

# Association Between Complementary and Alternative Medicine Use, Preventive Care Practices, and Use of Conventional Medical Services Among Adults With Diabetes

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**OBJECTIVE** — To assess the association between complementary and alternative medicine (CAM) use, preventive care practices, and use of conventional medical services among adults with diabetes.

**RESEARCH DESIGN AND METHODS** — We analyzed data on 2,474 adults with diabetes. We created an overall CAM-use category based on use of any of the following: diets, herbs, chiropractic care, yoga, relaxation, acupuncture, ayurveda, biofeedback, chelation, energy healing, Reiki therapy, hypnosis, massage, naturopathy, and homeopathy. We used multiple logistic regression to assess the effect of CAM use on preventive care practices (receipt of influenza and pneumonia vaccines) and use of conventional medical services (number of primary care and emergency department visits). STATA was used for statistical analysis to account for the complex survey design.

**RESULTS** — A total of 48% of adults with diabetes used some form of CAM. CAM use was independently associated with receipt of pneumonia vaccination (odds ratio 1.56 [95% CI 1.26–1.94]) but not significantly associated with receipt of influenza vaccination (1.17 [0.92–1.48]). CAM use was independently associated with visiting the emergency department (1.34 [1.06–1.70]), having six or more primary care visits (1.44 [1.14–1.83]), and having eight or more primary care visits (1.66 [1.22–2.25]).

**CONCLUSIONS** — In contrast to the findings of previous studies, CAM use appears to be associated with increased likelihood of receipt of preventive care services and increased emergency department and primary care visits. CAM use may not be a barrier to use of conventional medical services in adults with diabetes.

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**D** iabetes is a chronic debilitating condition that causes significant morbidity and mortality and is associated with increased health service utilization and cost (1,2). Americans are increasingly searching for complementary and alternative remedies for their chronic medical conditions (3–8). The National Center for Complementary and Alternative medicine defines complementary and alternative medicine (CAM) as “a

group of diverse medical and health care systems, practices, and products that are not currently considered to be part of conventional medicine—that is, medicine as practiced by holders of M.D. (medical doctor) or D.O. (doctor of osteopathy) degrees and their allied health professionals, such as physical therapists, psychologists, and registered nurses (9).”

Previous studies have suggested that patients use CAM therapy in addition to

or as a complement to conventional medicine (3–5,10). However, there is the notion among conventional medicine practitioners that patients who use CAM are less likely to use conventional medical services (11–13). In addition, some studies have suggested that CAM use is associated with decreased use of preventive care services (13).

The purpose of the current study was to examine associations between self-reported CAM use and self-reported use of preventive care services (receipt of influenza and pneumonia vaccinations) and conventional medical services (emergency department and primary care visits) among adults with diabetes. Based on the current literature, we hypothesized that among diabetic adults, users of CAM would be less likely to receive influenza and pneumonia vaccinations than nonusers. We further hypothesized that users of CAM would have fewer emergency department and primary care visits than nonusers.

## RESEARCH DESIGN AND METHODS

— We analyzed data from the 2002 National Health Interview Survey (NHIS), a national household survey sponsored by the National Center for Health Statistics (14,15). The sample was selected by a complex sampling design involving stratification, clustering, and multistage sampling, with a nonzero probability of selection for each person.

A new module that incorporated questions about complementary and alternative medicine behaviors of adults, the alternative health/CAM file, was added to the 2002 survey. This is the most comprehensive national study on CAM use in the U.S. to date, and it has several important advantages over previous CAM surveys. First, it is the largest individual survey for which CAM data has been obtained, with >31,000 respondents. Second, it collected very detailed information on >17 different types of CAM. Third, it included ~2,500 individuals with diabetes, which is the largest so far, and it collected information on key confounding

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**Abbreviations:** CAM, complementary and alternative medicine; NHIS, National Health Interview Survey. A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

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variables that were not included in previous surveys. Details about the methodology of the 2002 NHIS are available online (14,15).

### Diagnosis of diabetes and chronic medical conditions

The diagnosis of diabetes was based on self-report. We defined certain chronic comorbid conditions based on self-report. The chronic conditions included hypertension, coronary heart disease, stroke, chronic obstructive pulmonary disease, peripheral vascular disease, congestive heart failure, and cancer. These conditions were selected because prior studies had indicated that individuals with these conditions had higher CAM use than the general population (4,5). We created two categories of comorbidity for analyses: none vs. one or more comorbid conditions.

### CAM use

The different CAM modalities reported in the NHIS included acupuncture, ayurveda, biofeedback, chelation therapy, chiropractic care, energy healing therapy, Reiki, folk medicine, hypnosis, massage, naturopathy, natural herbs, homeopathic treatment, special diets, high-dose or mega-vitamin therapy, yoga, tai chi, qi yong, relaxation techniques, and prayer/spiritual healing. Detailed descriptions and definitions of CAM treatments are available online (9). We created eight CAM-use categories including dietary, herbal, chiropractic, yoga, relaxation, vitamin, prayer, and other (acupuncture, ayurveda, biofeedback, chelation, energy healing or Reiki therapy, hypnosis, massage, naturopathy, and homeopathy). However, to be consistent with other studies, we defined CAM use as the use of any of the treatment modalities listed above, excluding use of vitamins and prayer. We used this modified definition of CAM use for all analyses.

### Demographic and socioeconomic characteristics

The NHIS collected data on age, sex, race/ethnicity, census region, education, and household income. Other demographic data comprised marital status, census region, employment status, functional limitation, comorbidity, and perceived health status. For this analysis, we defined variables as follows: Four age categories were created: 18–34, 35–49, 50–64, and  $\geq 65$  years. Four racial/ethnic categories were defined: white, black, Hispanic, and

other. Three levels of education were used: less than high school graduate, high school graduate, and more than high school graduate. Census region was categorized as East, South, Midwest, and West. Household income was dichotomized as total household income  $< \$20,000$  and  $\geq \$20,000$ . Marital status was similarly dichotomized as married and not married. Employment status was defined as employed and unemployed. Functional limitation was defined as limited and not limited. Comorbidity was defined as having no comorbid conditions versus having one or more condition. Perceived health status was categorized as better, worse, or same as last year.

### Preventive care practices

We defined “preventive care practices” based on a “yes” response to two questions from the 2002 NHIS: 1) “During the last 12 months, have you had a flu shot?” and 2) “Have you ever had a pneumonia shot?”

### Conventional medical services

We identified use of conventional medical services by the following questions: “During the past 12 months, how many times have you gone to a hospital emergency room about your own health?” and “During the past 12 months, how many times have you seen a doctor or other health care professional about your own health at a doctor’s office, a clinic, or some other place? (not including hospital emergency room visits, hospital overnight stays, home visits, dental visits, or telephone calls).” Emergency department use was defined as at least one visit to the emergency room within the previous 12 months. We created four primary care visit categories: two or more, four or more, six or more, and eight or more visits within the prior 12 months.

### Statistical analyses

STATA statistical software (Release 8.0, College Station, TX), which accounts for the multistage sampling, clustering, and stratification design of national surveys such as the NHIS (16), was used for statistical analyses and to generate population estimates. We performed three types of analysis. First, we estimated proportion of patients with diabetes by demographic characteristics. Second, we compared users to nonusers of CAM using  $\chi^2$  statistics. Third, we use multiple logistic regressions to assess the independent association between CAM use and preventive care practices, emergency room visits,

and primary care visits, while controlling for covariates. The covariates in the different multiple logistic regression models included race/ethnicity, age, sex, education, income, marital status, employment, region of country, comorbid conditions, functional limitations, and health status.

## RESULTS

### CAM use in individuals with diabetes

Based on our definition of CAM, which excluded prayer and use of vitamins, ~48% of individuals with diabetes reported using CAM in 2002. Extrapolating to the ~15 million civilian, noninstitutionalized, U.S. adults with diabetes in 2002, ~7 million individuals with diabetes reported use of CAM. According to the categories of CAM we created, 67% of adults with diabetes reported using vitamins, 67% used prayer, 22% used some type of herbal remedy, 21% received chiropractic care, 17% used relaxation therapy, 14% used other types of CAM, 7% used some type of diet, and 4% used yoga.

**Table 1—Characteristics of adults with diabetes in the U.S., 2002**

Sample characteristics	Percent
Age (years)	
18–34	5.5
35–49	19.8
50–64	35.9
$\geq 65$	38.7
Ethnicity	
White	69.2
Black	15.1
Hispanic	11.5
Other	4.2
Women	50.3
Education	
Less than high school	28.0
High school graduate	33.4
More than high school graduate	38.6
Income ( $\geq \$20,000$ )	71.8
Married	62.5
Region	
Northeast	18.1
Midwest	22.5
South	41.4
East	18.0
Comorbidities (1+)	84.7
Functional limitation (yes)	64.2
Health status	
Better	20.5
Worse	19.2
Same	60.3
Employed (yes)	45.1

**Table 2—Comparison of demographic characteristics, preventive care practices, and use of conventional medical services among users and nonusers of CAM**

	Users	Nonusers	P value
n	1,148	1,326	
Age (years)			0.009*
18–34	5.7	5.3	
35–49	20.7	19.0	
50–64	38.8	33.4	
≥65	34.8	42.3	
Women	52.2	48.6	0.116
Race/ethnicity			<0.001*
Hispanic	11.4	11.5	
White	72.2	66.5	
Black	11.2	18.7	
Other	5.2	3.3	
Education			<0.001*
Less than high school	20.9	34.3	
High school graduate	31.0	35.7	
More than high school graduate	48.1	30.0	
Income (≥\$20,000)	75.1	68.6	0.002*
Employed (yes)	50.5	40.2	<0.001*
Comorbidity (yes)	86.0	83.4	0.1183
Functional limitation (yes)	68.7	60.2	0.005*
Influenza vaccination (yes)	48.9	44.8	0.040*
Pneumonia vaccination (yes)	50.3	44.6	0.007*
Emergency department visit (yes)	34.6	28.7	0.007*
Primary care visits			
Two or more	89.2	84.2	0.004*
Four or more	67.9	60.2	0.003*
Six or more	35.3	26.9	0.002*
Eight or more	16.1	10.8	0.009*

Data are percent. \*Statistically significant at  $P < 0.05$ .

### Comparison of users and nonusers of CAM

Table 1 shows the characteristics of adults with diabetes in the U.S. in 2002. Table 2 compares demographic characteristics, preventive care practices, and use of conventional medicine services among users and nonusers of CAM. In general, users of CAM were younger, had more education, had higher income, and were more likely to have employment. Users of CAM were more likely to receive influenza (48.9 vs. 44.8%,  $P = 0.040$ ) and pneumonia (50.3 vs. 44.6%,  $P = 0.007$ ) vaccinations. Similarly, CAM users were more likely to have an emergency room visit (34.6 vs. 28.7%,  $P = 0.007$ ) and two or more (89.2 vs. 84.2%,  $P = 0.004$ ), four or more (67.9 vs. 60.2%,  $P = 0.003$ ), six or more (35.3 vs. 26.9%,  $P = 0.002$ ), or eight or more (16.1 vs. 10.8%,  $P = 0.009$ ) primary care visits.

### Preventive care practices and use of conventional medical services

Table 3 shows the independent association between CAM use and preventive

**Table 3—Independent associations between CAM use and preventive care practices and use of conventional medical services**

	CAM user versus nonuser
Received influenza vaccine	1.17 (0.92–1.48)
Received pneumonia vaccine	1.56 (1.26–1.94)*
More than one emergency department visit	1.34 (1.06–1.70)*
Number of primary care visits	
Two or more visits	1.34 (0.92–1.94)
Four or more visits	1.27 (0.96–1.68)
Six or more visits	1.44 (1.14–1.83)*
Eight or more visits	1.66 (1.22–2.25)*

Data are adjusted odds ratio (95% CI). Adjusted for age, ethnicity, sex, education, income, marital status, census region, comorbidities, functional limitations, health status, and employment. \*Statistically significant at  $P < 0.05$ .

care services and use of conventional medical services. After controlling for potential confounding factors, CAM use was independently associated with receipt of pneumonia vaccination (odds ratio 1.56 [95% CI 1.26–1.94]) but not significantly associated with receipt of influenza vaccination (1.17 [0.92–1.48]). CAM use was also independently associated with visiting the emergency department (1.34 [1.06–1.70]), having six or more primary care visits (1.44 [1.14–1.83]), and having eight or more primary care visits (1.66 [1.22–2.25]).

**CONCLUSIONS**— The major finding of this study was that after controlling for confounding factors, CAM use in adults with diabetes was independently associated with increased likelihood of getting pneumonia vaccination and increased likelihood of visiting the emergency room and having multiple primary care visits. This suggests that CAM use in adults with diabetes may not be a barrier to use of preventive care services or use of conventional medical services.

Our findings are similar to those from a previous analysis of a nationally representative sample that found that patients who used CAM had more outpatient physician visits and used preventive care services more often (10). However, unlike that study, our study found that patients who used CAM were not significantly more likely to receive the influenza vaccine. The findings of this study are in contrast to the prevailing perceptions of many health care professionals who believe CAM use represents a rejection of conventional medicine (11–13). It also contradicts the findings of an earlier study that found that CAM use was associated with decreased use of preventive care services (13).

There are two plausible reasons for the association between CAM use and increased use of preventive care and conventional medical services. It may reflect the segment of the population that typically uses CAM. In this study, CAM users were typically younger, employed, more educated, and had higher income. Because of possible socioeconomic advantage, these patients may be more likely to be able to afford CAM therapies in addition to their conventional medical treatments. Another possible explanation is that patients who use CAM represent a subgroup that want autonomy to make treatment decisions and seem willing to

try new and alternative treatments without abandoning conventional treatment. Although it could be argued that patients who use CAM may be sicker and as a result have more frequent emergency department and primary care visits, this is not supported by our analysis. Even though patients with functional limitations were more likely to use CAM, the use of CAM did not differ significantly by number of comorbid conditions. In addition, the adjusted analyses controlled for the number of comorbid conditions and presence of functional disability. This would suggest that the findings of the study are independent of whether people had multiple comorbid conditions or functional limitations or disability.

There are some limitations with this study. First, because this study is cross-sectional, we cannot speak to causality. In addition, the NHIS dataset does not contain clinical or laboratory data, so we cannot speak to how CAM use affects health behavior or quality of care. Second, because CAM use is based on self-report there is potential for recall bias. Studies have shown that self-reported diagnosis of diabetes and other chronic conditions are reliable (17,18), but no studies have validated recall of CAM usage. Third, the definition of CAM still remains slightly ambiguous (9,19), which allows for estimates that are dependent on the inclusion and exclusion criteria used to define CAM. We have tried to minimize this by using definitions that are consistent with those of other studies. Finally, we could not differentiate type 1 from type 2 diabetes. However, based on national estimates that show that 90–95% of patients with diabetes have type 2 and the age of the sample (>18 years), it is likely that our results reflect estimates for patients with type 2 diabetes.

The major implication of this study is that CAM use in adults with diabetes does not seem to be a barrier to use of preventive care services or use of conventional medical services as frequently assumed. This should allay concerns that many health care providers have regarding the use of CAM in their patients and encourage providers to provide balanced discussions about available CAM therapies for diabetes. Since it appears that diabetic patients who use CAM represent a subgroup that may want more autonomy in making health care decisions, health care providers should probably not dissuade them from using CAM. Instead, the clinical en-

counter should be used to provide evidence-based information on effective CAM therapies for diabetes. To be able to do this, health care providers would need to update their knowledge on the evidence for different CAM therapies for diabetes (20–22) and become familiar with the American Diabetes Association's stand on the use of unproven therapies for diabetes (23).

In conclusion, this study shows that in contrast to the findings of previous studies, CAM use in adults with diabetes may not be a barrier to use of preventive care services or use of conventional medical services.

## References

- National Institute of Diabetes and Digestive and Kidney Diseases: National diabetes statistics fact sheet: general information and national estimates on diabetes in the United States, 2003 [article online]. Bethesda, MD, U.S. Department of Health and Human Services, National Institutes of Health. Available from <http://diabetes.niddk.nih.gov/dm/pubs/statistics>. Accessed 2 August 2005
- American Diabetes Association: Economic costs of diabetes in the U.S. in 2002. *Diabetes Care* 26:917–932, 2003
- Eisenberg DM, Kessler RC, Foster C, Norlock FE, Calkins DR, Delbanco TL: Unconventional medicine in the United States: prevalence, costs, and patterns of use. *N Engl J Med* 328:246–252, 1993
- Eisenberg DM, Davis RB, Ettner SL, Scott A, 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* 280:1569–1575, 1998
- Egede LE, Ye X, Zheng D, Silverstein MD: The prevalence and pattern of complementary and alternative medicine use in individuals with diabetes. *Diabetes Care* 25:324–329, 2002
- Yeh GY, Eisenberg DM, Davis RB, Phillips RS: Use of complementary and alternative medicine among persons with diabetes mellitus: results of a national survey. *Am J Public Health* 92:1648–1652, 2002
- Barnes PM, Powell-Griner E, McFann K, Nahin RL: Complementary and alternative medicine use among adults: United States, 2002. In *Advance Data from Vital and Health Statistics* (no. 343). Hyattsville, MD, National Center for Health Statistics, May 2004. Available from <http://www.cdc.gov/nchs/data/ad/ad343.pdf>. Accessed 2 August 2005
- Bausell RB, Lee WL, Berman BM: Demographic and health-related correlates to visits to complementary and alternative medical providers. *Med Care* 39:190–196, 2001
- National Center for Complementary and Alternative Medicine: Major domains of complementary and alternative medicine [article online]. Available from [http://nccam.nih.gov/news/camsurvey\\_fs1.htm#cam](http://nccam.nih.gov/news/camsurvey_fs1.htm#cam). Accessed 2 August 2005
- Druss BG, Rosenheck RA: Association between use of unconventional therapies and conventional medical services. *JAMA* 282:651–656, 1999
- Astin JA: Why patients use alternative medicine: results of a national survey. *JAMA* 279:1548–1553, 1998
- Clinical Oncology Group: New Zealand cancer patients and alternative medicine. *N Z Med J* 100:110–113, 1987
- Robinson AR, Crane LA, Davidson AJ, Steiner JF: Association between use of complementary/alternative medicine and health-related behaviors among health fair participants. *Prev Med* 34:51–57, 2002
- National Center for Health Statistics: Data file: National Health Interview Survey (machine-readable data file) [article online], 2004. Hyattsville, MD, National Center for Health Statistics. Available from [http://ftp.cdc.gov/pub/health\\_statistics/nchs/datasets/nhis/2002](http://ftp.cdc.gov/pub/health_statistics/nchs/datasets/nhis/2002). Accessed 2 August 2005
- National Center for Health Statistics: Data file documentation: National Health Interview Survey (machine-readable data file and documentation) [article online], 2004. Hyattsville, MD, National Center for Health Statistics. Available from [http://ftp.cdc.gov/pub/health\\_statistics/nchs/dataset\\_documentation/nhis/2002](http://ftp.cdc.gov/pub/health_statistics/nchs/dataset_documentation/nhis/2002). Accessed 2 August 2005
- Cohen SB: An evaluation of alternative PC-based software packages developed for the analysis of complex survey data. *Am Stat* 51:285–292, 1997
- Edwards WS, Winn DM, Kurlantzick V, Sheridan S, Berk ML, Retchin S, Collins JG: Vital health statistics 2: evaluation of National Health Interview Survey diagnostic reporting [article online], 1994. Hyattsville, MD, National Center for Health Statistics. Available from: [http://www.cdc.gov/nchs/data/series/sr\\_02/sr02\\_120.pdf](http://www.cdc.gov/nchs/data/series/sr_02/sr02_120.pdf). Accessed 31 August 2005
- Bowlin SJ, Morrill BD, Nafziger AN, Lewis C, Pearson TA: Reliability and changes in validity of self-reported cardiovascular disease risk factors using dual response: the behavioral risk factor survey. *J Clin Epidemiol* 49:511–517, 1996
- National Institutes of Health Office of Alternative Medicine, Practice and Policy Guidelines Panel: Clinical practice guidelines in complementary and alternative medicine: an analysis of opportunities and obstacles. *Arch Fam Med* 6:149–154, 1997

20. Yeh GY, Eisenberg DM, Kaptchuk TJ, Phillips RS: Systematic review of herbs and dietary supplements for glycemic control in diabetes. *Diabetes Care* 26: 1277–1294, 2003
21. Egede LE: Complementary and alternative medicine use by individuals with diabetes. *Geriatric Times* 5:8–11, 2004
22. Berman BM, Swyers JP, Kaczmarczyk J: Complementary and alternative medicine: herbal therapies for diabetes. *J Assoc Acad Minor Phys* 10:10–14, 1999
23. American Diabetes Association: Unproven therapies (Position Statement). *Diabetes Care* 27:S135, 2004