1998), and other musculoskeletal and related illnesses (Arcury, Bernard, Jordan, & Cook, 1996; Quandt et al., 2005).

Cognitive function is an important consideration in examining health behaviors, including management of chronic illnesses (Hall, Elias, & Crossley, 2006). Low cognitive function is associated with poor self-care practices including poor adherence to medication, and low autonomy and inability to make decisions (Schillerstrom et al., 2005; Stilley, Sereika, Muldoon, Ryan, & Dunbar-Jacob, 2004). Unfortunately very little is known about the influence of cognitive function on use of non-prescribed therapies for managing chronic conditions, nor is it known whether use of non-prescribed therapies for chronic problems is different from use of non-prescribed therapies for acute symptoms. Studies have suggested that the long term nature of chronic disease (in contrast to acute problems) allows the individual to actively participate in self-monitoring of symptoms that leads to crafting strategies of care over months and years (Shekelle et al., 2003; Verbrugge & Ascione, 1987). However, these studies do not address use of non-prescribed therapies. The limited analysis to date has generally been in documenting estimated non-prescribed therapy use among individuals with dementia and other age-related cognitive disorders (Coleman, Fowler, & Williams, 1995; Hogan & Ebly, 1996; Larner, 2007; Sharma et al., 2006). Further, previous studies often rely on gross measures of non-prescribed therapy utilization, such as life time use of general modalities, or use of modalities in the past year or three months (Astin et al., 2000; Barnes et al., 2004; Cheung et al., 2007). This measurement approach must be used cautiously in older adults who may have cognitive impairments. Moreover, this measurement approach limits knowledge of whether the therapy was used consistently.

This paper documents the number of older adults who use non-prescribed therapies to treat acute and chronic daily symptoms, and examines the relationship between cognitive function and non-prescribed therapy use in rural older adults. We hypothesize that cognitive function will shape the degree to which non-prescribed therapies are incorporated into older adults' self-care practices. At the same time, level of cognitive function may limit the use of some therapies, as they are beyond an individual's ability. In the presence of cognitive difficulty, people may revert to habit or potentially unproven methods as opposed to seeking out more proven methods. Further, research has suggested that adults likely wait until a more advanced stage of health decline before increasing non-prescribed therapy use (Eisenberg et al., 1993). Because low cognitive function in an older population carries an implicit assumption of decline and little prior knowledge is available, we explore (1) whether baseline levels of cognitive function predict non-prescribed therapy use over time; and (2) whether the relationship of cognitive function with non-prescribed therapy use differs if the therapy is being used for chronic disease management or in response to an acute symptom believed to be unrelated to an existing chronic condition. We use specific measures of non-prescribed therapy use that include therapies that are common in minority and rural communities (Arcury, Preisser, Gesler, & Sherman, 2004; Arcury, Quandt, Bell, & Vitolins, 2002; Vitolins et al., 2000). These therapies include the use of home remedies, vitamins, herbs, or supplements, prayer, ignore symptoms (watchful waiting), over-the-counter (OTC) medicines, and food or beverage. We use repeated measures of daily symptoms and treatment to obtain detailed data on whether the therapy is used consistently over a 6-month follow-up, whether the therapy is used in response to a specific acute symptom, or to treat diagnosed conditions.

METHODS

Data collection focused on older adults (aged 65 and older) who lived in three rural counties in south-central North Carolina. A repeated measures design was used in which each participant completed a baseline structured interview and then six follow-up interviews, at monthly intervals, each participant completed structured interviews on three consecutive days. Measures obtained at "follow up" refer to participants' responses obtained from all of

the 18 potential participant interviews that occurred after the baseline survey. Project exclusion criteria were used to ensure that study participants were mentally competent to give consent and had sufficient cognitive ability to accurately recall information from the previous 24 hours. We based our procedures on experience in other surveys conducted with rural older adults (e.g., Bell, et al., 2005; Bell et al., 2005). Those with severe cognitive impairment or dementia would be excluded from this study, and the clock-drawing test (CDT) was used to screen for this exclusion. The CDT has been found to be sensitive and useful in the clinical assessment of demented patients (Kirby, Denihan, Bruce, Coakley, & Lawlor, 2001; Shulman, 2000). All study participants remained capable throughout the follow-up period. All participant recruitment and data collection procedures were approved by the Wake Forest School of Medicine IRB, and all participants gave signed informed consent.

Participants

A total of 200 community-dwelling adults aged 65 and older were recruited from three counties in south central North Carolina. These counties were chosen because they contain large minority populations and because a high proportion of the population is below the federal poverty line. The minority group populations of the counties range from 50% and 65%. The poverty rates for persons 65 and older are between 17.2% and 22.0% for these counties, compared with 13.2% for North Carolina as a whole. The sample included community-dwelling adults who self-identified as African American or white, and spoke English. The sample design called for the sample to be stratified by ethnicity (African American and white) and sex so that approximately 50 participants were recruited into each ethnic-sex group. A site-based procedure (Arcury & Quandt, 1999) was used to recruit representative participants. Sites are places, organizations, or services used by members of the population of interest. Participants were recruited from 34 sites. The types of sites at which older adults were recruited to this study included county recreation departments (3 different sites), county social service departments (3), county government meetings (2), senior center and congregate meal sites (3), senior housing complexes (3), social and support clubs (7), churches (6), businesses (5), and polling sites (2). In addition, recruitment included individuals who had participated in previous research studies, who were referred by other participants, and who were referred by community interviewers.

A total of 200 African American and white older adults completed baseline interviews. Nearly 70% (139) of the participants completed each of six sets of the follow-up interviews. Of the 61 (30%) participants who completed fewer than the six sets of follow-up interviews, 23 (11.5% of total sample) completed five sets, five (2.5%) completed four sets, five (2.5%) completed three sets, twelve (6.0%) completed two sets, eleven (5.5%) completed one set, and five (2.5%) completed only the baseline interview. The reasons for participants not completing all six sets of follow-up interviews varied. Three participants died, and nine became too ill to continue. Twenty-two participants changed addresses and phone numbers, and could not be located. Fifteen participants decided that they did not want to continue.

Data Collection

Data collection was completed by interviewers who had received extensive training. Participants completed baseline, in-person interviews, usually in their homes, between April 2008 and May 2009. Following the baseline, they completed a series of daily-diary follow-up interviews on three consecutive days at intervals of at least one month. Participants generally completed follow-up interviews on the telephone. However, follow-up interviews were completed in-person with 33 participants who did not have a telephone (n=10), had poor hearing or other physical limitations (n=14), or who disliked speaking on the telephone (n=9). Follow-up data collection was completed in January 2010. Baseline interviews ranged

from 45 to 120 minutes in length. Follow-up interviews generally took 20 minutes to complete, but ranged in length from 15 to 90 minutes.

Measures

The baseline survey included data about personal characteristics including sex, age, ethnicity, marital status (currently married vs. not currently married), educational attainment (< high school, high school, and > high school), income, health behaviors including cigarette smoking (current smoker or not current smoker, alcohol consumption (current drinker or not current drinker) and self-reported total number of chronic conditions. Income was asked in two separate items on the baseline questionnaire; one was whether income was above or below \$13,000 (federal cut-off poverty level) and the other was a 15-category question where one of the cut-points was \$13,000. To reduce missing values from both questions (10% missing for above or below \$13,000 and 90% for 15-category question), the two questions were combined into one indicator of above or below \$13,000.

The Mini-Mental State Examination (MMSE), the primary cognitive measure, was also collected as part of the baseline survey. The MMSE is among the most frequently used cognitive screening measures in studies of older adults (Folstein, Folstein, & McHugh, 1975). This instrument has been used extensively in community surveys, nursing home studies, longitudinal studies of aging, clinical investigations (Fillenbaum, Wilkinson, Welsh, & Mohs, 1994). The MMSE has also been verified and used in numerous other studies of rural older adults e.g., (Elnitsky & Alexy, 1998; Ganguli et al., 1993; Ganguli, Fox, Gilby, & Belle, 1996).

Acute Symptoms—At each follow-up interview, participants were asked if they had experienced each of 40 symptoms including general symptoms (e.g., runny nose and cough); cardio-respiratory symptoms (e.g., shortness of breath); gastrointestinal symptoms (e.g., indigestion and bloating); musculoskeletal symptoms (e.g., neck or back pain and joint pain); nervous system symptoms (e.g., numbness); mental health symptoms (e.g., difficulty sleeping and low energy); and genito-urinary symptoms (e.g., incontinence). For each symptom reported to have occurred in the previous 24 hours, participants were asked if the symptom was attributable to an existing chronic condition. Symptoms that were not related to a chronic condition were defined as acute symptoms in this study.

For each acute symptom experienced, participants were asked if they had (1) prayed; (2) taken an OTC medicine (e.g., cod liver oil and Ben Gay); (3) eaten or drunk something special; (4) taken a home remedy (e.g., honey, vinegar, olive oil, and whisky); (5) taken a vitamin, herb, or supplement; (6) stayed in bed or rested; and (7) ignored the symptom or decided to wait and see. Responses to home remedy, vitamin, herb, supplement, and rest had small frequencies for any month of follow-up and therefore these categories were not included in analysis of acute symptoms.

Chronic Conditions—At each follow-up interviews, participants were asked which therapies they used for each chronic condition (arthritis, diabetes, heart disease, and respiratory disease) reported at baseline. The therapies included (1) pray; (2) OTC medicine; (3) eaten or drunk something special; (4) home remedy; and (5) vitamin, herb or supplement.

In this study, the six follow-ups with three daily interviews were treated as six observations (rather than 18). Use of therapies was defined as any use of therapies at any of the three days within the monthly observation period, and non-user was defined as no use of the therapies at all during the three days within of each monthly observation period.

Statistical Analysis

Descriptive statistics of baseline characteristics of participants are presented as either frequency and percentage for categorical variables or as means and standard deviations for continuous variables (Table 1). All analyses were completed in PROC GLIMMIX in SAS v9.2 (SAS Institute Inc., Cary, NC) and adjusted for correlation between repeated measurements on the same participant using a compound symmetry covariance structure. Four dichotomous repeated measures outcomes (prayer, OTCs, eat or drink something, and ignore symptoms) were created to reflect responses to daily acute symptoms. A relatively similar set of dichotomous outcomes was constructed for an existing chronic condition (arthritis, diabetes, heart disease, and respiratory disease); these outcomes were use of prayer, OTCs, eat or drink something, home remedies, and vitamins, herbs or supplements. All outcomes were modeled separately using the GEE approach. Tests of linear trends over time for non-prescribed therapy use for any daily acute symptom and chronic condition were completed in a mixed model that treated time as continuous and adjusted for the correlation between repeated measurements. Interactions between month of follow-up and MMSE score were tested in the repeated measures model to determine whether associations of cognitive function at baseline with use of non-prescribed therapy differed by time. A series of nine different mixed models were fit to analyze the effect of cognitive function on each of the nine outcomes. Model 1 examined the effects of demographic variables (age, gender, marital status, ethnicity, educational status, and income), health behaviors (cigarette smoking and alcohol consumption), and total chronic conditions on non-prescribed therapy use after adjusting for time. Model 2 (fully adjusted model) included all variables in model 1 plus baseline MMSE to determine if cognitive function further improved the models. Type I error rate was fixed at 0.05.

RESULTS

Participants included 52 African American women, 48 African American men, 50 white women, and 50 white men (Table 1). Most are aged 65 to 74 years (59.5%), with 40.5% aged 75 years and older. About half (47.0%) have a high school education or less, and 53.0% have education beyond high school. All but two of the participants have at least one chronic health condition.

Table 2 shows the percentage of older adults who used non-prescribed therapies for acute symptoms believed to be unrelated to an existing chronic condition. Non-prescribed therapy use for acute symptoms was limited on any of the days when participants experienced any of the symptoms. Ignoring a symptom or waiting to see if it resolved was the most common practice when older adults experienced daily acute symptoms, with use ranging from 35.9% to 42.4% across follow-ups. OTC medicines were also frequently used to treat any acute symptoms (31.5% to 37.1%). Food and beverages were the least frequently used therapy when older adults experienced daily acute symptoms.

The percentage of older adults who used non-prescribed therapies for any chronic condition across the six months of follow-up is reported in Table 3. Of the five types of non-prescribed therapies, use of prayer and OTC were the two most commonly reported forms, with use ranging from 43.9% to 61.3% across follow-ups. Food and beverages (9.3% to 14.1%) as well as home remedies (6.7% to 10.6%) were also used to treat chronic conditions. Fewer used vitamin, supplement, or herb (6.3% to 10.2%) for treating chronic conditions. The percentage of use for each of the therapies slightly fluctuated across the six months of follow-up for both acute and chronic problems.

To determine whether baseline levels of cognitive function predict non-prescribed therapy use over time, interactions between month of follow-up and baseline MMSE score were

tested in the repeated measures model. Baseline cognitive function did not predict change in the use of non-prescribed therapies over a 6-month follow-up. Because the MMSE score by time interaction was statistically non-significant, month was specified as a covariate to examine the association of baseline cognitive function with average use of non-prescribed therapies.

Next multivariate models were run to determine whether the relationship of cognitive function with non-prescribed therapy use differs if the therapy is being used for acute symptom management or in response to a chronic condition. Results of the multivariate models for acute symptoms are presented in Table 4, with cognitive function as the predictor and non-prescribed therapy use for acute symptoms as outcomes. In fully adjusted models (model 2), there were significant differences in ethnicity, education, and total chronic conditions. African American older adults were more likely than white older adults to use prayer to treat acute symptoms not attributable to chronic conditions. Those with greater than a high school education were less likely to ignore symptoms. Those with higher number of chronic conditions were more likely to use non-prescribed therapies to treat acute symptoms. Lower cognitive scores were significantly associated with an increase in the use of prayer in treating daily acute symptoms, adjusting for demographic variables, health behaviors, and health conditions. Those with poorer cognitive function were also more likely to ignore an acute symptom or wait to see if it resolved. Cognitive function was not associated with use of OTCs or eating or drinking something for an acute symptom.

The association between cognitive function and non-prescribed therapy use for any chronic condition are shown in Table 5. Older adults with less than a high school education and those with higher number of medical conditions were more likely to use OTC remedies for treating a chronic condition (model 2). Current non-drinkers were less likely to use home remedies or take a vitamin, herb, or supplement relative to current drinkers. Lower cognitive function was associated with an increase in the use of home remedies for treating chronic conditions, adjusting for demographic and behavioral factors, as well as comorbid conditions. There were no significant relationships between cognitive function and use of prayer, OTC remedies, food and beverage remedies as well as use of vitamins, supplements, and herbs.

DISCUSSION

Little information is available on the association between cognitive function and use of non-prescribed therapies for managing daily health symptoms in older adults. We therefore used a daily diary report to investigate just that. Research has suggested the implications of advanced health decline and increasing non-prescribed therapy use over time (Eisenberg et al., 1993). A low MMSE score in an older population may imply a decline, but we did not find an association between baseline cognitive function and use of non-prescribed therapies over a 6-month follow-up. Cognitive function predicted the use of some non-prescribed therapies in response to acute symptoms as well as symptoms participants attributed to existing chronic health problems. Older adults with poorer cognitive function were more likely to pray and ignore symptoms on days that they experienced symptoms not related to chronic conditions. Lower cognitive function was associated with increased use of home remedies for treating chronic conditions.

These findings have several implications. First, our data suggest the relatively widespread use of non-prescribed therapies, including prayer, for managing acute conditions. Some of these non-prescribed therapies, such as prayer may have benign health effects, but others may be problematic (e.g., ignoring the symptom). The use of prayer for health is quite common in the general United States adult population; analysis of the 2002 NHIS shows

that 45.2% of all adults used prayer for health (Barnes et al., 2004), and that about 60% of those aged 70 and older used prayer for health (Bell et al., 2005; Harvey & Silverman, 2007).

In multivariate analysis, older adults with poorer cognitive function are more likely to ignore symptoms on days that they experience symptoms not related to chronic conditions. It is possible that these adults could be misperceiving symptoms due to their lower cognitive function. The reasons are not clear since this study does not elucidate factors associated with the decisions to treat or ignore symptoms (Dean, 1986; Stoller, Forster, & Portugal, 1993). However, ignoring symptoms may suggest a general decline in the prefrontal cortex or executive function which is responsible for decision-making (Stuss & Levine, 2002). Ignoring symptoms may also reflect a more general self-care approach among older adults with poor cognitive function. Other studies have found that older adults with cognitive deficits are not aware of their own limitations and are less likely than cognitively intact adults to seek appropriate medical care or services (Zarit & Anthony, 1986; Zarit, Orr, & Zarit, 1985). Poor cognitive status can impair the ability to monitor symptoms as well as to interpret symptoms (Brown & Park, 2002; Murray, Burns, See, Lai, & Nazareth, 2005; Sevick et al., 2007). The findings from this study suggest that poor cognitive function plays a role in why older patients are likely to ignore symptoms or less likely to take on an appropriate course of actions in a timely manner when symptom occurs. Ignoring acute symptoms which might be dangerous has clinical ramifications including risk of hospital admission or premature death (Sevick et al., 2007; Shekelle et al., 2003).

Second, this study finds that poorer cognitive function is associated with increased use of home remedies for treating chronic conditions. This is an important finding that has not been reported in the literature before. Home remedies are often based on products found around the house and more readily available for older adults who no longer drive or get out much due to poor cognitive status. The current data do not differentiate among possible explanations. The association of a poorer cognitive function with increased use of home remedies merits careful consideration and deserves attention for further investigation.

Lastly, the results have an important implication for health professionals and informal/formal caregivers who care for aging individuals. Knowledge about what self-care practices adults with poor cognitive status use to treat their symptoms may enable practitioners to understand and have open discussion with older patients and caregivers. Such open discussion can help providers better monitor and document non-prescribed therapy use in medical charts (Cohen, Ek, & Pan, 2002), but it also allows caregivers to identify potentially harmful self-care behaviors and encourage safer, more appropriate choices. Additionally, the current data do not directly investigate use of non-prescribed therapies to help prevent cognitive decline or treat cognitive problems. However, chronic conditions such as arthritis, heart disease, respiratory disease, and diabetes are highly prevalent in older adults and significantly contribute to cognitive impairment and decline. As chronic illness-related cognitive impairment continues to gain recognition, non-prescribed therapy use may be indicated to help improve cognitive function. This is expected given that the medical community has very little to offer to improve cognitive functioning or no effective therapy in preventing or delaying cognitive decline. Non-prescribed therapy use for cognitive enhancement or improvement will only increase in the future due to the rapid growth in the number of older adults and the increasing incidence of illness-related cognitive decline, cognitive impairments, and other dementias (Solomon & Michalczuk, 2009).

Strengths of the study include the use of repeated measures of multiple non-prescribed therapies. Observational studies of the community-dwelling population of older adult population often rely on gross measures of non-prescribed therapy utilization, such as life

time use of general therapies, or use of therapies in the past year or three months. Further, cross-sectional data cannot provide detailed insight on non-prescribed therapy use over time in relation to cognitive function. The longitudinal analysis of change over the six time points suggests that cognitive function has no major effect on the dynamic of use over a 6-month time period. The non-significant relationship could be due to multiple factors, including a short period of follow-up time. A longer duration of time may be needed to determine the changes in non-prescribed therapy use as a function of change or decline in cognitive function.

Limitations of this analysis deserve comment. The sample selection process was not random, limiting the generalizability of the results. However, the research included relatively large sample with a high rate of completion across six three-day follow-ups. The sample was ethnically diverse and representative of rural North Carolina counties. For example, the 53% high school completion rate found in our study is typical at least of these low income counties. The high school graduation rates for persons 25 and older are between 70% and 75% for these counties, compared with 83% for North Carolina as a whole. Additionally, our study required participants to recall information from the previous 24 hours. Though we excluded from the sample older adults with severe cognitive impairment or dementia, the possibility of some recall bias in the sample may exist, particularly among those with lower MMSE scores. However, this bias is reduced in our study design, relative to those that require a longer-term recall. Study participants remained capable throughout the follow-up period. Further, the fact that we examined non-prescribed therapy use in a community-based setting may mean that older adults with severe cognitive deficits or dementia were not included. However, we were not able to assess cognitive function at each interview and therefore could not determine whether the association between cognitive function and non-prescribed therapy use was a reflection of changes in cognition due to aging or disease. The mean $\pm$ SD MMSE score (26.4 ± 3.7) indicated a normal but relatively low cognitive function in this group. Given the low education in the sample, our data may reflect a group of individuals with low stable cognitive functioning. Not all forms of cognitive tests and non-prescribed therapies could be included. Because diary studies impose substantial demands on participants, the current study focused on the MMSE as a widely-used cognitive measure and common therapies to reduce participant burden.

Our study is among the first in a series of papers to provide some insight on the relationship between cognitive function and non-prescribed therapy use for managing acute and chronic problems. Our findings suggest the need for further study of non-prescribed therapies as used by older adults with cognitive problems, and the potential value for health providers to inquire about this in understanding how their patients with poor cognitive function manage and treat daily symptoms.

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References

- Arcury TA, Bell RA, Snively BM, Smith SL, Skelly AH, Wetmore LK, et al. Complementary and alternative medicine use as health self-management: rural older adults with diabetes. *Journal of Gerontology Series B: Psychological Sciences and Social Sciences*. 2006; 61(2):S62–70.
- Arcury TA, Bernard SL, Jordan JM, Cook HL. Gender and ethnic differences in alternative and conventional arthritis remedy use among community-dwelling rural adults with arthritis. *Arthritis Care Research*. 1996; 9(5):384–390.

- Arcury TA, Grzywacz JG, Neiberg RH, Lang W, Nguyen HT, Altizer K, et al. Daily use of complementary and other therapies for symptoms among older adults: study design and illustrative results. *Journal of Aging and Health*. 2011; 23(1):52–69. [PubMed: 20937796]
- Arcury TA, Preisser JS, Gesler WM, Sherman JE. Complementary and alternative medicine use among rural residents in western North Carolina. *Complementary Health Practice Review*. 2004; 9:93–102.
- Arcury TA, Quandt SA. Participant recruitment for qualitative research: A site-based approach to community research in complex societies. *Human Organization*. 1999; 58(2):128–133.
- Arcury TA, Quandt SA, Bell RA, Vitolins MZ. Complementary and alternative medicine use among rural older adults. *Complementary Health Practice Review*. 2002; 7:167–186.
- Arcury TA, Suerken CK, Grzywacz JG, Bell RA, Lang W, Quandt SA. Complementary and alternative medicine use among older adults: ethnic variation. *Ethnicity and Disease*. 2006; 16(3): 723–731. [PubMed: 16937611]
- Astin JA, Pelletier KR, Marie A, Haskell WL. Complementary and alternative medicine use among elderly persons: one-year analysis of a Blue Shield Medicare supplement. *Journal of Gerontology: Series A: Biological Sciences and Medical Sciences*. 2000; 55(1):M4–9.
- Barnes PM, Powell-Griner E, McFann K, Nahin RL. Complementary and alternative medicine use among adults: United States, 2002. *Advance Data*. 2004; (343):1–19. [PubMed: 15188733]
- Bell RA, Arcury TA, Snively BM, Smith SL, Stafford JM, Dohanish R, et al. Diabetes foot self-care practices in a rural triethnic population. *Diabetes Educator*. 2005; 31(1):75–83. [PubMed: 15779248]
- Bell RA, Quandt SA, Arcury TA, Snively BM, Stafford JM, Smith SL, et al. Primary and specialty medical care among ethnically diverse, older rural adults with type 2 diabetes: the ELDER Diabetes Study. *Journal of Rural Health*. 2005; 21(3):198–205. [PubMed: 16092292]
- Bell RA, Suerken C, Quandt SA, Grzywacz JG, Lang W, Arcury TA. Prayer for health among U.S. adults: The 2002 National Health Interview Survey. *Complementary Health Practice Review*. 2005; 10:175–188.
- Brown SC, Park DC. Roles of age and familiarity in learning of health information. *Educational Gerontology*. 2002; 28:695–710.
- Cheung CK, Wyman JF, Halcon LL. Use of complementary and alternative therapies in community-dwelling older adults. *Journal of Alternative and Complementary Medicine*. 2007; 13(9):997–1006.
- Cohen RJ, Ek K, Pan CX. Complementary and alternative medicine (CAM) use by older adults: a comparison of self-report and physician chart documentation. *Journal of Gerontology: Series A: Biological Sciences and Medical Sciences*. 2002; 57(4):M223–227.
- Coleman LM, Fowler LL, Williams ME. Use of unproven therapies by people with Alzheimer's disease. *Journal of the American Geriatrics Society*. 1995; 43(7):747–750. [PubMed: 7602024]
- Dean K. Lay care in illness. *Social Science and Medicine*. 1986; 22(2):275–284. [PubMed: 3515573]
- DeFries GH, Ory MG, Vickery DM. Afterword: Toward a research agenda for addressing the potential of self-care in later life. In: Ory MG, DeFries GH, editors. *Self-care in later life*. Springer; New York: 1998. p. 193–199.
- Eisenberg DM, Kessler RC, Foster C, Norlock FE, Calkins DR, Delbanco TL. Unconventional medicine in the United States. Prevalence, costs, and patterns of use. *New England Journal of Medicine*. 1993; 328(4):246–252. [PubMed: 8418405]
- Elnitsky C, Alexy B. Identifying health status and health risks of older rural residents. *Journal of Community Health Nursing*. 1998; 15(2):61–75. [PubMed: 9631590]
- Ernst E, Cassileth BR. The prevalence of complementary/alternative medicine in cancer: a systematic review. *Cancer*. 1998; 83(4):777–782. [PubMed: 9708945]
- Fillenbaum GG, Wilkinson WE, Welsh KA, Mohs RC. Discrimination between stages of Alzheimer's disease with subsets of Mini-Mental State Examination items. An analysis of Consortium to Establish a Registry for Alzheimer's Disease data. *Archives of Neurology*. 1994; 51(9):916–921. [PubMed: 8080392]

- Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*. 1975; 12(3):189–198. [PubMed: 1202204]
- Foster DF, Phillips RS, Hamel MB, Eisenberg DM. Alternative medicine use in older Americans. *Journal of the American Geriatrics Society*. 2000; 48(12):1560–1565. [PubMed: 11129743]
- Ganguli M, Belle S, Ratcliff G, Seaberg E, Huff FJ, von der Porten K, et al. Sensitivity and specificity for dementia of population-based criteria for cognitive impairment: the MoVIES project. *Journal of Gerontology*. 1993; 48(4):M152–161. [PubMed: 8315228]
- Ganguli M, Fox A, Gilby J, Belle S. Characteristics of rural homebound older adults: a community-based study. *Journal of the American Geriatrics Society*. 1996; 44(4):363–370. [PubMed: 8636578]
- Grzywacz JG, Arcury TA, Bell RA, Lang W, Suerken CK, Smith SL, et al. Ethnic differences in elders' home remedy use: sociostructural explanations. *American Journal Health Behavior*. 2006; 30(1):39–50.
- Haan MN, Weldon M. The influence of diabetes, hypertension, and stroke on ethnic differences in physical and cognitive functioning in an ethnically diverse older population. *Annals of Epidemiology*. 1996; 6(5):392–398. [PubMed: 8915470]
- Hall PA, Elias LJ, Crossley M. Neurocognitive influences on health behavior in a community sample. *Health Psychology*. 2006; 25(6):778–782. [PubMed: 17100506]
- Harvey IS, Silverman M. The role of spirituality in the self-management of chronic illness among older African and Whites. *Journal of Cross Cultural Gerontology*. 2007; 22(2):205–220. [PubMed: 17370121]
- Hogan DB, Ebly EM. Complementary medicine use in a dementia clinic population. *Alzheimer Disease and Associated Disorders*. 1996; 10(2):63–67. [PubMed: 8727166]
- Kirby M, Denihan A, Bruce I, Coakley D, Lawlor BA. The clock drawing test in primary care: sensitivity in dementia detection and specificity against normal and depressed elderly. *International Journal of Geriatric Psychiatry*. 2001; 16(10):935–940. [PubMed: 11607936]
- Larner A. Awareness and use of complementary therapies for AD. *Progress in Neurology and Psychiatry*. 2007; 11(8):27–29.
- Miller KL, Liebowitz RS, Newby LK. Complementary and alternative medicine in cardiovascular disease: a review of biologically based approaches. *American Heart Journal*. 2004; 147(3):401–411. [PubMed: 14999187]
- Murray E, Burns J, See TS, Lai R, Nazareth I. Interactive Health Communication Applications for people with chronic disease. *Cochrane Database System Review*. 2005; (4):CD004274.
- NCCAM. [February 11, 2011] What is complementary and alternative medicine (CAM). 2011. from <http://nccam.nih.gov/health/whatiscam>
- Ness J, Cirillo DJ, Weir DR, Nisly NL, Wallace RB. Use of complementary medicine in older Americans: results from the Health and Retirement Study. *Gerontologist*. 2005; 45(4):516–524. [PubMed: 16051914]
- Ory MG. The resurgence of self-care research: addressing the role of context and culture. *Journal of Cross Cultural Gerontology*. 2008; 23(4):313–317. [PubMed: 18985446]
- Payne C. Complementary and Integrative Medicine: Emerging Therapies for Diabetes, Part 1. *Diabetes Spectrum*. 2001; 14(3):129–131.
- Quandt SA, Chen H, Grzywacz JG, Bell RA, Lang W, Arcury TA. Use of complementary and alternative medicine by persons with arthritis: results of the National Health Interview Survey. *Arthritis Rheumatism*. 2005; 53(5):748–755. [PubMed: 16208669]
- Schillerstrom JE, Horton MS, Royall DR. The impact of medical illness on executive function. *Psychosomatics*. 2005; 46(6):508–516. [PubMed: 16288129]
- Sevick MA, Trauth JM, Ling BS, Anderson RT, Piatt GA, Kilbourne AM, et al. Patients with Complex Chronic Diseases: perspectives on supporting self-management. *Journal of General Internal Medicine*. 2007; 22(Suppl 3):438–444. [PubMed: 18026814]
- Sharma P, Herrmann N, Rochon PA, Lee M, Croxford R, Rothenburg L, et al. Perceptions of natural health products among patients attending a memory clinic. *American Journal of Alzheimers Disease and Other Dementia*. 2006; 21(3):156–163.

- Shekelle, PG.; Maglione, M.; Chodosh, J.; Mojica, W.; Morton, SC.; Suttrop, M., et al. [February 15, 2011] Chronic Disease Self Management for Diabetes, Osteoarthritis, Post-Myocardial Infarction Care, and Hypertension. 2003. from http://www.rand.org/content/dam/rand/pubs/reprints/2007/RAND_RP1258.pdf
- Shulman KI. Clock-drawing: is it the ideal cognitive screening test? *International Journal of Geriatric Psychiatry*. 2000; 15(6):548–561. [PubMed: 10861923]
- Solomon PR, Michalczuk DE. Toward establishing guidelines for evaluating cognitive enhancement with complementary and alternative medicines. *Evaluation and the Health Professions*. 2009; 32(4): 370–392.
- Stillely CS, Sereika S, Muldoon MF, Ryan CM, Dunbar-Jacob J. Psychological and cognitive function: predictors of adherence with cholesterol lowering treatment. *Annals of Behavioral Medicine*. 2004; 27(2):117–124. [PubMed: 15026295]
- Stoller EP, Forster LE, Portugal S. Self-care responses to symptoms by older people. A health diary study of illness behavior. *Medical Care*. 1993; 25(6):539–569.
- Stuss DT, Levine B. Adult clinical neuropsychology: lessons from studies of the frontal lobes. *Annual Review of Psychology*. 2002; 53:401–433.
- van den Berg E, Kloppenborg RP, Kessels RP, Kappelle LJ, Biessels GJ. Type 2 diabetes mellitus, hypertension, dyslipidemia and obesity: A systematic comparison of their impact on cognition. *Biochimica et Biophysica Acta*. 2009; 1792(5):470–481. [PubMed: 18848880]
- Verbrugge LM, Ascione FJ. Exploring the iceberg. Common symptoms and how people care for them. *Medical Care*. 1987; 25(6):539–569. [PubMed: 3695661]
- Vitolins MZ, Quandt SA, Case LD, Bell RA, Arcury TA, McDonald J. Vitamin and mineral supplement use by older rural adults. *Journal of Gerontology: Series A: Biological Sciences and Medical Sciences*. 2000; 55(10):M613–617.
- Zarit, SH.; Anthony, CK. Interventions with dementia patients and their families.. In: Gilhooly, MLM.; Zarit, SH.; Birren, JE., editors. *The Dementias: Policy and Management*. Prentice Hall; Englewood Cliffs, NJ: 1986.
- Zarit, SH.; Orr, NK.; Zarit, JM. *The Hidden Victims of Alzheimer's Disease: Families Under Stress*. New York University Press; New York, NY.: 1985.

Table 1

Baseline Characteristics of the Study Sample (N = 200).

Variable	N (%)	Mean ± Standard Deviation
Female	102 (51)	
Age		73.8 ± 6.9
African American	97 (49)	
Currently married	81 (41)	
Education		
< High school	68 (34)	
High school	26 (13)	
> High school	106 (53)	
< \$13,000	53 (27)	
Current smoker	22 (11)	
Current drinker	39 (20)	
Total number of chronic conditions		5.2 ± 2.7
Arthritis	131(66)	
Diabetes	71(36)	
Heart Disease	73 (37)	
Respiratory Disease	32 (16)	
MMSE score		26.4 ± 3.7

Table 2

Use of Non-prescribed Therapies for Any Daily Acute Symptom not Attributable to a Chronic Condition across 6 Follow-up Interviews.

	Follow-Up Interview					
	1	2	3	4	5	6
Therapy	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Prayer	59 (30.9)	41 (22.8)	43 (24.6)	47 (28.1)	39 (24.1)	38 (25.2)
OTC	67 (35.1)	59 (32.8)	63 (36.0)	62 (37.1)	51 (31.5)	49 (32.5)
Eat or drink something	44 (23.0)	39 (21.7)	31 (17.7)	32 (19.2)	29 (17.9)	30 (19.9)
Ignore the symptoms	81 (42.4)	76 (42.2)	63 (36.0)	60 (36.0)	60 (37.9)	59 (39.1)

Table 3
Use of Non-prescribed Therapies for Any Chronic Condition across 6 Follow-up Interviews.

Therapy	Follow-Up Interview					
	1	2	3	4	5	6
Therapy	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Prayer	117 (61.3)	95 (52.8)	102 (58.3)	99 (59.3)	97 (59.9)	82 (54.3)
OTC	105 (55.0)	79 (43.9)	81 (46.3)	83 (49.7)	68 (42.0)	70 (46.4)
Eat or drink something	27 (14.1)	23 (12.8)	18 (10.3)	18 (10.8)	21 (13.0)	14 (9.3)
Home remedies	16 (8.4)	12 (6.7)	15 (8.6)	13 (7.8)	13 (8.0)	16 (10.6)
Vitamin, herb, supplement	13 (6.8)	17 (9.4)	11 (6.3)	17 (10.2)	16 (9.9)	12 (7.9)

Table 4

Regression Coefficients for MMSE Score Describing the Association between Cognitive Function and Use of Non-prescribed Therapies for Any Acute Symptom.

	Prayer		OTC		Eat or drink something		Ignore	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	<i>B; β (SE B)</i>	<i>B; β (SE B)</i>	<i>B; β (SE B)</i>	<i>B; β (SE B)</i>	<i>B; β (SE B)</i>	<i>B; β (SE B)</i>	<i>B; β (SE B)</i>	<i>B; β (SE B)</i>
Age	7.25; 0.03 (4.02)	4.25; 0.01 (4.16)	0.11; 0.01 (3.34)	-0.23; -0.01 (3.51)	3.08; 0.01 (3.90)	2.37; 0.01 (4.10)	2.82; 0.01 (3.29)	-0.15; -0.01 (3.45)
Female	-0.86; -0.05 (4.76)	3.57; 0.22 (5.08)	1.15; 0.07 (3.88)	1.61; 0.10 (4.13)	1.10; 0.06 (4.60)	2.07; 0.13 (4.91)	1.40; 0.08 (3.83)	5.41; 0.34 (4.08)
Married	5.93; 0.37 (5.29)	5.41; 0.34 (5.24)	3.70; 0.23 (4.20)	3.66; 0.23 (4.21)	2.16; 0.13 (4.97)	2.02; 0.12 (4.99)	1.35; 0.08 (4.15)	1.23; 0.07 (4.14)
African American	10.77; 0.68 [*] (4.26)	8.63; 0.54 [*] (4.23)	2.60; 0.16 (3.46)	2.36; 0.15 (3.55)	7.26; 0.46 (4.09)	6.82; 0.43 (4.18)	0.73; 0.04 (3.42)	-1.29; -0.08 (3.49)
> High school	-8.41; -0.53 [*] (6.29)	-7.49; -0.47 (6.18)	-2.18; -0.13 (5.18)	-2.08; -0.13 (5.21)	2.23; 0.14 (6.49)	2.43; 0.15 (6.51)	-13.49; -0.85 [*] (5.04)	-12.81; -0.81 [*] (5.00)
> 13,000	-9.19; -0.65 (4.60)	-5.03; -0.35 (4.86)	-3.57; -0.25 (3.96)	-3.08; -0.21 (4.22)	-1.51; -0.10 (4.57)	-0.53; -0.03 (4.89)	-4.11; -0.29 (3.86)	-0.18; -0.01 (4.10)
Current smoker	0.64; 0.06 (4.14)	0.79; 0.08 (4.11)	-0.16; -0.01 (3.35)	-0.17; -0.01 (3.36)	5.47; 0.55 (3.64)	5.47; 0.55 (3.66)	2.55; 0.25 (3.25)	2.48; 0.25 (3.24)
Not Current drinker	4.57; 0.35 (4.85)	3.13; 0.24 (4.86)	-2.45; -0.19 (3.56)	-2.57; -0.20 (3.59)	-0.63; -0.04 (4.25)	-0.89; -0.06 (4.30)	-2.19; -0.17 (3.56)	-3.42; -0.26 (3.57)
Total chronic conditions	15.06; 0.18 [*] (4.14)	14.99; 0.18 ^{***} (4.13)	10.75; 0.12 [*] (3.35)	10.73; 0.12 [*] (3.36)	9.80; 0.11 ^{**} (3.92)	9.67; 0.11 ^{**} (3.93)	11.37; 0.13 ^{***} (3.33)	11.47; 0.13 ^{***} (3.34)
MMSE		-13.36; -0.11 ^{**} (5.47)		-1.55; -0.01 (4.64)		-3.06; -0.02 (5.22)		-13.36; -0.11 ^{**} (4.70)

Model 1: age, gender, marital status, ethnicity, education, income, cigarette smoking, alcohol consumption, and total chronic conditions, adjusted for time. Model 2: Model 1 plus baseline MMSE.

^{*} $p < .05$.

^{**} $p < .01$.

^{***} $p < .001$.

Table 5
Coefficients for MMSE Score Describing the Association between Cognitive Function and Use of Non-prescribed Therapies for Any Chronic

	Prayer		OTC		Eat or drink something		Home remedies		Vitamin, herb, supplement	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
B; β (SE B)										
Age	6.74; 0.03 (4.68)	5.51; 0.02 (4.47)	-1.13; -0.01 (4.02)	-2.14; -0.01 (4.23)	8.09; 0.03 (4.80)	8.97; 0.04 (5.11)	6.73; 0.03 (6.24)	1.02; 0.01 (6.24)	-3.15; -0.01 (6.37)	-4.91; -0.02 (6.53)
Gender	3.66; 0.23 (4.58)	5.40; 0.34 (5.14)	-1.07; -0.06 (4.62)	0.26; 0.01 (4.91)	-2.76; -0.17 (5.85)	-3.80; -0.24 (6.20)	12.44; 0.78 (8.07)	21.32; 1.35*	9.19; 0.58 (7.92)	11.25; 0.71 (8.18)
Ethnicity	-2.19; -0.14 (5.7)	-2.30; -0.14 (5.16)	5.87; 0.37 (5.02)	5.79; 0.37 (5.04)	-2.29; -0.14 (6.30)	-2.07; -0.13 (6.37)	11.91; 0.76 (8.73)	11.71; 0.75 (8.24)	-9.20; -0.58 (8.20)	-9.42; -0.60 (7.96)
Education	9.89; 0.62* (4.40)	8.99; 0.57* (4.39)	1.13; 0.07 (4.13)	0.41; 0.02 (4.23)	-1.38; -0.08 (5.32)	-0.82; -0.05 (5.46)	12.13; 0.77 (7.13)	9.63; 0.61 (6.88)	-7.37; -0.46 (7.15)	-8.51; -0.54 (7.13)
Income	-12.32; -0.78* (6.49)	-12.02; -0.76 (6.50)	-2.30; -0.14** (6.25)	-2.01; -0.12* (6.28)	1.49; 0.09 (7.85)	1.19; 0.07 (7.91)	7.91; 0.50 (14.98)	9.70; 0.61 (14.37)	11.41; 0.72 (12.31)	12.63; 0.80 (12.15)
Alcohol consumption	-3.79; -0.21 (5.77)	-1.82; 0.12 (5.50)	-0.51; -0.03 (4.78)	1.01; 0.07 (5.14)	-0.48; -0.03 (5.96)	-1.78; -0.12 (6.46)	-5.26; -0.37 (7.87)	1.74; 0.12 (8.03)	6.39; 0.45 (8.17)	8.82; 0.62 (8.51)
Cigarette smoking	-6.85; -0.69 (4.43)	-6.73; -0.68 (4.11)	-3.30; -0.33 (4.03)	-3.31; -0.33 (4.04)	-5.61; -0.56 (6.33)	-5.59; -0.56 (6.36)	-7.57; -0.76 (7.63)	-9.64; -0.97 (7.60)	-15.43; -1.56 (8.92)	-16.56; -1.68 (8.90)
Marital status	3.26; 0.25 (4.40)	2.87; 0.22 (4.36)	-6.53; -0.50 (4.27)	-6.94; -0.53 (4.31)	5.11; 0.39 (5.92)	5.46; 0.42 (5.97)	-22.59; -1.75*** (6.54)	-26.78; -2.07* (6.69)	-17.63; -1.36* (6.08)	-18.40; -1.42* (6.10)
Interactions	7.67; 0.09 (4.48)	7.67; 0.09 (4.27)	11.39; 0.13** (4.05)	11.47; 0.13** (4.08)	7.81; 0.09 (5.01)	7.89; 0.09 (5.05)	8.42; 0.10 (6.58)	7.43; 0.08 (6.31)	12.32; 0.14 (6.61)	12.63; 0.15 (6.48)
Baseline	-6.41; -0.05 (6.34)		-4.80; -0.04 (5.81)		3.64; 0.03 (6.99)		-21.56; -0.18** (8.13)			-8.32; -0.07 (9.50)

age, gender, marital status, ethnicity, education, income, cigarette smoking, alcohol consumption, and total chronic conditions, adjusted for time. Model 2: Model 1 plus baseline