Complementary and Alternative Medicine Among Older Adults in the United States:

Current Evidence and Future Directions

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Introduction

While complementary and alternative medicine (CAM) is commonly accepted and practiced in many countries, it has recently received attention in the United States. Older adults are no different than their younger counterparts in searching for more options and better therapies to improve health conditions. With increased prevalence in use of CAM, it is crucial to examine the evidence of effectiveness and safety of these therapies for future directions, particularly for older adults. This paper summarizes the following topics: (a) prevalence of complementary and alternative medicine (CAM) use among older adults; (b) types of frequently used CAM; (c) factors affecting CAM use; (d) health of older adults; (e) evidence of CAM effectiveness; (f) benefits and risks of CAM use among older adults; and (g) conclusions and future directions.

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Prevalence of complementary and alternative medicine (CAM) use among older adults

Worldwide, 70% to 90% of human health care is delivered by alternative systems of medical practices, varying from self-care fostered by folk principles to care by organized health care systems based on alternative traditions or practices. In the United States, CAM is practiced by a substantial portion of the population (Barnes, Powell-Griner, McFann, & Nahin, 2004; Eisenberg, Davis, Ettner, Appel, Wilkey, et al., 1998; Eisenberg., Kessler, Foster, Norlock, Calkins, et al., 1993; Tindle, Davis, Phillips, & Eisenberg, 2005) and prevalence of and expenditures for CAM use have increased exponentially during the last decade (Barnes et al., 2004; Eisenberg et al. 1998). While traditional biomedical models of care focus on treating diseases, CAM is frequently used for treating non life-threatening and/or chronic medical conditions and preventing those conditions (Astin, 1998; Eisenberg et al. 1998; Yoon & Horne, 2001; Yoon, Horne, & Adams, 2004). Adults with chronic conditions are more likely to use CAM compared to those without (Saydah & Eberhardt, 2006), and adults who reported fre-

quent anxiety or depression used self-practiced CAM significantly more than those without these conditions, as reported by Grzywacz and colleagues (2006) in their analyses of the 2002 National Health Interview Survey (NHIS). In addition, persons with diabetes were 1.6 times more likely to use CAM compared to those without diabetes, and a diabetic condition was an independent predictor of using CAM (Egede, Zheng, Ye, & Silverstein, 2002).

Older adults place more importance on preventing and treating chronic health conditions as they age because they are more at risk of developing a higher number of multiple chronic conditions than their younger counterparts. With increased prevalence of chronic health conditions, they are searching for possible options in addition to or as a substitute for conventional medical care. Since *baby boomers* (a term used in the U.S. to indicate those born between 1946 and 1964) are predicted to comprise the largest proportion of the adult population over the next 20 years (National Center for Health Statistics [NCHS], 2005) and be more ethnically diverse than ever before (United States Census Bureau, 2000), prevalence of CAM use in this population will also increase.

According to findings based on 2002 NHIS data, approximately 40% of adults reported using some types of CAM (excluding prayer), and typical, frequent consumers of CAM have been middle-aged White Americans, well-educated, with high SES (Barnes et al., 2004; Graham, Ahn, Davis, O'Connor, Eisenberg, et al., 2005). Prevalence of CAM use in older adults was similar to the general population. About 30-40% of older adults used some types of CAM in community settings (Astin, Pelletier, Marie, & Haskell, 2000; Foster, Phillips, Hamel, & Eisenberg, 2000), whereas 64% of older adults reported using CAM in urban ambulatory care settings (Cohen, Ek, & Pan, 2002). Likewise, Yoon and colleagues (Yoon & Horne, 2001; Yoon et al. 2004) reported that 33-45% of older women in North Central Florida used herbals during the past year, and the majority of those used were not disclosed to their health care providers.

Types of frequently used CAM

Prevalence and research findings of CAM research vary among studies because of inconsistency in definitions of CAM. The National Center for Complementary and Alternative Medicine (NCCAM), National Institutes of Health (NIH), defines CAM as "a group of diverse medical and health care systems, practice, and products that are not presently considered to be part of conventional medicine" although there may be some scientific evidence (NCCAM, 2007). Five main categories of CAM include 1) alternative (whole) medical systems, 2) mind-body interventions, 3) biologically based therapies, 4) manipulative and body-based methods, and 5) energy therapies (National Institutes of Health/ National Center for Complementary and Alternative Medicine [NIH/NCCAM], 2002). For the first time in the US, a comprehensive 'Alternative Health Supplement' survey was included as part of the 2002 NHIS, a population-based survey (National Center for Health Statistics [NCHS], 2003). In the Alternative Health Supplement (NCHS, 2003), NCCAM defined 17 types of CAM and categorized them into two groups, professionally provided CAM (CAM-Prof; 10 categories) and self-practiced CAM (CAM-Self; 7 categories) (see Table 1).

< Table 1 > Types of CAM categorized in the 2002 NHIS Alternative Health Supplement

Domain and Whole Medical Systems*	**Service oriented categories****	
	Professional provided CAM	**Self-practiced** CAM
Alternative (Whole) medical systems	Acupuncture Ayurveda Naturopathy Folk Medicine	Homeopathic treatment
Mind-body interventions	Biofeedback Hypnosis	Relaxation techniques Prayer for your own health
Energy therapies	Energy Healing Therapy/Reiki	Yoga/Tai Chi/Qi Gong
Biologically based treatments	Chelation therapy	Vitamins Herbs Special Diets
Manipulative and body-based methods	Massage Chiropractic care	

* Workshop on Alternative Medicine (1994)

** National Health Interview Survey, Alternative Health Supplement (NHIS, 2002)

Findings based on the 2002 NHIS Alternative Health Supplement indicated that mind-body interventions (e.g., relaxation technique, prayer) were the most frequently used type of CAM (52.6%), followed by biologically-based therapies such as (21.9%) and manipulative and body-based methods such as massage and chiropractic care (10.9%) (Barnes et al. 2004). Prayer, also, was commonly practiced as CAM for health reasons in the US (Barnes et al., 2004; Dunn & Horgas, 2000; McCaffrey, Eisenberg, Legedza, Davis & Phillips, 2004). Excluding prayer, natural products like echinacea, ginseng, and ginkgo were the most frequently used type of CAM in the US (Barnes et al., 2004). Recent findings indicated an overall higher prevalence of CAM use in the general population, with herbals (herbal products and homeopathic treatment) the most frequently used (Barnes et al. 2004; Eisenberg et al. 1993; Eisenberg et al. 1998; Graham et al., 2005; Ni, Simile, & Hardy, 2002; Tindle et al., 2005; Yoon & Horne, 2001; Yoon et al., 2004).

Factors affecting CAM use

Limited information is available as to why CAM use, particularly herbals, has escalated over the last decade, and whether factors impacting health care access/utilization are associated with this increase. Pagán and Pauly (2005) reported inability to afford conventional medical care as a possible reason for increased CAM use, while others argued it was based on personal belief, dissatisfaction with conventional health care, and cul-

tural values about managing health (Cassileth, & Chapman, 1996; McGregor, & Peay, 1996; Sutherland, & Verhoef, 1994 7) chronic, painful, and unsuccessful medical problems, 8) beliefs about importance of psychological factors more than evidence-based medicine, and 9) negative attitude toward physicians.

These findings indicated diverse personal reasons for choosing CAM but were lacking in the assessment of potential system factors leading to CAM use, such as lack of insurance or transportation issues. According to recent findings analyzing population-based data using the 2002 NHIS (Barnes et al., 2004), over 50% of persons participating in the survey reported that combining CAM with conventional medicine would be helpful and that it would be interesting to try CAM. Other personal reasons reported were that conventional therapies would not be helpful or that CAM use was suggested by conventional health care providers. However, about 13% of participants reported that the cost of receiving conventional medical treatment was too expensive (Barnes et al., 2004). Overall, there are growing concerns about whether those experiencing difficulty accessing health care when needed are relying on self-practiced CAM (particularly herbals) as a substitute for conventional medical care. If persons select CAM, either as an alternative or as complementary to conventional health care, based on their personal beliefs and cultural influence, it still raises concerns because of following reasons: 1) selected self-prescribed CAM therapies cause delay seeking of conventional health care, which may further deteriorate person's chronic health conditions, 2) selected self-prescribed CAM therapies may alter adherence to the prescribed regimens offered by conventional health care providers, and 3) further these may impact on treatment outcomes.

Health of older adults

In 2003, nearly 36 million people aged 65 and over lived in the United States, accounting for over 12% of the total population (National Center for Health Statistics [NCHS], 2005). The number of older adults is expected to increase dramatically between 2010 and 2030, when *baby boomers* (a term used in the US to indicate those born between 1946 and 1964) start turning 65 years old (Collins, Davis, Schoen, Doty, & Kriss, 2006; NCHS, 2005). This population's growth will be linked with increased racial and ethnic diversity. Major shift in the composition of older adults is projected, with 61% non-Hispanic Whites, 18% Hispanics, 12% non-Hispanic Blacks, and 8% Asians by the year 2050 (U.S. Census Bureau, 2000). In their analysis of the Health and Retirement Survey, Kington and Smith (1997) found that African Americans and Hispanics reported higher rates of chronic conditions than Whites, and persons with chronic conditions and lower socioeconomic status (SES) reported more functional limitations. They suspected that lower SES was indicative of inadequate treatment/limited access to healthcare, which would further increase the risk of negative health outcomes.

Aging is often associated with chronic health conditions (Anderson & Horvath, 2004; Schoenborn, Vickerie, & Powell-Griner, 2006; Wolff, Starfield, & Anderson, 2002) with 80% of older adults living with at least one chronic condition and 60% with two or more (Anderson & Horvath, 2004; Hoffman, Rice, & Sung, 1996; Wolff et al., 2002). Common chronic health conditions include cardiovascular disease, arthritis, diabetes, chronic respiratory disease, and hypertension (Federal Interagency Forum on Aging-Related Statistics, 2006). These conditions often lead to depression, functional and/or cognitive disabilities, decreased quality of life of

older adults, and an inability for them to remain in the community (Centers for Disease Control and Prevention [CDC] 1997; Williamson, 2000). According to Miller and colleagues (2004), older adults who experienced chronic conditions such as diabetes, hip fracture, knee pain, depression, and stroke had the most difficulty recovering from functional limitations compared to older adults who did not experience these conditions (Miller, Zhang, Silliman, Hayes, Leveille, et. al., 2004).

In addition, older adults with multiple chronic conditions may face complex consequences, including use of multiple medications (Federal Interagency Forum on Aging-Related Statistics, 2006) and higher health care expenditure to manage their health, which can negatively impact individual and social financial resources (Boyd, Darer, Boult, Fried, Boult, et al., 2005; Gijsen, Hoeymans, Schellevis, Ruwaard, Satariano, et al., 2001). Steinman and colleagues (2006) reported that older adults use an average of eight medications (maximum 17) in their study of patients visiting a Veterans Administration (VA) hospital (mostly men with chronic health conditions) (Steinman, Landefeld, Rosenthal, Berthenthal, Sen et al., 2006). However, this author found that older women living in a community reported similar numbers of medications used as men in the VA setting and they frequently use many over-the-counter drugs and dietary supplements, particularly herbs, to manage their own health. These, too, are paid for out-of-pocket (Yoon & Horne, 2001; Yoon et al., 2004) in spite of little or no insurance coverage (Barnes et al., 2004; Eisenberg et al., 1998; Ni et al., 2002; Yoon & Horne, 2001; Yoon et al., 2004). The high prevalence of complementary therapy use may be caused by system factors (external factors) that limit or delay access to conventional healthcare services (including access to prescribed medications) and/or by personal factors (internal factors) such as personal beliefs or a person's cultural traditions.

Evidence of CAM effectiveness

The high prevalence of CAM use among adults raises two imperative questions, particularly among older adults: effectiveness and safety. Researchers have investigated whether effectiveness of CAM is superior to placebos, similar to conventional medical treatments, or even superior to conventional treatments. At the same time, whether CAM use is safer than usual conventional treatments with similar effectiveness or whether it causes unnecessary side effects (known or unknown) should be examined. Although the last decade has produced more findings from randomized clinical trials (RCT) and metal-analyses, either these findings are positive but not compelling, or are not compelling at all in most cases, again, indicating a need for further study. In spite of insufficient evidence of effectiveness of CAM to treat chronic health conditions, however, there is solid evidence that older adults are using CAM and expecting it to offer benefits with fewer side effects than those caused by conventional treatments.

There is limited information available on CAM use for older adults based on systematic reviews, meta-analyses, randomized clinical trials, observational studies, and case reports. In this paper, evidence of CAM effectiveness is summarized using the most common chronic health conditions for older adults in the US, which are pain (particularly arthritis related pain), cardiovascular conditions, hypertension, diabetes, and chronic lung conditions such as asthma, emphysema, chronic bronchitis (Federal Interagency Forum on

Aging-Related Statistics, 2006). Falls can also cause short-term functional limitation and/or disability or result in death (CDC, 2006). <Table 2> summarizes findings from the selected publications on effectiveness of currently available CAM use in older adults with common chronic health conditions (Federal Interagency Forum on Aging-Related Statistics, 2006). Evidence from recently published, systematic reviews, meta-analyses, and randomized controlled trials are categorized by common chronic health conditions.

< Table 2 > Examples of CAM Studies Involving Common Chronic Health Conditions in Older Adults

Chronic conditions and type of CAM	Study focus	Reference	Study design, sample size, & recruitment sites (**RCT**: Randomized clinical trial)	Study period and outcome measures	Results	Comments
PAIN						
Acupuncture	Reduction of chronic low back pain	Meng, Wang, Ngeow, Lao, Peterson et al., (2003)	**RCT & cross-over design [N=55]** (acupuncture plus standard therapy [n=24], standard therapy [n=23], withdrawal [n=8]) Age ≥ 60 yr with low back pain ≥ 12 weeks Sample was recruited from mainly hospital clinics, USA.	5 wk intervention History-Demographic information, Charlson Comorbidity Index, Activities of Daily Living, medication, other CAM use, short depression scale Back pain specific history-Roland Disability Questionnaire (RDQ), visual analogue scale (VAS), health-related quality of life, psychological impact profile	Disability: Clinically and statistically significant difference- decreased RDQ at week 6 (p=0.001) in experimental group and maintained for up to 4 weeks after treatment Pain: no difference in VAS at week 6 (p=0.1) and significant difference at week 9 (p=0.02) Fewer medication-related side effects were reported in experimental group.	Relatively small sample size with high number of drop-outs (n=8); no placebo applied to a control group.
Acupuncture	Knee pain	Witt, Brinkhaus, Jena, Linde, Streng, et al., (2005)	**RCT** (28 multi-centers) **[N= 300 , 2:1:1]** ratio-acupuncture [n=150], minimal acupuncture [n=76], waiting list control [n=74]; withdrawal [n=6]) Age: 50-75 yrs and osteoarthritis Sample was recruited from local newspapers and trial centers, Germany.	8 week intervention (12 sessions, 30 minutes per session) and follow-up at 26 wks and 52 wks. Measurements: Western Ontario and McMaster Universities Osteoarthritis [WOMAC], German Society for the Study of Pain survey (German pain disability index, emotional aspects of pain [SES], depression scale [ADS]), numeric pain scale, demographic information German version of SF-36, pain medication	Significantly less pain, less use of analgesics, and improved function in acupuncture group after 8 wks compared to minimal acupuncture (p=0.0002) or waiting group (p<0.0001), but this improvement decreased over time, and there were no differences in pain and function among three groups at 26 and 52 week follow-up (p=0.063, p=0.08 respectively) .	Limited representation of all OA patients due to recruiting method (newspaper advertisement); Study indicated minor side effects of acupuncture; Reduction of non-steroidal anti-inflammatory drugs (NSAIDs) might be a benefit for older adults. Needs long-term effects of acupuncture.

Chronic conditions and type of CAM	Study focus	Reference	Study design, sample size, & recruitment sites (**RCT**: Randomized clinical trial)	Study period and outcome measures	Results	Comments
Qi gong	Chronic pain (osteoarthritis, neuralgia)	Yang, Kim, & Lee (2005)	**RCT [N=40]** Qi gong (n=19), control group (n=21) Age: ≥ 65 yr Sample was recruited from the communities, Korea.	Qi gong intervention 20 min x2/week for 4 wks; control group for usual activities Measurements: Visual Analogue Scale [VAS], Profile of Mood Scale [POMS] weekly and 6 wks	Qi gong significantly improved pain and mood compared to control group at 6 wks (both main effect and interaction effect between intervention x time).	Subjects were mainly females. No known long-term effect of qi gong (this was short-term intervention).
Herbal product (glucosamine & chondroitin)	Pain related to knee osteoarthritis	Clegg, Reda, Harris, Klein, James, et al., (2006)	**RCT [N=1583]** (multi-center study) Four intervention (glucosamine [n=317], chondroitin [n=318], glucosamine+chondroitin [n=317], celecoxib [n=318]) groups and one placebo-controlled [=313] group Subjects were recruited from multiple sites, USA.	Intervention: glucosamine (1500 mg) daily, chondroitin sulfate (1200 mg) daily, both glucosamine and chondroitin sulfate, celecoxib (200 mg) daily, or placebo for 24 wks Measurements: Pain was measured by the WOMAC (20% decrease in knee pain after 24 weeks of intervention), joint swelling, Short Form-36 (measures quality of life), and health assessment questionnaire.	No significant difference in pain relief among chondroitin, glucosamine, and placebo groups. Response rate was higher in celecoxib group than placebo group (10% age points, p=0.008); significantly higher response rate for moderate-to-severe pain in combination therapy group than placebo group (79.2% vs. 54.3%, P=0.002).	Seventy-seven adverse events in 61 subjects; three serious events (chest pain in glucosamine subject; congestive heart failure in combination subject, stroke in celecoxib subject). Main outcome measure was a self-reported questionnaire--no measures of physical function or physiological status. More trials are needed.
Hypnosis	Hip or knee pain related to osteoarthritis (OA)	Gay, Philippot, & Luminet (2002)	**RCT [N=36]** Hypnosis group (n=13), Jacobson's relaxation group (n=13), control group (n=10). Mean age: 65 yrs Sample was recruited from a community, Belgium.	Eight sessions for 8 weeks, 3 month and 6-month follow-ups; Measurements – Pain (Visual Analogue Scale [VAS]) Medication use and dosage, Stanford Hypnotic Susceptibility Scale form C [SHSS:C], Imagery vividness (questions from Sheehan's questionnaire of mental imagery), anxiety and depression –STAI & Zung inventories.	Both hypnosis and relaxation were more effective on pain and decreased pain medication use than that of control group. Hypnosis reduced 50% of OA pain after 4 weeks of training and was maintained up to 6 months. Relaxation was effective at 8 weeks but was not maintained at 3 month follow-up. Overall, hypnosis is more effective than relaxation and control group.	Small sample size, subjects predominantly women (33/36), belief in treatment efficacy of therapists not measured (possible confounding factor), no measures of subjects' practice at home.

Chronic conditions and type of CAM	Study focus	Reference	Study design, sample size, & recruitment sites (**RCT**: Randomized clinical trial)	Study period and outcome measures	Results	Comments
CARDIOVASCULAR CONDITIONS INCLUDING HYPERTENSION						
Qi gong	Hypertension	Cheung, Lo, Fong, Chan, Wong, et al. (2005)	**RCT [N=88]** Qi gong (n=47, mean age: 57 yrs), exercise (n=41, mean age: 51 yrs). Age: 18-79 yrs community-resi ding adults with untreated hypertension. Sample recruited from local community, Hong Kong.	Qi gong/exercise: 2-hr training session/week for 4 wks and 8 more follow-up sessions. Both groups instructed to practice qi gong or exercise 60 min in AM and 15 min in PM every day. Measurements (all in Chinese version): SF-36, Beck Depression Inventory [BDI], blood pressure, demographic information.	Both groups showed significantly decreased blood pressure, heart rate, body weight, BMI, waist circumference, total cholesterol, pain, and 24-hr urine albumin excretion; Improved social function, depression, and general health between baseline and at week 16. Both qi gong and exercise have similar effects on blood pressure (decreased).	No control group, small sample size, and no measure of long-term effect of qi gong; no clear information on subjects' adherence to a research protocol.
Dietary supplement (Omega-3 fatty acids)	Effects on heart rate and heart rate variability after myocardial infarction.	O'Keefe, Abuissa, Sastre, Steinhaus, & Harris (2006)	**RCT:** randomized double-blind, placebo-controlled, and crossover design, **[N=18]** Average age: 67.8 yrs Survivors of myocardial infarction , USA.	Intervention: omega-3 fatty acids 3 caps per day; placebo: 50:50 mix of corn and olive oils per cap three times a day for 4 months (2 sequential) Measurements: heart rate (HR) with Holter s monitor, heart rate variability, inflammatory marker (C-reactive protein, tumor necrosis factor-α , and interleukin-6), blood pressure.	Decreased resting heart rate (p<0.0001) and improved 1-minute HR recovery after exercise (p<0.01); no change in overall HR variability, blood pressure, arterial compliance, lipids, or inflammatory markers. Omega-3 fatty acids may decrease a risk for sudden cardiac death.	Pilot study with small sample size, all subjects were Caucasian men, and no women or other ethnic groups were included, no explanation about randomization process, no documentation about subjects' adherence on diet instruction or research protocol.
Tai Chi	Hypertension and falls	Verhagen, Immink, van der Meulen, & Bierma-Zeinstra (2004)	**Systematic review** (Researchers searched articles up to 2001) about older adults and Tai Chi: A total of nine papers was included for the review **[N=505].** Age: ≥ 50 yrs Study was conducted in the Netherlands.	Intervention: tai chi from 1 hr weekly for 10 wks to 1 hr/day for 1 yr Control: walking or no treatment Analyses: this was mostly a pre-post analysis, not a between-group comparison.	Limited evidence for the beneficial effect of tai chi in reducing fall risks, improving functional status, and lowering blood pressure. More RCTs are needed to measure the effect of tai chi for fall prevention and other health benefits.	Limitations: inclusion of non-randomized studies, only publications written in English were included.

Chronic conditions and type of CAM	Study focus	Reference	Study design, sample size, & recruitment sites (**RCT**: Randomized clinical trial)	Study period and outcome measures	Results	Comments
CHRONIC LUNG PROBLEMS						
Acupressure	Dyspnea related to chronic obstructive pulmonary disease (COPD)	Tsay, Wang, Lin, & Chung (2005)	**RCT:** Two-group experimental blocking design **[N=52]**; random assignment to acupressure (n=26) or comparison group (n=26) Age: ≥ 60 yrs Sample recruited from intensive care units in medical centers, Taiwan.	Acupressure: daily for 10 days Comparison group: massage ad hand holding Measurements: Visual Analogue Scales [VAS] for dyspnea, & anxiety; physiological measures - heart rate (HR), respiration rate (RR); all were measured at baseline, and every day for 10 days during intervention and 11-17 days during follow-up.	Dyspnea, anxiety, HR, and RR were significantly improved over time throughout intervention in acupressure group compared to comparison group. When intervention was stopped, effect of acupressure was diminished gradually.	No specific description about protocol on massage and handholding for comparison group. Daily variability of HR and RR was not known throughout study period.
Biofeedback	Chronic Obstructive Pulmonary Disease (COPD)	Giardino, Chan, & Borson, (2004)	**RCT:** Quasi-experimental design: Pre- and posttests **[N=20]**. No control group or randomization Age 48-79 yrs (mean: 63 yrs) with COPD Sample recruited from pulmonary rehabilitation program at a medical center, USA.	Intervention: heart rate variability (HRV) biofeedback for five weekly sessions, walking with pulse oxymetry biofeedback for 4 weekly sessions, and daily home practice (total 10 week intervention) Measurements: Distance walk in 6 minutes (6MWD), quality of life (St. George's Respiratory Questionnaire [SGRQ]), anxiety, dyspnea (Pulmonary Functional Status & Dyspnea Questionnaire [PFSDQ-M]), COPD self-efficacy scale, self-reported disability, and depression (Hospital Anxiety and Depression Scale [HADS]).	Significant difference in 6MWD (t=5.16, p<0.001), perceived disability, quality of life (SGRQ; t=3.20, p=0.01), and COPD self-efficacy (t=4.01, p< 0.001), everyday activity impairments (t = 5.16, p <0.001), dyspnea distress before (t =2.99, p < 0.01) and after (t =3.46, p < 0.01) the 6MWD, and RSA during spontaneous breathing (t =6.77, p < 0.001).	Pilot study to test feasibility of intervention; no randomization; no control group; small sample size; no long-term follow-up to examine maintenance effect of the intervention.
DIABETES MELLITUS (DM)						
Herbal product (cinnamon extract)	DM type 2	Mang, Wolters, Schmitt, Kelb, Lichtinghagen et al. (2006)	**RCT:** placebo-controlled, double-blind design [**N=65**]; cinnamon group [n=33], placebo [n=32], Sample recruited from communities, Germany.	Intervention: Cinnamon extract 112 mg daily for 4 months, Placebo: microcrystalline cellulose tabs for 4 months Measurements: HbA_{1c}, fasting blood glucose, LDL, HDL, and pill counts.	Significant mean percentage difference in fasting blood glucose between intervention and control groups (10.3% vs. 3.4%, p=0.046), no difference in HbA_{1c}, & lipid profiles; no adverse effects of cinnamon extract were reported.	No known long-term effect of cinnamon extract or daily variability of blood glucose.

Chronic conditions and type of CAM	Study focus	Reference	Study design, sample size, & recruitment sites (**RCT**: Randomized clinical trial)	Study period and outcome measures	Results	Comments
Tai Chi	Mobility and DM type 2	Orr, Tsang, Lam, Comino, & Singh (2006)	**RCT:** sham-exercise controlled, single-blind design **[N=35]**; Tai Chi group [n=17], control group [n=18] Sample was recruited from Australia.	Intervention: Fifty-five minutes per session for twice a week for 16 weeks (total 32 sessions); Control group: sham exercise (ex. seated calisthenics, stretching) Measurements: mobility impairment (balance and gait speed, static balance, dynamic balance, and balance index); physiologic assessments (knee extensor strength, peak power, peak contraction velocity, endurance, and overall exercise capacity); and health status (body fat index, cognition, comorbidity, fasting blood glucose, quality of life, attitude toward diabetes).	No changes in physiological and health status changes; Significant changes in balance (p=0.03) and maximal gait speed (p= 0.005); lower baseline blood glucose and body fat were main factors predicting maximal gait speed; Tai Chi improved mobility in this population.	No explanation about recruitment process or inclusion criteria; 80% of subjects were women, small sample size, no follow-up in the study design; no specific effect on physiologic changes for diabetic control, but may be useful for daily activities, particularly in older adults.
FALLS						
Tai Chi	Falls and fall risk reduction	Li, Harmer, Fisher, McAuley, Chaumeton, et al., (2005)	**RCT [N=256]** Tai Chi group (n=125), control group (n= 131), Age: 70-92 yrs Sample recruited from community, USA.	Intervention: Tai Chi for 1 hour each session for 3 times per week for 6 months; Control group: stretching exercise for 6 months; and 6-month follow-up for both groups. Measurements: number of falls; functional balance (Berg Balance Scale, Dynamic Gait Index, Functional Reach, and single-leg standing); physical performance (50-foot speed walk, Up&Go); and fear of falling (Survey of Activities and Fear of Falling in the Elderly [SAFFE]) measured at baseline, 3, and 6 months. (intervention), and at a 6-month pos-intervention follow-up	Tai Chi vs. control groups: 3.16 vs. 8.96 falls per 100 participant-months (p<0.001), fewer falls (n=38 vs. 73; p=0.007), lower proportions of fallers (28% vs. 46%; p<0.01), and fewer injurious falls (7% vs. 18%; p<0 .03). Tai Chi may be beneficial for balance and postural control in inactive older adults.	Long-term practice of Tai Chi needed to be effective for preventing falls. There was limited generalizability due to exclusion of over 60% of screened potential subjects and pain or other geriatric conditions were not measured.
Tai Chi	Reduction of fear of falling	Sattin, Easley, Wolf, Chen, & Kutner (2005)	**RCT:** cluster-randomized **[N=311],** Tai Chi group (n=158), control wellness education group (n= 153) Age: 70-97 yrs	Intervention: Tai Chi for 60-90 minutes two times per week for 48 weeks; Control group: wellness education one hour each week for 48 weeks Measurements: Fear of falling (Activities-Specific Balance Confidence Scale [ABC] & Fall Efficacy Scale),	Tai Chi group indicated significantly lower level of fear of falling at the end of the intervention (p<0.001), significant interaction between intervention and time (p<0.001), Tai Chi non-completers showed	The majority were women; not known whether Tai Chi had immediate effects in alleviating fear of falling after a fall; no

Chronic conditions and type of CAM	Study focus	Reference	Study design, sample size, & recruitment sites (**RCT**: Randomized clinical trial)	Study period and outcome measures	Results	Comments
			Subjects recruited from 10 matched congregated living facilities in urban areas, USA.	depression (Center for Epidemiological Studies Depression Scale[CES-D]), demographic information, Body Mass Index [BMI], activity level, gait speed, and lower extremity disability.	slower gait speed (p=0.02), higher impairment in gait balance (p=0.04), and worse functional reach (p<0.001) than subjects completing the Tai Chi intervention.	long-term follow-up data available from this study to measure maintenance effect of Tai Chi.

Benefits and risks of CAM use among older adults

Studies have shown that the general benefits of CAM use in older adults may encompass enhanced feelings of empowerment (Andrews, 2002; Rose, 2006), higher internal locus of control (Yoon & Horne, 2004), and increased self-control about managing health (Rose, 2006). CAM users perceived better psychological comfort, lower incidence of side effects, greater level of confidence with control and satisfaction (Rose, 2006). These benefits, however, will differ based on the type of CAM used (see Table 2). Many older adults on a fixed or limited income may also perceive CAM as a substitute for conventional health care, particularly if the CAM is less expensive and easier to obtain. However, for health care providers, this perception can signal major health risks.

The use of CAM for older adults with chronic health conditions may result in health risks due to delayed seeking of conventional health care providers and increased use of hospital emergency rooms (Bang, & Lim, 2006; Beckman, Sommi, & Switzer, 2000; Pearl, Leo, & Tsang, 1995). Other issues related to CAM use among older adults are safety and effectiveness. Most recently, Bruno and Ellis (2005), in their analysis of the 2002 NHIS, reported that herbal products were the most commonly used type of CAM in approximately 13% of older adults. Herbal use may place older adults at risk of suboptimal health outcomes due to age-related physiologic declines in drug metabolism and elimination (Buxton, 2006), multiple medications use, and lack of effective communication between clients and their healthcare providers (Yoon & Horne, 2001; Yoon et al., 2004). This may cause misinterpretation of conventional treatment regimens for diagnosed health conditions, and/or unintentionally lead to incorrectly changing prescribed medication dosages. Further, certain herbal products were identified that resulted in potentially dangerous interactions with prescribed and/or non-prescribed medications (Yoon & Schaffer, 2006). For example, when a client visits his/her healthcare providers for symptoms of gastrointestinal bleeding and does not disclose medications, including prescribed (e.g., antiplatelet agents); non-prescribed (e.g., non-steroidal anti-inflammatory drugs [NSAIDs] such as ibuprofen); and herbal products (e.g., long-term use of garlic tablets), a healthcare provider may consider dosage adjustment of prescribed antiplatelet

agents (e.g., aspirin or clopidogrel) or add a proton pump inhibitor [PPI] in addition to antiplatelet therapy (Lanas, & Scheiman, 2007) without realizing drug-herbal interactions. However, it should not be ignored that there may be potential benefits of using complementary therapies, *if* they are utilized correctly, for certain health conditions.

Conclusions and future directions

As indicated in Table 2, the potential effectiveness of CAM was apparent for many older adults who suffer from or would like to prevent detrimental chronic health conditions. Thus, it is crucial to continue to fund more rigorous clinical trials, with larger sample sizes and higher generalizability, to investigate the potential benefits of CAM for this population. In addition, in spite of effort to standardize the research protocols for CAM, there is still great variability among protocols under the same type of CAM. Standardization of protocols for specific types of CAM, duration of treatment, and long-term effects should be established for optimal outcomes.

It is known that client adherence to prescribed regimens is an issue for many conventional healthcare providers. Since many CAM interventions require longer duration of practice to demonstrate effect, adherence may also be an issue for older adults, particularly in terms of application in everyday life. For example, practicing CAM as part of an everyday lifestyle (e.g., tai chi, meditation) is needed to experience benefits. Thus, it is imperative to educate both the public and healthcare providers about the potential benefits of CAM if strict adherence to a protocol is maintained.

In summary, careful consideration should be given to using CAM alone or in combination with conventional medicines to maximize health benefits and minimize risks for older adults. Before this can be achieved, however, more research is needed to build a body of scientific evidence to substantiate what constitutes safe and effective treatment.

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Abstract

Complementary and Alternative Medicine Among Older Adults in the United States:

Current Evidence and Future Directions

Complementary and alternative medicine has gained popularity and respectability in recent years in the United States. Since aging is often associated with chronic health conditions that commonly lead to physical and psychosocial disabilities (e.g., depression, functional and/or cognitive disabilities, and decreased quality of life), older adults often seek options to maintain health and treat chronic conditions as an adjunct to conventional medical care. Herbal products, the most commonly used among various complementary and alternative medicines (CAM), should be used with caution due to potential herbal-drug interactions (related to polypharmacy) and herbal-disease interactions (related to comorbidities). Five of the most common chronic conditions in older adults are chronic pain, cardiovascular problems, hypertension, diabetes, and chronic lung problems. A high rate of falls or risk of falling is also a problem unique to this older population. For these conditions, only a few types of CAM (e.g., acupuncture, qi gong, tai chi) were tested, with promising results. However, in spite of evidence supporting the use of certain types of CAM to alleviate some common chronic conditions, findings are limited in terms of other types of CAM tested and both short and long-term effects. More rigorous clinical trials of various CAM types are thus warranted to advance scientific knowledge and establish evidence-based practices to care for the growing number of older adults who deserve to have a better quality of life.

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