

# Study of association between use of complementary and alternative medicine and non-compliance with modern medicine in patients presenting to the emergency department

Jose VM, Bhalla A\*, Sharma N\*, Hota D, Sivaprasad S\*, Pandhi P

Departments of  
Pharmacology and  
\*Internal Medicine,  
Postgraduate Institute  
of Medical Education and  
Research, Chandigarh -  
160 012, India

Correspondence:  
VM Jose,  
E-mail:  
vishnujose@hotmail.com

Received : 06-07-06  
Review completed : 20-09-06  
Accepted : 09-02-07  
PubMed ID : 96-101  
J Postgrad Med 2007;53:

## ABSTRACT

**Context:** Complementary and alternative medicines (CAMs) are extensively used by the public. Noncompliance is an important cause of therapy failure. **Aim:** This study was done to determine prevalence of emergency admission due to noncompliance with modern medicine following switching over to CAM and to identify any significant association for CAM use among noncompliers. **Setting and Design:** This cross-sectional study was conducted in the emergency unit of a tertiary healthcare institute. **Materials and Methods:** Demographic factors and system affected were compared between compliers and noncompliers. Prevalence, reasons and nature of noncompliance were determined. Age, gender, outcome, relation strength and potential preventability of noncompliance, precipitating and previous disease and noncompliant drugs were compared for significant association between CAM using and other noncompliers. **Statistical Analysis:** Student's 't' test, Chi square test and odds ratio were used. **Results:** Of the 506 patients interviewed 168 (33%) were noncompliant. In 160 (95%) patients noncompliance was due to under-dosing. Lack of knowledge and CAM use constituted 144 (86%) noncompliance-related admissions. Thirty-three (7%) admissions were strongly related to noncompliance and CAM use. Age, gender, outcome, drug use and diseases except chronic obstructive pulmonary disease (COPD) and asthma showed no association while relation strength and potential preventability of emergency admission was less with CAM-using noncompliers. Noncompliance was observed for hypertension, diabetes, COPD and asthma, seizure disorder, tuberculosis and hemophilia besides hepatic and renal failure. The CAM noncompliers used CAM more for modern medicine incurable or unaffordable than curable diseases. **Conclusion:** Advice for regular treatment and frequent monitoring can decrease CAM use-related noncompliance admissions.

**KEY WORDS:** Complementary and alternative medicine, emergency admission, noncompliance, prevalence

Complementary and alternative medicines are extensively used by patients.<sup>[1-4]</sup> Though complementary and alternative medicine (CAM) use may be beneficial and safe, lack of randomized controlled trials makes its use controversial.<sup>[5]</sup> When patients switch over to CAM in preference to modern medicine, they are exposed to the risk of acute exacerbation and chronic complications due to inadequate disease control, adverse reactions and interactions.<sup>[5]</sup> These problems can lead to emergency admission due to inadequate treatment and infrequent monitoring. This study was done to determine the prevalence of emergency admission due to noncompliance with modern medicine following switching over to CAM. An attempt was also made to identify any significant association for CAM use among noncompliers. If significant association with demographic factors or any specific disease or drug is observed,

then whenever patients requiring these drugs report to the doctor, they can be specifically advised about the availability of CAM use besides modern medicine and the relevance of adequate treatment and frequent monitoring irrespective of the type of care they undertake. Though CAM usage and outcomes have been earlier evaluated,<sup>[6]</sup> its use leading to emergency visit has not been extensively evaluated.

## Materials and Methods

This study was conducted over a three-month period in 2004-5. Patients of either gender were interviewed by a pharmacologist using a structured questionnaire on the day they reported to the emergency medicine department of a tertiary healthcare institute. If the patient was severely diseased, the caretaker who stayed and took care of the patient at home

was interviewed for obtaining details of the patient. Only patients or their caretaker who consented for the participants in the study were interviewed. During the interview the caretaker was asked to produce the treatment slip provided to the patient by the doctor during the previous hospital visit. From this treatment slip, the last modern medicine hospital visit day and advice given to the patient were noted. Reasons for the patient visit to CAM provider were asked and the reply noted. Since the investigator lacked knowledge regarding the use of different alternative systems of medicine, detailed evaluation of the patient for CAM use was not attempted. Direct interview with the patient was expected to give the correct report since at times of emergency reporting, patients give correct reply suspecting serious health complications. Confidentiality and secrecy of the patient's identity and data was maintained.

Patients' age, gender and the major system affected were noted. If there was noncompliance, then reason for noncompliance, nature of noncompliance (as over-dosing or under-dosing), strength of the present visit with respect to noncompliance, drugs and diseases to which the patient was noncompliant, potential preventability of the emergency visit and the final outcome of the visit were determined.

Systems affected were classified into central nervous system, cardiovascular system including hypertension, gastrointestinal system, respiratory system and other systems. Since multiple reasons can lead to hospital admission, a logical conclusion was made after considering the health status of the patient and reasons which led to the emergency visit. Since multi-system diseases were common, the system affected that led to the emergency visit was considered as the major system affected.

Patients who consumed less than 80% or more than the advised quantity of drugs were considered as noncompliant. Reasons for noncompliance were lack of knowledge, CAM usage, nonaffordability, living alone, adverse drug reactions, overdose and contraindicated drug use and suicidal intent. If there were multiple reasons for noncompliance, the most relevant single reason was determined after logical assessment from the explanation given by the patient for noncompliance. Nature of compliance was considered over-compliance, when longer periods or larger doses of drug were used and under-compliance if inadequate drug dose or frequency was followed. The relevance of noncompliance with respect to the hospital admission was decided after enquiring the reason for admission, problems present at admission, diseases the patient had for which the patient was put on drugs, different drugs which the patient was taking, noncompliant drugs and relation of noncompliant drug with the present complication for which the patient was admitted. From these factors the strength of the relation which led to the emergency department visit was determined by the two evaluators. Causality of admission was considered 'strongly related', if reason for admission was due to drug noncompliance or 'indirectly related' if reason for admission could have occurred due to noncompliance and 'unrelated' if there was no relation between emergency

admission and noncompliance. The disease which led to patient admission in the emergency department and other diseases which the patient had at the time of their emergency admission were determined. Drugs to which patient was noncompliant were determined. The admission was termed 'potentially preventable' if emergency admission could have been avoided by the patient by being compliant. Outcome was considered as death if patient succumbed to the illness or succumbed secondary to complications that followed admission.

### *Statistical analysis*

An earlier study done in the same emergency medicine department among elderly patients had shown noncompliance with modern medicine to the extent of 33%.<sup>[4]</sup> Hence to determine the prevalence of CAM use as a reason for noncompliance and emergency admission, with a precision of 95% and variation of 5%, sample size required was 340 patients.

Compliant and noncompliant patients were compared for any significant difference with respect to age, gender or the major system affected. CAM using and other noncompliers were compared for difference in age, gender, strength of the relation of admission to noncompliance, potential preventability of admission and outcome following admission. Relevance of noncompliance with respect to the hospital admission determined by the two authors was tested for inter-rater reliability by Cohen's Kappa and values more than 0.7 were considered good inter-rater reliability. Similar evaluations of strength by both the investigators were given the same final strength and if evaluation by the two evaluators was not similar then the lower strength was given to the relation. Unpaired Student's 't' test with Welch's correction and Chi-square test with Yate's correction were used for comparison. Descriptive analysis was done for noncompliant patients for describing nature of noncompliance and reason for noncompliance. Significant association for CAM using noncompliers with disease due to which patients were admitted, other diseases patients had at the time of admission and drugs that patients were asked to consume at the time of admission were determined by calculating Odds ratio with Woolf's approximation. *P* value of less than 0.05 was considered significant. Values were expressed as mean with 95% confidence interval, actual numbers and percentage.

## **Results**

A total of 506 patients were interviewed in the emergency department during the study period. Among the interviewed patients, 168 (33%) were found to be noncompliant with at least one modern medicine prescribed to them. Age, gender and major system affected did not show significant difference between compliers and noncompliers [Table 1]. Noncompliance in 160 (95%) patients was due to under-dosing and in the remaining eight (5%) patients, due to accidental (seven) or suicidal (one) over-dosing. Lack of knowledge regarding the need of regular intake of medicine and opting for CAM were the two major reasons for noncompliance-related admission in 144 (86%) patients [Figure 1, Table 2].

**Table 1: Comparison of compliers with noncompliers who reported to emergency**

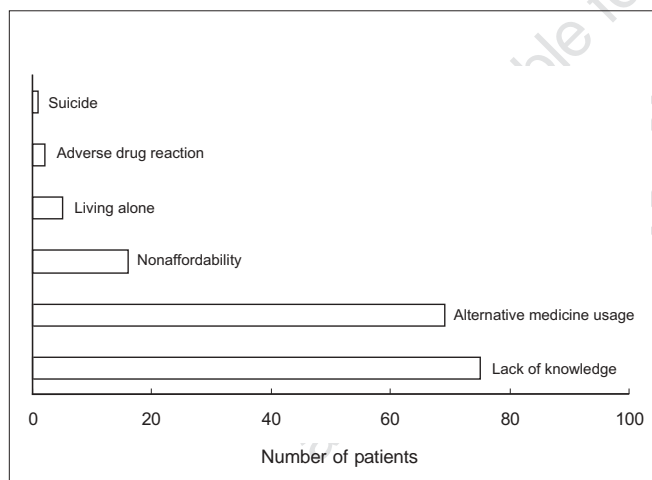
	Compliant (%)	Noncompliant (%)	P value (df, Chi value)
Total number of patients	338 (67)	168 (33)	
Mean age (95% CI)	44.21 (42.36-46.06)	46.36 (43.52-49.20)	0.21 (504) <sup>†</sup>
Number of males	238 (70)	112 (67)	0.45 (1,0.57)
Major system affected leading to admission			
Central nervous system	93 (28)	57 (34)	0.52 (4,3.25)
Cardiovascular system including hypertension	72 (21)	29 (17)	
Gastrointestinal system	49 (14)	22 (13)	
Respiratory system	40 (12)	16 (10)	
Others	84 (25)	44 (26)	

Analyzed using student's 't' test<sup>†</sup> and Chi square test

**Table 2: List of all the reasons mentioned by patients for noncompliance**

Reasons mentioned for noncompliance	Main reasons		Other reasons	
	CAM-NC	O-NC	CAM-NC	O-NC
Complementary medicine use	69	0	0	0
Lack of knowledge	0	75	3	9
Nonaffordability	0	16	0	0
Suicide attempt	0	1	0	0
Adverse drug reaction	0	2	0	0
Living alone	0	5	0	0
Overdose and contraindicated drug use	0	0	1	6
Total	69	99	4	15

CAM-NC-Complementary and alternative medicine using noncompliers, O-NC-Other noncompliers



**Figure 1: Reasons for noncompliance and emergency reporting (total 168 patients)**

Of the total 168 noncompliers, 69 (41%) were CAM-using noncompliers and the remaining 99 (59%), other noncompliers. Patients in whom noncompliance was strongly related to emergency admission, when compared for CAM use, showed no difference in age [45.39 (39.28-51.51) v/s 43.81 (39.32-48.29,  $P=0.67$ ) years], number of male patients [23 (70%) v/s 49 (64%) ( $P=0.69$ , Chi value=0.16)] and number of deaths following admission [3 (9%) v/s 6 (8%) ( $P=0.82$ , Chi value=0.05)]. When compared irrespective of strength of noncompliance, similar nonsignificant values were obtained. Among the 69 CAM-using noncompliers, 33 (48%) admissions were strongly related, 21 (30%) were indirectly related and 15 (22%) were unrelated to noncompliance with modern medicine

and CAM use. The numbers based on the strength of relation for other noncompliers were 77 (78%), 14 (14%) and eight (8%) respectively and there was significant difference noticed ( $P<0.01$ , Chi value=16.29, df=2). Inter-rater reliability by Cohen's Kappa was 0.81 for CAM noncompliers and 0.71 for other noncompliers. Fifty-four (78%) of the total 69 emergency admissions among CAM-using noncompliers were potentially preventable compared to 91 (92%) of the total 99 other noncompliance-related admissions ( $P=0.01$ , Chi value=5.32, df=1) and there was significant difference observed.

Common diseases which led to the emergency department reporting of the CAM-using noncompliers, whose visit was strongly related to noncompliance and CAM use were stroke and transient ischemic attack (TIA), chronic obstructive pulmonary disease (COPD) and bronchial asthma, ischemic heart disease (IHD), seizure disorder, tuberculosis and complications, renal failure and hepatic failure. Common diseases observed were hypertension, diabetes mellitus, COPD and bronchial asthma, seizure disorder and tuberculosis. Common drugs used were antihypertensives, antidiabetics, anti-COPD and asthma drugs, antituberculosis drugs and antiepileptics [Tables 3-5]. A drug noncomplier with asthma or COPD had 10.48 times odds of being a CAM-using noncomplier than other noncomplier. No other significant associations were observed.

Common diseases which led to the emergency department reporting of CAM nonusing noncompliant patients, whose visit was strongly related to noncompliance, were stroke and TIA, IHD, hemophilia, seizure disorder and diabetes and related complications. Common diseases seen were hypertension,

diabetes mellitus, seizure disorder and hemophilia. Common drugs used were antihypertensives, antidiabetics, antihemophilic factor and antiepileptics [Tables 3-5].

### Discussion

Among the emergency admissions, 33% were due to noncompliance. Prevalence of noncompliance reported is 30 to 60%<sup>[7]</sup> and for long-term treatments, 50%.<sup>[8]</sup> Neither age nor

gender showed significant difference supporting the earlier observation of lack of consistent association between demographic factors and noncompliance.<sup>[9]</sup> Frequency and complexity of drug regimen, unintentional noncompliance, willful noncompliance, lack of information, poor patient-doctor relationship and lack of motivation were found to predict noncompliance in earlier studies.<sup>[10]</sup> These factors which constituted the 'lack of knowledge' group, was the commonest cause of noncompliance. Thrombolytics and Factor VIII were

Table 3: Reason for admission and past diseases among noncompliant patients

	Strongly related						Total			
	Admission cause			Earlier diseases			Admission cause		Earlier diseases	
	CAM-NC	O-NC	Odds ratio (CI)	CAM-NC	O-NC	Odds ratio (CI)	CAM-NC	O-NC	CAM-NC	O-NC
COPD and asthma	4	1	10.48 (1.03-257.13)	4	2	5.11 (0.76-42.3)	4	1	5	2
Stroke and TIA	7	17	0.95 (0.31-2.83)	0	1	0 (0-41.55)	10	18	0	1
Ischemic heart disease	4	13	0.68 (0.17-2.51)	0	5	0 (0-2.74)	7	18	1	7
Seizure disorder	4	9	1.04 (0.25-4.14)	4	11	0.84 (0.21-3.12)	4	9	5	11
Tuberculosis	4	3	3.4 (0.59-20.72)	4	3	3.37 (0.6-20.19)	4	5	4	4
Renal failure	3	2	3.75 (0.48-34.12)	0	0	-	10	5	2	1
CCF	2	3	1.59 (0.18-12.55)	1	0	-	3	3	2	0
Diabetes and problems	1	8	0.27 (0.01-2.29)	6	15	0.93 (0.29-2.85)	2	8	13	21
Portal hypertension	1	1	2.38 (0.01-90.20)	1	1	2.38 (0-89.9)	1	2	1	2
Hypertension	1	0	-	16	33	1.23 (0.54-2.82)	1	0	25	38
Typhoid	1	0	-	1	0	-	1	0	1	0
Infection	1	0	-	0	1	-	4	0	0	1
Hemophilia	0	11	0 (0-1.02)	0	11	0 (0-1.04)	0	12	0	12
Bleeding	0	5	0 (0-2.72)	0	2	0 (0-9.78)	3	7	0	2
Liver failure	0	0	-	0	2	0 (0-9.78)	6	1	6	3
Rheumatoid arthritis	0	0	-	1	1	2.38 (0-89.9)	1	0	6	1
Organ transplant	0	0	-	1	0	-	0	0	1	0
HIV	0	0	-	1	0	-	0	0	1	0
Others	0	4	0 (0-3.63)	0	6	0 (0-2.18)	8	10	7	9
Total diseases	33	77	-	40	94	-	69	99	80	115
Total patients	33	77	-	33	77	-	69	99	69	99

Admission cause- The reason for present admission, Earlier disease- Diseases which the patients had before this particular hospital admission, Strongly related- Admission cause strongly related with noncompliance and CAM use, Total- All admissions due to noncompliance and CAM use, CAM - Complementary and alternative medicine, NC - Noncompliers, COPD - Chronic obstructive pulmonary disease, TIA - Transient ischemic attack, HIV - Human immunodeficiency virus

Table 4: List of drugs to which patients were noncompliant

	Strongly related to admission			Total	
	CAM-NC	O-NC	OR (CI)	CAM-NC	O-NC
Antihemophilic factor	0	11	0 (0-0.98)	0	12
Antihypertensives	16	30	1.32 (0.57-3.08)	26	39
Antidiabetic drugs	5	13	0.84 (0.24-2.8)	14	22
Antiasthma drugs and chronic obstructive pulmonary disease	4	1	9.83 (0.98-239.43)	5	2
Antituberculosis drugs	4	1	9.83 (0.98-239.43)	4	3
Antiseizure drugs	4	10	0.88 (0.21-3.35)	5	10
Antibiotics	2	1	4.65 (0.32-133.93)	2	1
Anticoagulants	1	2	1.12 (0-16.45)	1	2
Rheumatoid arthritis treatment	1	1	2.26 (0-85.44)	6	1
Antiulcer drugs	1	1	2.26 (0-85.44)	1	1
Immunosuppressants	1	0	-	1	0
Ischemic heart disease treatment	0	6	0 (0-2.07)	0	6
Drugs for liver failure	0	4	0 (0-3.45)	5	1
Nonsteroidal antiinflammatory drugs	0	4	0 (0-3.45)	1	5
Others	0	2	0 (0-9.29)	6	8
Total number of drugs	39	87	-	77	113
Total number of patients	33	77	-	69	99

OR (CI)- Odds ratio (confidence interval), Strongly related- Admission cause strongly related with noncompliance, Total- All admissions due to noncompliance, CAM-NC-Complementary and alternative medicine-using noncompliers, O-NC-Other non-compliers

**Table 5: Reasons for admission among complementary and alternative medicine (CAM)-using noncompliers and their number (noncompliance strongly related to admission) and drugs they were substituting for CAM and their number**

Reason for admission	No.	Noncompliant drugs	No.
Complications following COPD and asthma	4	Antiasthmatics and antiCOPD drugs	4
Stroke and transient ischemic attack	7	Antihypertensives, Anticoagulant, Rheumatoid arthritis drugs, Antidiabetes drugs	6 1 1 2
Ischemic heart disease	4	Antihypertensives, Antidiabetes drugs	4 2
Seizure disorder	4	Antiseizure drugs	4
Tuberculosis complication	4	Antituberculosis drugs	4
Renal failure	3	Antihypertensives, Antidiabetic drugs	3 1
Congestive cardiac failure	2	Antihypertensives	2
Diabetes-related complication	1	Antidiabetes drugs	1
Hematemesis due to nonuse of prophylaxis	1	Antiulcer drugs	1
Severe hypertension	1	Antihypertensives	1
Typhoid pneumonia	1	Antibiotics	1
Fever due to nonuse of prophylaxis for HIV	1	Cotrimoxazole	1
Total	33	Total	39

nonaffordable to a few patients and led to noncompliance. Lack of significant difference in the major system affected rules out the possibility that noncompliance is particularly common in diseases affecting a particular system.

Switching over to CAM following modern medicine prescription constituted a surprisingly high 7% of emergency admissions. A survey done elsewhere reported that 51% patients first consult a modern medicine doctor before consulting a CAM provider.<sup>[11]</sup> The same survey also reported that 79% patients preferred combined use of conventional and modern medicines.<sup>[11]</sup> Due to the existence of multiple CAM systems and since investigators lack sufficient expertise in CAM usage, noncompliance with CAM was not assessed. Earlier studies have shown up to 25% patients consuming CAM for their reporting illness and 55% giving history of consuming CAM at earlier stages of the disease.<sup>[12-14]</sup> Due to high CAM consumption rate, good efficacy of CAM in certain diseases and availability of CAM for almost all known diseases, comparison of CAM usage between compliers and noncompliers was not done suspecting irrelevant results. Disease-specific outcome following CAM use compared with modern medicine use can provide valid results but our study was not aimed at that. The increasing trend in the use of CAM has been observed in the United States.<sup>[15]</sup> Prevalence of CAM use was 25% in the United Kingdom, 40% in the United States, 50% in Germany, France and Australia.<sup>[13,16]</sup> Age and gender showed no significant association in our study. Twelve per cent children who reported to the emergency department,<sup>[17]</sup> 45% pediatric population<sup>[17]</sup> and 44% patients aged above 18 years,<sup>[16]</sup> gave history of CAM intake in earlier studies. Thirty-nine and 41% of males and females were CAM followers in another study.<sup>[17]</sup> Still another study showed significantly more CAM usage by females and 15 to 34-year-olds.<sup>[2]</sup> Overall though age and gender may be relevant for CAM usage in other countries, due to the existence of joint family culture, it is irrelevant in India. Emergency admission of 78% of CAM-using modern medicine noncompliers was related to noncompliance and 48%

admissions were solely due to that, in our study. Incomplete control of the disease or development of 'new' symptoms following CAM usage were the reason for their admission.<sup>[18,19]</sup> Though nonsignificant compared to other noncompliers, deaths were also noted with CAM users. Complementary and alternative medicine use can cause adverse effects, drug interactions and may compromise disease control unlike popular belief of absolute safety.<sup>[18-21]</sup>

Age, gender, outcome and noncompliant drugs showed no association with CAM-using noncompliers over other noncompliers. Noncompliance was strongly related to emergency admission, in significantly less number of patients among CAM-using noncompliers. Significantly less number of patients had potentially preventable disease among CAM-using noncompliers. These results favor CAM-using noncompliers, giving an impression of some degree of efficacy. This also hints at the fact that CAM was more used by people for treatment of diseases like renal and hepatic failure, which had been declared incurable without adequate finances, by the modern medicine doctor and the only treatment they could rely on further, was CAM. Complementary and alternative medicine use in these circumstances may be justifiable due to the nonaffordability of therapy by the patients, provided patients are informed about the existence of costly treatments.

Among the patients admitted, COPD and asthma patients had significant odds of being a CAM-using non-complier. Tuberculosis was misdiagnosed by CAM providers for respiratory disease and was inappropriately treated leading to emergency visit. Commonest causes of emergency admission among noncompliers were complications of inadequate treatment of chronic diseases like hypertension, diabetes mellitus, seizure disorder, tuberculosis, hemophilia, bronchial asthma and COPD. The list of noncompliant drugs also confirms the same observation. These diseases can be well controlled by modern medicine. Complementary and alternative medicines are used extensively for conditions



ranging from general health maintenance,<sup>[21]</sup> self-limiting minor conditions to serious chronic illnesses like hypertension,<sup>[11,21,22]</sup> diabetes,<sup>[16]</sup> asthma,<sup>[23]</sup> rheumatoid arthritis,<sup>[24]</sup> hyperlipidemia,<sup>[25]</sup> cancer,<sup>[26]</sup> leukemia,<sup>[27]</sup> HIV,<sup>[28]</sup> multiple sclerosis,<sup>[29]</sup> depression,<sup>[30]</sup> inflammatory bowel disease,<sup>[31]</sup> epilepsy<sup>[32]</sup> and dermatological conditions.<sup>[33]</sup>

This study showed no significant association with age, gender, incidence of death, drug use or diseases except for COPD and asthma among CAM-using noncompliers over other noncompliers. Extensive use of CAM was observed and has been reported earlier though replacement of CAM with modern medicine leading to emergency admission has not been reported much.<sup>[1-3,16]</sup> There are possibilities for adverse effects, drug interactions and serious health risk, since elaborate preclinical and clinical studies are not essential for marketing CAM.<sup>[5,18-20]</sup> Efficacy and potency are not adequately determined.<sup>[5,18,19]</sup> Quality confirmation and potency determination with CAM is difficult due to variable composition, contamination and variability in standardization, and is not mandatory.<sup>[19,21]</sup> All these problems can lead to inadequate disease control which along with the inhibition of patients to reveal CAM use,<sup>[11]</sup> makes enquiry regarding CAM use an unavoidable question to be put to patients reporting to emergency. Spending time with the patients to enquire regarding CAM use and stressing on periodic hospital reporting and laboratory testing to monitor disease progress irrespective of the nature of treatment they are getting, can help to decrease CAM-related problems. This will prevent emergency admission of the subgroup of patients having modern medicine preventable disease who due to belief in CAM and ignorance of the benefits of modern medicine opt for CAM, neglecting modern medicine and frequent investigations.

## References

- 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* 1993;328:246-52.
- MacLennan AH, Wilson DH, Taylor AW. Prevalence and cost of alternative medicine in Australia. *Lancet* 1996;347:569-73.
- Fischer P, Ward A. Complementary medicine in Europe. *BMJ* 1994;309:107-11.
- Malhotra S, Karan RS, Pandi P, Jain S. Drug related medical emergencies in the elderly: Role of adverse drug reactions and non-compliance. *Postgrad Med J* 2001;77:703-7.
- Barnes J. Quality, efficacy and safety of complementary medicines: Fashions, facts and the future. Part II: Efficacy and safety. *Br J Clin Pharmacol* 2003;55:331-40.
- Pappas S, Perlman A. Complementary and alternative medicine. The importance of doctor-patient communication. *Med Clin North Am* 2002;86:1-10.
- Meichenbaum D, Turk DC. Facilitating treatment adherence. Plenum Press: New York; 1987.
- Sackett DL, Snow JC. The magnitude of compliance and non-compliance. *In*: Haynes RB, Taylor DW, Sackett DL, editors. *Compliance in Health Care*. Johns Hopkins University Press: Baltimore; 1979. p. 11-22.
- Edwards L, Roden DM. Principles of prescription order writing and patient compliance. *In*: Hardman JG, Limbird LE, Gilman AG, editors. *Goodman and Gilman's The pharmacological basis of therapeutics*. 10<sup>th</sup> ed. McGraw-Hill: New York; 2001. p. 1903-15.
- Bennett PN, Brown MJ. Compliance. *Topics in drug therapy. Clinical Pharmacology*. 9<sup>th</sup> ed. Churchill Livingstone: Edinburgh; 2003. p. 18-22.
- Eisenberg DM, Kessler RC, VanRompay MI, Kaptuchuk TJ, Wilkey SA, Appel S, *et al.* Perceptions about complementary therapies relative to conventional therapies among adults who use both: Results from a national survey. *Ann Intern Med* 2001;135:344-51.
- Li JZ, Quinn JV, McCulloch CE, Jacobs BP, Chan PV. Patterns of complementary and alternative medicine use in ED patients and its association with health care utilization. *Am J Emerg Med* 2004;22:187-91.
- Allen R, Cushman LF, Morris S, Feldman J, Wade C, McMahon D, *et al.* Use of complementary and alternative medicine among Dominican emergency department patients. *Am J Emerg Med* 2000;18:51-4.
- Zun LS, Gossman W, Lillienstein D, Downey L. Patients' self-treatment with alternative treatment before presenting to the ED. *Am J Emerg Med* 2002;20:473-5.
- Eisenberg DM, Davis RB, Ettner SL, Appel S, Wilkey S, Van Romyay M, *et al.* Trends in alternative medicine use in the United States, 1990-1997: Results of a follow-up national survey. *JAMA* 1998;280:1569-75.
- Astin JA. Why patients use alternative medicine: Results of a national study. *JAMA* 1998;279:1548-53.
- Pitetti R, Singh S, Hornyak D, Garcia SE, Herr S. Complementary and alternative medicine use in children. *Pediatr Emerg Care* 2001;17:165-9.
- De Smet PA. Health risks of herbal remedies. *Drug Saf* 1995;13:81-93.
- De Smet PA. Herbal remedies. *N Eng J Med* 2002;347:2046-56.
- Rogers EA, Gough JE, Brewer KL. Are emergency department patients at risk for herb-drug interactions? *Acad Emerg Med* 2001;8:932-4.
- Barnes J. Quality, efficacy and safety of complementary medicines: Fashions, facts and the future. Part I. Regulation and quality. *Br J Clin Pharmacol* 2003;55:226-33.
- Shafiq N, Gupta M, Kumari S, Pandhi P. Prevalence and pattern of use of complementary and alternative medicine (CAM) in hypertensive patients of a tertiary care center in India. *Int J Clin Pharmacol Ther* 2003;41:294-8.
- Ernst E. Complementary therapies for asthma: What patients use. *J Asthma* 1998;35:667-71.
- Ernst E. Usage of complementary therapies in rheumatology: A systematic review. *Clin Rheumatol* 1998;17:301-5.
- Stevinson C, Pittler MH, Ernst E. Garlic for treating hypercholesterolemia. A meta-analysis of randomized clinical trials. *Am J Med* 2000;133:420-9.
- Ernst E, Cassileth BR. The prevalence of complementary/alternative medicine in cancer: A systematic review. *Cancer* 1998;83:777-82.
- Gupta M, Shafiq N, Kumari S, Pandhi P. Patterns and perceptions of complementary and alternative medicine (CAM) among leukaemia patients visiting haematology clinic of a north Indian tertiary care hospital. *Pharmacoepidemiol Drug Saf* 2002;11:671-6.
- Fairfield KM, Eisenberg DM, Davis RB, Libman H, Phillips RS. Patterns of use and perceived efficacy of complementary and alternative therapies in HIV-infected patients. *Arch Intern Med* 1998;158:2257-64.
- Tremlett HL, Wiles CM, Luscombe DK. Non-prescription medicine use in multiple sclerosis clinic population. *Br J Clin Pharmacol* 2000;50:55-60.
- Ernst E, Rand JI, Stevinson C. Complementary therapies for depression: An overview. *Arch Gen Psychiatry* 1998;55:1026-32.
- Rawsthorne P, Shanahan F, Cronin NC, Anton PA, Lofberg R, Bohman L, *et al.* An international survey of the use and attitude regarding alternative medicine by patients with inflammatory bowel diseases. *Am J Gastroenterol* 1999;94:1298-303.
- Tandon M, Prabhakar S, Pandhi P. Pattern of use of complementary/alternative medicine (CAM) in epileptic patients in a tertiary care hospital in India. *Pharmacoepidemiol Drug Saf* 2002;11:457-63.
- Ernst E. The usage of complementary therapies by dermatological patients: A systematic review. *Br J Dermatol* 2000;142:857-61.

Source of Support: Nil, Conflict of Interest: None declared.