Published in final edited form as:

J Appl Gerontol. 2017 September ; 36(9): 1054–1069. doi:10.1177/0733464815602116.

The Association of Complementary Therapy Use with Prescription Medication Adherence among Older Community-Dwelling Adults

Valery S. Effoe, MD, MS

Department of Epidemiology and Prevention, Division of Public Health Sciences Wake Forest School of Medicine Winston-Salem, NC 27157 veffoe@wakehealth.edu

Cynthia K. Suerken, MS

Department of Biostatistical Sciences, Division of Public Health Sciences Wake Forest School of Medicine Winston-Salem, NC 27157 csuerken@wakehealth.edu

Sara A. Quandt, PhD

Department of Epidemiology and Prevention, Division of Public Health Sciences Wake Forest School of Medicine Winston-Salem, NC 27157 squandt@wakehealth.edu

Ronny A. Bell, PhD, MS

Department of Epidemiology and Prevention, Division of Public Health Sciences Wake Forest School of Medicine Winston-Salem, NC 27157 rbell@wakehealth.edu

Thomas A. Arcury, PhD

Department of Family and Community Medicine Wake Forest School of Medicine Winston-Salem, NC 27157 tarcury@wakehealth.edu

Abstract

Medication adherence is a major health concern, particularly among older adults who have one or more chronic conditions. We examined the association between complementary therapy use and medication adherence among older community-dwelling adults. In a bi-ethnic sample of 165 adults aged 65 years and older, anthropometric variables, data on chronic medical conditions, and medication use were assessed. Medication adherence was modeled as a score (<50%, 50%–75%, and >75%) and complementary therapy use was categorized as a binary variable. Over half of participants (50.3%) were female, and 47.3% were African American. Complementary therapy use was prevalent (87.9%) and did not differ by sex, ethnicity, income, and educational attainment. Medication adherence score was > 75% in 84.8% of complementary therapy users and 80.0% of non-users ($p = 0.61$). Despite a high use of complementary therapy in this population, there was no apparent association with low medication adherence.

Correspondence Thomas A. Arcury, PhD Department of Family and Community Medicine Wake Forest School of Medicine Medical Center Boulevard Winston-Salem, NC 27157 Phone: 336-716-9438 Fax: 336-716-3206 tarcury@wakehealth.edu.

Conflict of Interest: The authors have no potential conflicts of interest.

Human Subjects Approval: This research was reviewed and approved by the Wake Forest University Health Sciences Institutional Review Board (FWA00001435) as Human Protocol IRB00000182.

Declaration of Conflicting Interests The authors declare no potential conflicting interests with respect to the authorship and/or publication of this article.

Keywords

Complementary therapy; medication adherence; rural older adults; chronic conditions

Introduction

Medication adherence is a major concern in the health of elderly patients, who most often present clinically with one or more chronic conditions (Osterberg & Blaschke, 2005). Multiple factors influencing patient adherence to prescription medications have been described, and include demographic, treatment, clinical, and behavioral variables (Krousel-Wood, Muntner, Islam, Morisky, & Webber, 2009; Morisky, Ang, Krousel-Wood, & Ward, 2008). One such factor is the use of complementary therapies. Complementary therapy use in the United States has increased over the last decade (Arcury, Grzywacz, Stoller, Bell, Altizer, Chapman, & Quandt, 2009; Barnes, Powell-Griner, McFann, & Nahin, 2004; Eisenberg et al., 1998; Eisenberg et al., 1993; Tindle, Davis, Phillips, & Eisenberg, 2005), and is quite common among older adults (Arcury, Bell, Snively, Smith, Skelly, Wetmore, & Quandt, 2006; Bell, Stafford, Arcury, Snively, Smith, Grzywacz, & Quandt, 2006; Bell, Suerken, Grzywacz, Lang, Quandt, & Arcury, 2006a). Older adults often integrate complementary therapies into their health self-management regimens whether as self-care behaviors, informal support, formal support, or medical care (Ory, DeFries, & Duncker, 1998).

Poor adherence to prescription medication regimens accounts for substantial worsening of disease, death, and increased health care costs in the United States (McDonnell & Jacobs, 2002; Rodgers & Ruffin, 1998; Senst et al., 2001). About one- to two-thirds of all medication-related hospital admissions are due to poor adherence, and this alone accounts for over \$100 billion per year in health expenditure in the United States (Berg, Dischler, Wagner, Raia, & Palmer-Shevin, 1993; Senst et al., 2001). In a retrospective cohort study of 137,277 participants, patients who maintained an adherence rate of 80%–100% were significantly less likely to be hospitalized, had lower disease-related medical costs, and all-cause medical costs, than those who had lower adherence rates (Sokol, McGuigan, Verbrugge, & Epstein, 2005). Jha et al. showed that greater adherence to diabetes medications is linked to less hospital use and could save over \$5 billion annually (Jha, Aubert, Yao, Teagarden, & Epstein, 2012).

A systematic review of the associations between dose regimens and medication compliance showed that the more medication a patient uses, the less likely the patient is to be adherent to the regimen (Claxton, Cramer, & Pierce, 2001). This would suggest a lower adherence to prescription medications with the addition of complementary therapies. However, this claim has not been extensively studied among rural older adults with a high prevalence of complementary therapy use. In the present study, we report a cross-sectional analysis that describes complementary therapy use among rural older adults, and examine associations with prescription medication adherence.

Methods

Study population

Participants included community-dwelling adults aged 65 and older who identified as African American or White. Participants had to have the ability to speak English, give informed consent, and complete the series of interviews. There were no exclusion criteria. Participants were recruited to “a health study among older adults.” The recruitment flyer stated, “Older adults use many methods to treat aches, pains, ailments, and diseases. For instance, some adults only use doctors and prescriptions, others use home remedies, and some use a combination of these. We'd like to hear what you do and why.” At the stage of obtaining informed consent, participants were told “The purpose of this research study is to identify the types of complementary therapies older adults use and how the use of complementary therapies helps older adults maintain their health.” Details of the study design and baseline characteristics of the participants have been published elsewhere (Arcury, Grzywacz, Neiberg, Lang, Nguyen, Altizer ... Quandt, 2011, 2012). The study counties were selected because they included large minority populations (50%–65% minority) and had higher rates of poverty, with two of the counties having poverty rates that exceed one quarter of the county's population. A site-based procedure was used to recruit representative participants (Arcury & Quandt, 1999). 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). Participant recruitment and data collection procedures were approved by the Wake Forest School of Medicine Institutional Review Board (Human Protocol IRB00000182), and all participants gave signed informed consent.

Data collection

Data collection was completed by trained interviewers. Baseline interviews were completed from April 2008 through May 2009. Participants then completed a series of daily-diary follow-up interviews on three consecutive days at one-month intervals, totaling eighteen daily interviews over a period of six months (Arcury et al. 2011). For the purpose of this study, we performed a cross-sectional analysis averaging calculated medication adherence scores over the entire study period. During interviews, questions about the general use of complementary therapy were asked. At baseline, if participants indicated they had used a therapy in the past 12 months, they were further asked if they had used it in the past 3 months. Participants using therapy in the past 3 months were asked the frequency of its use. During follow-up visits, participants were questioned on their use of each complementary therapy in the previous month. Participants were also asked if they had used any prescription medication for specific chronic conditions (arthritis, heart disease, diabetes, and respiratory disease).

Study variables

The outcome variable for this analysis is prescription medication adherence. Prescription medication was defined as any medication prescribed to a participant by a physician. Self-reported adherence to prescription medications was ascertained by evaluating the degree to which the participant followed the prescribing physician's instructions for the prescription. All participants had one or more prescription medications. Complementary therapy modalities, not prescribed by physicians, were excluded from the adherence evaluations. A complete inventory of prescribed medications for each participant was done at baseline and this list was updated during each subsequent interview. Specific questions asked to participants included: i) in the past 24 hours, did you take your medicine?; ii) in the past 24 hours, how much medicine did you take?; iii) how often do you take this medicine? An adherence score was calculated for each participant based on the responses to these three questions. Eighteen (18) time points were created for each participant (each corresponding to an interview day of the study period) and the ratio of the effective amount of medication taken to the amount to be taken was recorded for each time point. The adherence score was computed as follows:

$$100\% \times \frac{\text{Number of meds taken over 18 time points}}{(\text{Number of meds taken over 18 time points} + \text{Number of meds not taken over 18 time points})}$$

Adherence score was categorized as follows: less than 50% of medications, 50 – 75% of medications, and more than 75% of medications taken.

We defined complementary therapies as any therapy that exists largely outside institutions where conventional medicine is taught and provided (Zollman & Vickers, 1999). Baseline interview included questions to participants about their use of eleven specific home remedies, seven over-the-counter drugs (e.g., cod liver oil), nine specific vitamins or minerals, nine specific herbs, four specific supplements (e.g., flaxseed, fish, or omega-e oil; coenzyme Q10), three specific practitioners (e.g., chiropractor, massage therapist), and four specific practices (e.g., relaxation, meditation) in the past year (Arcury et al., 2011). Participants were asked if they had used any additional therapies within these seven groups. Complementary therapy use was considered as the use of these treatment modalities on a regular basis in the year prior to the baseline survey or at least in the 3 months prior to baseline. Each of the follow-up interviews asked participants about their use of complementary therapy in the treatment of four chronic conditions (arthritis, diabetes, heart disease, and respiratory disease).

Gender, ethnicity, marital status (currently married or not married), level of education (less than high school, high school or more than high school), annual income (less than \$13,000 US dollars or \$13,000 US dollars and more), health insurance status, number of chronic conditions (2 or less and more than 2), and participant satisfaction with medical services (satisfied or dissatisfied) were treated as categorical variables. Age was treated as a continuous variable.

Statistical analyses

For each chronic condition, tests of association between demographic characteristics and any complementary therapy use over the course of the study were performed using Fisher's exact test. Tests of association between medication adherence category and complementary therapy use for each chronic condition were performed using an exact Cochran-Armitage trend test. All data analyses were performed using SAS version 9.2 (SAS institute, Cary, NC). A p-value of < 0.05 was considered to indicate statistical significance.

Results

Demographic Characteristics

A total of 165 participants (50.3% women) were included in the analyses (Table 1). Any complementary therapy use was prevalent (87.9%) among males and females in the study sample, with 78.8% using over-the-counter medications, 23% using herbs or supplements, 24.9% using home remedies, and 36.9% using health food or drinks. However, complementary therapy use did not significantly differ by gender, ethnicity or age. No difference in complementary therapy use status was present by education, marital status, level of education, or satisfaction with medical services. Although the proportion of complementary therapy users to non-users was higher among participants without health insurance and those with an annual income less than \$13,000, these differences were not statistically significant. Finally, participants' number of chronic conditions did not prove to be a discriminatory factor in complementary therapy use; 70.3% of the participants who used complementary therapy had 2 or less chronic conditions, compared with 85% of non-users ($p = 0.197$).

Complementary Therapy Use and Chronic Disease

About half of the participants (46.2%) who reported using any form of complementary therapy were being treated for heart disease, 24.1% for diabetes, 20.7% for arthritis, and 5.5% for chronic respiratory disease (Table 2). For participants receiving treatment for heart disease, the ratio of complementary therapy users to non-users was significantly higher in males than in females ($p = 0.016$). No significant gender differences in complementary therapy use were observed among those treated for arthritis, diabetes and respiratory disease. Although the ratio of complementary therapy users to non-users was generally higher among whites than African Americans, for those participants receiving treatment for arthritis, diabetes, and heart disease, these differences were not significant (Table 3).

Prescription Medication Adherence and Complementary Therapy Use

A total of 145 participants reported use of any complementary therapy concomitantly with prescription medication for any type of chronic condition. Of these, 123 (84.8%) had an adherence score of 75% or more (Figure 1). Differences in adherence score between complementary therapy users and non-users did not reach statistical significance; 16 of the 20 participants (80%) who reported no form of complementary therapy use had an adherence score of 75% or more ($p = 0.61$). This relationship did not differ when

considering adherence and complementary therapy use for the various chronic conditions under study (Table 4).

Among participants reporting the use of one or more forms of complementary therapy, the majority (86%) used 2 or more prescription medications. However, regardless of the number of prescription medications that participants were taking, their use or non-use of complementary therapy did not affect adherence; among those using 2 or more prescription medications, 86% of complementary therapy users and 79% of non-complementary therapy users reported taking at least 75% of their prescribed medications all the time ($p = 0.38$). A similar trend was observed among participants using fewer than 2 prescription medications.

Discussion

The relationship between the use of complementary therapy and adherence to prescription medications among older adults has not been extensively studied. Speculations and reports indicate that the use of complementary therapy may have a negative effect on prescription medication adherence (Gohar, Greenfield, Beevers, Lip, & Jolly, 2008; Jernewall, Zea, Reisen, & Poppen, 2005; M. Krousel-Wood, Thomas, Muntner, & Morisky, 2004). Results from our study show that, despite the high prevalence of complementary therapy use in this rural, older adult population, no association between the use of complementary therapy and adherence to prescription medications is evident.

Studies that have focused on the use of complementary therapy among older adults have reported a wide range of prevalence rates, generally ranging from 28% to 88% (Arcury, Suerken, Grzywacz, Bell, Lang, & Quandt, 2006; Astin, Pelletier, Marie, & Haskell, 2000; Bell et al., 2006a; Cherniack, Senzel, & Pan, 2001; Cuellar, Aycok, Cahill, & Ford, 2003; Grzywacz, Suerken, Quandt, Bell, Lang, & Arcury 2006; Micek et al., 2007; Najm, Reinsch, Hoehler, & Tobis, 2003; Ness, Cirillo, Weir, Nisly, & Wallace, 2005; Shreffler-Grant, Weinert, Nichols, & Ide, 2005). Our study found a prevalence rate of 87.8% among men and women. This high prevalence may be due to our study having considered many different modalities such as natural products (home remedies, herbal medicines, vitamins, and minerals), mind and body therapies (meditation, relaxation, formal exercise), and manipulative and body-based practices (massage, manipulation by chiropractors and physical therapists). Other studies have considered one form of complementary therapy use (natural products). Also, because participants recruited to this study were told that it focused on the use of complementary therapies as well as other therapies, some older adults may have agreed to participate because of an interest in the use of complementary therapies (Arcury et al., 2011).

Over 64% of our sample had at least a high school education and more than two-thirds had an annual income above the poverty line (\$13,000 US dollars). Among participants who used complementary therapy, 62.1% had attended at least high school. This finding from our study is similar to that described in previously published studies (Astin, 1998; Barnes et al., 2004; Bell, Suerken, Grzywacz, Lang, Quandt, & Arcury, 2006b; Cherniack et al., 2001; Egede, Ye, Zheng, & Silverstein, 2002). Individuals with more education may be more resourceful and more likely to research their underlying disease. Moreover, research has

shown that people view complementary therapies as more empowering, less authoritarian, and offering them more personal autonomy and control over their healthcare decisions (Astin, 1998; Thorne, Paterson, Russell, & Schultz, 2002). Results from our study did not reveal any significant differences in age, gender, and marital status between complementary therapy users and non-users. This finding corroborates with that from prior studies (Cherniack et al., 2001; Gohar et al., 2008).

Several studies have evaluated the associations between complementary therapy use and adherence to prescription medications, in most cases involving medication adherence to one type of medical condition (hypertension, inflammatory bowel disease, human immunodeficiency virus infection) and use of mainly ingested forms of complementary therapy (M. A. Krousel-Wood et al., 2010; Lakatos et al., 2010; Nahin et al., 2009; Tilburt, Dy, Weeks, Klag, & Young, 2008; Weizman et al., 2012). Our study included various forms of complementary therapy use and adherence in adults presenting with four major chronic conditions (arthritis, diabetes, heart disease, and respiratory disease). An overall association was studied, and associations in each of the four chronic condition categories. The finding from our study that complementary therapy use was not associated with low adherence is similar to the results of previous studies (Cherniack, 2011; Gohar et al., 2008; Weizman et al., 2012.) In one of these studies, among complementary therapy users, 88% reported the willingness to continue conventional therapy after starting a complementary therapy. These findings suggest that older adults may be complementing, rather than substituting, conventional treatment with complementary therapies. Though some studies have described a low adherence to antihypertensive medications in African Americans, but not whites, receiving complementary therapy (Krousel-Wood et al., 2010), our study did not find ethnic differences in the association between complementary therapy use and medication adherence.

Our study has a number of limitations. The sample studied was non-random, analysis was cross-sectional, and involved older adults restricted to one region of the US. Therefore caution must be used in generalizing the study results. However, it provides important new information on the association between complementary therapy use and medication adherence in older rural adults. While this manuscript and prior studies involving the same age group from different regions of the US have similar findings, future more comprehensive research is needed to determine the full spectrum of effects complementary therapy use has on prescription medication adherence in older adults. Data on use of complementary therapy and prescription medications were self-reported thus have a potential for misclassification. Previous observational studies have used the validated self-reported continuous Morisky score to assess adherence (Gohar et al., 2008; M. A. Krousel-Wood et al., 2010), while others have used a dichotomous measure (adherent vs non-adherent) (Cherniack, 2011; Weizman et al., 2012), thus making direct comparisons difficult. Our study used a scoring system, rather than a dichotomous measure, because adherence can vary along a continuum from 0 to 100% (Pullar, Kumar, Tindall, & Feely, 1989; Rudd et al., 1988). Finally, the small number of participants in each chronic condition by gender or ethnicity group did not allow for examining whether the use of specific complementary therapies had an effect on prescription medication adherence for each chronic condition.

Despite these limitations, the present study has a number of strengths. Previous studies have recruited patient samples primarily from a hospital facility or a managed care organization (Cherniack, 2011; Gohar et al., 2008; Krousel-Wood et al., 2010; Lakatos et al., 2010). In our study, we recruited a community sample from 34 sites. Though not random, this minimizes selection bias. The study population is bi-ethnic, data on diverse complementary therapy modalities were collected, and it involved participants with more than one chronic condition.

Conclusion

This study has shown that a substantial proportion of older adults aged 65 years or more use complementary therapy concomitantly with prescription medications. The frequent co-existence of one or more chronic conditions makes this population group potentially vulnerable to polypharmacy and medication non-adherence. However, complementary therapy use among older adults appeared to complement, rather than substitute, conventional therapies.

Acknowledgments

Funding Work on this project was supported by the National Center for Complementary and Alternative Medicine (grant number R01 AT003635).

References

- Arcury TA, Bell RA, Snively BM, Smith SL, Skelly AH, Wetmore LK, Quandt SA. Complementary and alternative medicine use as health self-management: rural older adults with diabetes. *Journals of Gerontology. Series B: Psychological Sciences and Social Sciences*. 2006; 61(2):S62–70.
- Arcury TA, Grzywacz JG, Neiberg RH, Lang W, Nguyen H, Altizer K, Quandt SA. Older adults' self-management of daily symptoms: complementary therapies, self-care, and medical care. *Journal of Aging and Health*. 2012; 24(4):569–597. [PubMed: 22187091]
- Arcury TA, Grzywacz JG, Neiberg RH, Lang W, Nguyen HT, Altizer K, Quandt SA. 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, Grzywacz JG, Stoller EP, Bell RA, Altizer KP, Chapman C, Quandt SA. Complementary therapy use and health self-management among rural older adults. *Journals of Gerontology. Series B: Psychological Sciences and Social Sciences*. 2009; 64(5):635–643.
- Arcury TA, Quandt SA. Participant recruitment for qualitative research: A site-based approach to community research in complex societies. *Human Organization*. 1999; 58:128–133.
- 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. Why patients use alternative medicine: results of a national study. *JAMA*. 1998; 279(19):1548–1553. [PubMed: 9605899]
- 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. *Journals 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.
- Bell RA, Stafford JM, Arcury TA, Snively BM, Smith SL, Grzywacz JG, Quandt SA. Complementary and Alternative Medicine Use and Diabetes Self-Management Among Rural Older Adults. *Complement Health Pract Rev*. 2006; 11(2):95–106. [PubMed: 19756166]

- Bell RA, Suerken CK, Grzywacz JG, Lang W, Quandt SA, Arcury TA. CAM use among older adults age 65 or older with hypertension in the United States: general use and disease treatment. *Journal of Alternative and Complementary Medicine*. 2006a; 12(9):903–909. [PubMed: 17109582]
- Bell RA, Suerken CK, Grzywacz JG, Lang W, Quandt SA, Arcury TA. Complementary and alternative medicine use among adults with diabetes in the United States. *Alternative Therapies in Health and Medicine*. 2006b; 12(5):16–22.
- Berg JS, Dischler J, Wagner DJ, Raia JJ, Palmer-Shevlin N. Medication compliance: a healthcare problem. *Annals of Pharmacotherapy*. 1993; 27(9 Suppl):S1–24. [PubMed: 8400462]
- Cherniack EP. Complementary medicine use is not associated with non-adherence to conventional medication in the elderly: a retrospective study. *Complementary Therapies in Clinical Practice*. 2011; 17(4):206–208. [PubMed: 21982134]
- Cherniack EP, Senzel RS, Pan CX. Correlates of use of alternative medicine by the elderly in an urban population. *Journal of Alternative and Complementary Medicine*. 2001; 7(3):277–280. [PubMed: 11439850]
- Claxton AJ, Cramer J, Pierce C. A systematic review of the associations between dose regimens and medication compliance. *Clinical Therapeutics*. 2001; 23(8):1296–1310. [PubMed: 11558866]
- Cuellar N, Aycock T, Cahill B, Ford J. Complementary and alternative medicine (CAM) use by African American (AA) and Caucasian American (CA) older adults in a rural setting: a descriptive, comparative study. *BMC Complementary and Alternative Medicine*. 2003; 3:8. [PubMed: 14622445]
- Egede LE, Ye X, Zheng D, Silverstein MD. The prevalence and pattern of complementary and alternative medicine use in individuals with diabetes. *Diabetes Care*. 2002; 25(2):324–329. [PubMed: 11815504]
- Eisenberg DM, Davis RB, Ettner SL, Appel S, Wilkey S, Van Rompay M, Kessler RC. Trends in alternative medicine use in the United States, 1990–1997: results of a follow-up national survey. *JAMA*. 1998; 280(18):1569–1575. [PubMed: 9820257]
- 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]
- Gohar F, Greenfield SM, Beevers DG, Lip GY, Jolly K. Self-care and adherence to medication: a survey in the hypertension outpatient clinic. *BMC Complementary and Alternative Medicine*. 2008; 8:4. [PubMed: 18261219]
- Grzywacz JG, Suerken CK, Quandt SA, Bell RA, Lang W, Arcury TA. Older adults' use of complementary and alternative medicine for mental health: findings from the 2002 National Health Interview Survey. *Journal of Alternative and Complementary Medicine*. 2006; 12(5):467–473. [PubMed: 16813511]
- Jernewall N, Zea MC, Reisen CA, Poppen PJ. Complementary and alternative medicine and adherence to care among HIV-positive Latino gay and bisexual men. *AIDS Care*. 2005; 17(5):601–609. [PubMed: 16036246]
- Jha AK, Aubert RE, Yao J, Teagarden JR, Epstein RS. Greater adherence to diabetes drugs is linked to less hospital use and could save nearly \$5 billion annually. *Health Affairs*. 2012; 31(8):1836–1846. [PubMed: 22869663]
- Krousel-Wood M, Thomas S, Muntner P, Morisky D. Medication adherence: a key factor in achieving blood pressure control and good clinical outcomes in hypertensive patients. *Current Opinion in Cardiology*. 2004; 19(4):357–362. [PubMed: 15218396]
- Krousel-Wood MA, Muntner P, Islam T, Morisky DE, Webber LS. Barriers to and determinants of medication adherence in hypertension management: perspective of the cohort study of medication adherence among older adults. *Medical Clinics of North America*. 2009; 93(3):753–769. [PubMed: 19427503]
- Krousel-Wood MA, Muntner P, Joyce CJ, Islam T, Stanley E, Holt EW, Webber LS. Adverse effects of complementary and alternative medicine on antihypertensive medication adherence: findings from the cohort study of medication adherence among older adults. *Journal of the American Geriatrics Society*. 2010; 58(1):54–61. [PubMed: 20122040]

- Lakatos L, Czegledi Z, David G, Kispal Z, Kiss LS, Palatka K, Lakatos PL. Treatment adherence and use of complementary and alternative medicine in patients with inflammatory bowel disease. *Orvosi Hetilap*. 2010; 151(7):250–258. [PubMed: 20133244]
- McDonnell PJ, Jacobs MR. Hospital admissions resulting from preventable adverse drug reactions. *Annals of Pharmacotherapy*. 2002; 36(9):1331–1336. [PubMed: 12196047]
- Micek MA, Bradley KA, Braddock CH 3rd, Maynard C, McDonell M, Fihn SD. Complementary and alternative medicine use among Veterans Affairs outpatients. *Journal of Alternative and Complementary Medicine*. 2007; 13(2):190–193.
- Morisky DE, Ang A, Krousel-Wood M, Ward HJ. Predictive validity of a medication adherence measure in an outpatient setting. *Journal of Clinical Hypertension (Greenwich, Conn.)*. 2008; 10(5):348–354.
- Nahin RL, Pecha M, Welmerink DB, Sink K, DeKosky ST, Fitzpatrick AL. Concomitant use of prescription drugs and dietary supplements in ambulatory elderly people. *Journal of the American Geriatrics Society*. 2009; 57(7):1197–1205. [PubMed: 19515113]
- Najm W, Reinsch S, Hoehler F, Tobis J. Use of complementary and alternative medicine among the ethnic elderly. *Alternative Therapies in Health and Medicine*. 2003; 9(3):50–57.
- 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., DeFries, GH., Duncker, AP. Introduction: The nature, extent, and modifiability of self-care behaviors in later life. Springer; New York: 1998.
- Osterberg L, Blaschke T. Adherence to medication. *New England Journal of Medicine*. 2005; 353(5):487–497. [PubMed: 16079372]
- Pullar T, Kumar S, Tindall H, Feely M. Time to stop counting the tablets? *Clinical Pharmacology and Therapeutics*. 1989; 46(2):163–168. [PubMed: 2758726]
- Rodgers PT, Ruffin DM. Medication nonadherence: Part II--A pilot study in patients with congestive heart failure. *Managed Care Interface*. 1998; 11(9):67–69. 75.
- Rudd P, Byyny RL, Zachary V, LoVerde ME, Mitchell WD, Titus C, Marshall G. Pill count measures of compliance in a drug trial: variability and suitability. *American Journal of Hypertension*. 1988; 1(3 Pt 1):309–312. [PubMed: 3291897]
- Sensit BL, Achusim LE, Genest RP, Cosentino LA, Ford CC, Little JA, Bates DW. Practical approach to determining costs and frequency of adverse drug events in a health care network. *American Journal of Health-System Pharmacy*. 2001; 58(12):1126–1132. [PubMed: 11449856]
- Shreffler-Grant J, Weinert C, Nichols E, Ide B. Complementary therapy use among older rural adults. *Public Health Nursing*. 2005; 22(4):323–331. [PubMed: 16150013]
- Sokol MC, McGuigan KA, Verbrugge RR, Epstein RS. Impact of medication adherence on hospitalization risk and healthcare cost. *Medical Care*. 2005; 43(6):521–530. [PubMed: 15908846]
- Thorne S, Paterson B, Russell C, Schultz A. Complementary/alternative medicine in chronic illness as informed self-care decision making. *International Journal of Nursing Studies*. 2002; 39(7):671–683. [PubMed: 12231024]
- Tilburt JC, Dy SM, Weeks K, Klag M, Young JH. Associations between home remedy use and a validated self-reported adherence measure in an urban African-American population with poorly controlled hypertension. *Journal of the National Medical Association*. 2008; 100(1):91–97. [PubMed: 18277815]
- Tindle HA, Davis RB, Phillips RS, Eisenberg DM. Trends in use of complementary and alternative medicine by US adults: 1997–2002. *Alternative Therapies in Health and Medicine*. 2005; 11(1):42–49.
- Weizman AV, Ahn E, Thanabalan R, Leung W, Croitoru K, Silverberg MS, Nguyen GC. Characterisation of complementary and alternative medicine use and its impact on medication adherence in inflammatory bowel disease. *Alimentary Pharmacology and Therapeutics*. 2012; 35(3):342–349. [PubMed: 22176478]
- Zollman C, Vickers A. What is complementary medicine? *BMJ*. 1999; 319(7211):693–696. [PubMed: 10480829]

Figure 1. Adherence score of participants by complementary therapy status. The horizontal axis represents the adherence score for use of prescription medications, while the vertical axis represents the proportion of participants in the study. The solid line represents the curve for complementary therapy users, while the dashed line represents the curve for non-users.

Table 1

Sociodemographic Characteristics of Participants by Complementary Therapy Users and Non-Users

Sociodemographic Characteristics	Overall	Complementary Therapy User	Complementary Therapy Non-User	P-Value
Sex, n (%)				
Female	83 (50.3)	73 (50.3)	10(50.0)	NS
Male	82 (49.7)	72 (49.7)	10(50.0)	
Race, n (%)				
African American	78 (47.3)	68 (46.9)	10 (50.0)	NS
White	87 (52.7)	77 (53.1)	10 (50.0)	
Age, mean ($\pm$ SD)	73.8 (6.9)	74.0 (7.1)	73.5 (7.1)	NS
Level of Education, n (%)				
Less than High School	59 (35.8)	55 (37.9)	4 (20.0)	NS
High School	20 (12.1)	19 (13.1)	1 (5.0)	
More than High School	86 (52.1)	71 (49.0)	15 (75.0)	
Currently Married, n (%)	68 (41.2)	60 (41.4)	8 (40.0)	NS
Satisfied with Medical Services, n (%)	161 (98.2)	141 (97.9)	20 (100.0)	NS
Annual income, n (%)				
< \$13,000	46 (28.8)	41 (29.3)	5 (25.0)	NS
\$13,000	114 (71.3)	99 (70.7)	15 (75.0)	
Have Health Insurance, n (%)	159 (97.0)	139 (96.5)	20 (100)	NS
Number of chronic conditions, n (%)				
2	119 (72.1)	102 (70.3)	17 (85.0)	NS
>2	46 (27.9)	43 (29.7)	3 (15.0)	

SD, standard deviation; NS, non-significant ($P > 0.05$)

Table 2

Comparison of Complementary Therapy Users and Non-Users by Chronic Condition and by Gender

Condition	Gender	Complementary Therapy User	Complementary Therapy Non-user	P-Value
Arthritis, n (%)	Female	21 (84.0)	4 (16.0)	NS
	Male	9 (64.3)	5 (35.7)	
Diabetes, n (%)	Female	14 (51.9)	13 (48.1)	NS
	Male	21 (60.0)	14 (40.0)	
Heart disease, n (%)	Female	23 (69.7)	10 (30.3)	0.016
	Male	44 (91.7)	4 (8.3)	
Respiratory disease, n (%)	Female	6 (37.5)	10 (62.5)	NS
	Male	2 (22.2)	7 (77.8)	

NS, non-significant ($P > 0.05$)

Table 3

Comparison of Complementary Therapy Users And Non-Users by Chronic Condition and by Ethnicity

Condition	Ethnicity	Complementary Therapy User	Complementary Therapy Non-user	P-Value
Arthritis, n (%)	African American	10 (71.4)	4 (28.6)	NS
	White	20 (80.0)	5 (20.0)	
Diabetes, n (%)	African American	16 (47.1)	18 (52.9)	NS
	White	19 (67.9)	9 (32.1)	
Heart disease, n (%)	African American	28 (75.7)	9 (24.3)	NS
	White	39 (88.6)	5 (11.4)	
Respiratory disease, n (%)	African American	4 (40.0)	6 (60.0)	NS
	White	4 (26.7)	11 (73.3)	

NS, non-significant ($P > 0.05$)

Table 4

Complementary Therapy Use and Adherence Score by Chronic Condition

Condition	Complementary Therapy Status	Adherence Score			P-Value
		< 50%	50% – 75%	> 75%	
Arthritis, n (%)	User	8 (26.7)	4 (13.3)	18 (60.0)	NS
	Non-User	2 (22.2)	1 (11.1)	6 (66.7)	
Diabetes, n (%)	User	0 (0.0)	1 (2.9)	34 (97.1)	NS
	Non-User	1 (3.7)	1 (3.7)	25 (92.6)	
Heart Disease, n (%)	User	1 (1.5)	2 (3.0)	64 (95.5)	NS
	Non-User	0 (0.0)	0 (0.0)	14 (100.0)	
Respiratory Disease, n (%)	User	4 (50.0)	1 (12.5)	3 (37.5)	NS
	Non-User	6 (35.3)	5 (29.4)	6 (35.3)	
Any Condition, n (%)	User	4 (2.8)	18 (12.4)	123 (84.8)	NS
	Non-User	1 (5.0)	3 (15.0)	16 (80.0)	
< 2 prescription medications, n (%)	User	2 (9.5)	3 (14.3)	16 (76.2)	NS
	Non-User	0 (0.0)	0 (0.0)	1 (100.0)	
2 prescription medications, n (%)	User	2 (1.6)	15 (12.1)	107 (86.3)	NS
	Non-User	1 (5.3)	3 (15.8)	15 (78.9)	

NS, non-significant ($P > 0.05$)